

# Geometry and Human Behavior

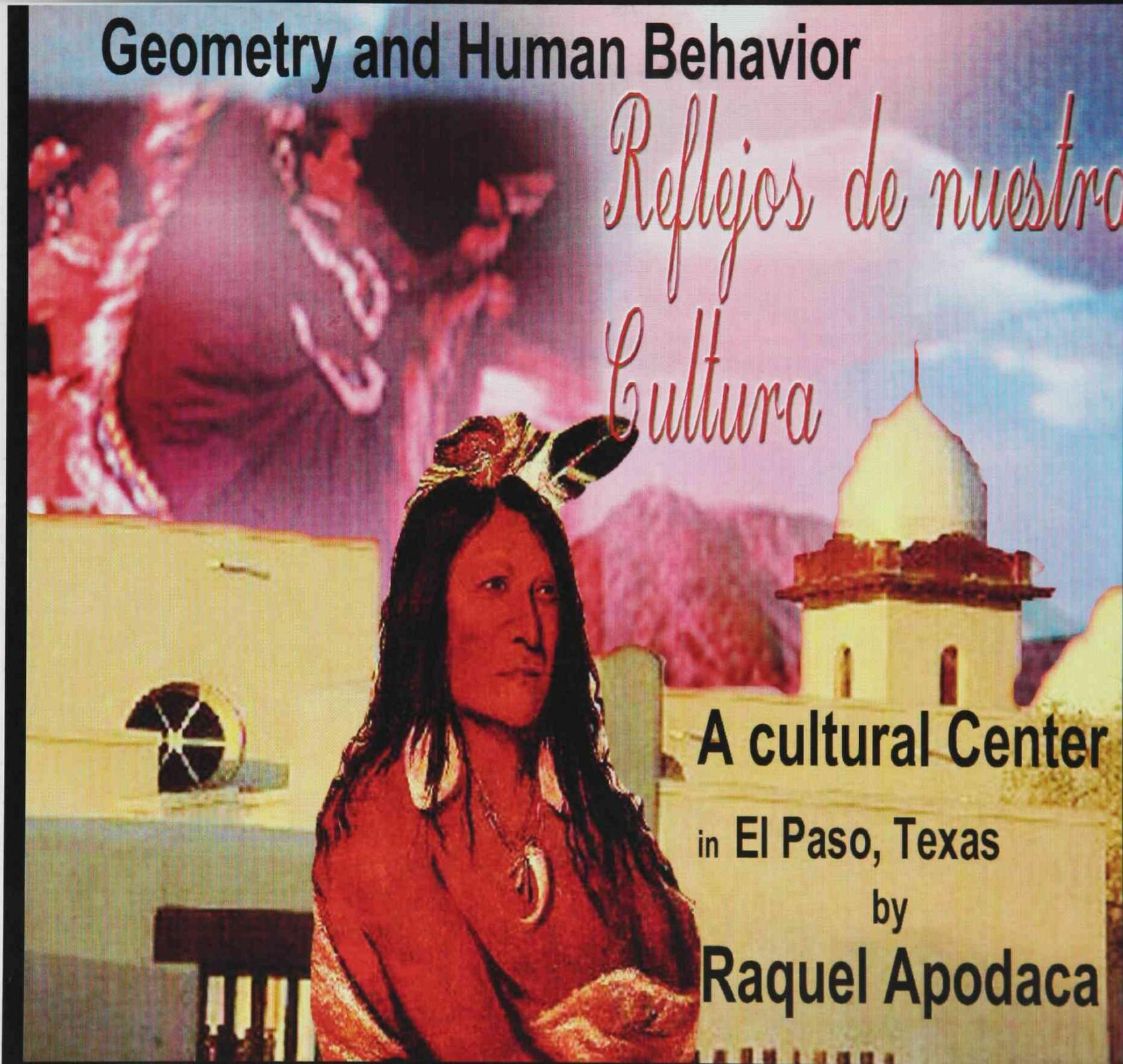
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Cultura*

**A cultural Center**

**in El Paso, Texas**

**by**

**Raquel Apodaca**



**Geometry and Human Behavior**

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THESIS IN ARCHITECTURE

Submitted to the Architecture Faculty of the College of Architecture of  
Texas Tech University in partial fulfillment for the degree of:

Bachelor of Architecture

 David A. Driskill, AIA, Thesis Instructor

 MICHAEL G. Peters, Thesis Advisor

Accepted

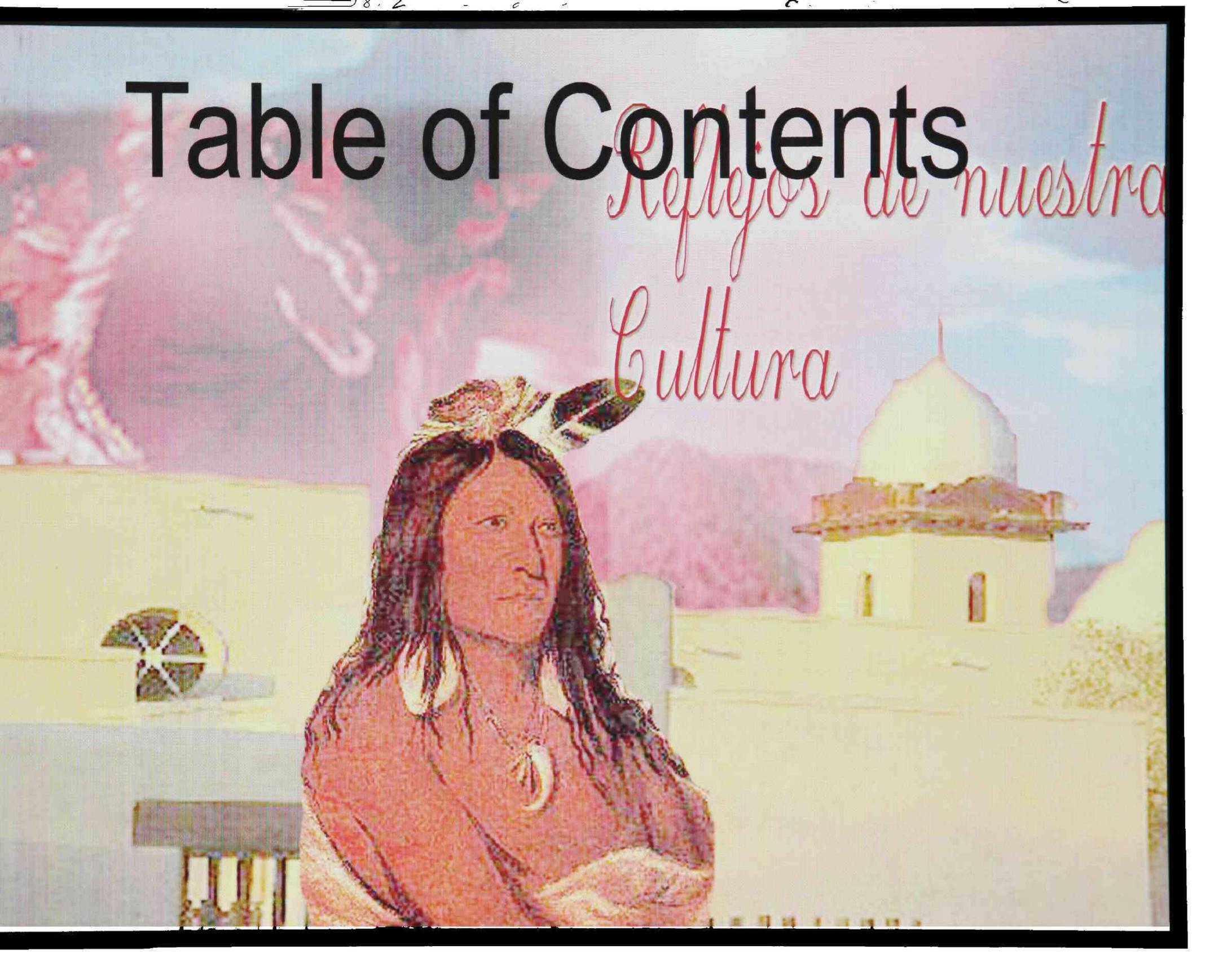
 James E. White, Dean

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Date

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**Abstract**

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# Abstract

## Theory

Architectural forms have an affect on human behavior by the experiences throughout the environment. The environment is experienced through the relationship of the surroundings and past experiences.<sup>1</sup> People do not experience the environment on their own because they are part of what surrounds them, and the image of the environment is important on the way people perceive things. Therefore, geometry in relation to the surrounding environments will develop a sense of togetherness and enhance the cultural experience.

## Context

The site is in El Paso, Texas next to Speaking Rock Casino, which is owned by the Tigua Indians. On the site there is a historical landmark, which is ignored due to the gambling that now takes place in the site.

## Facility

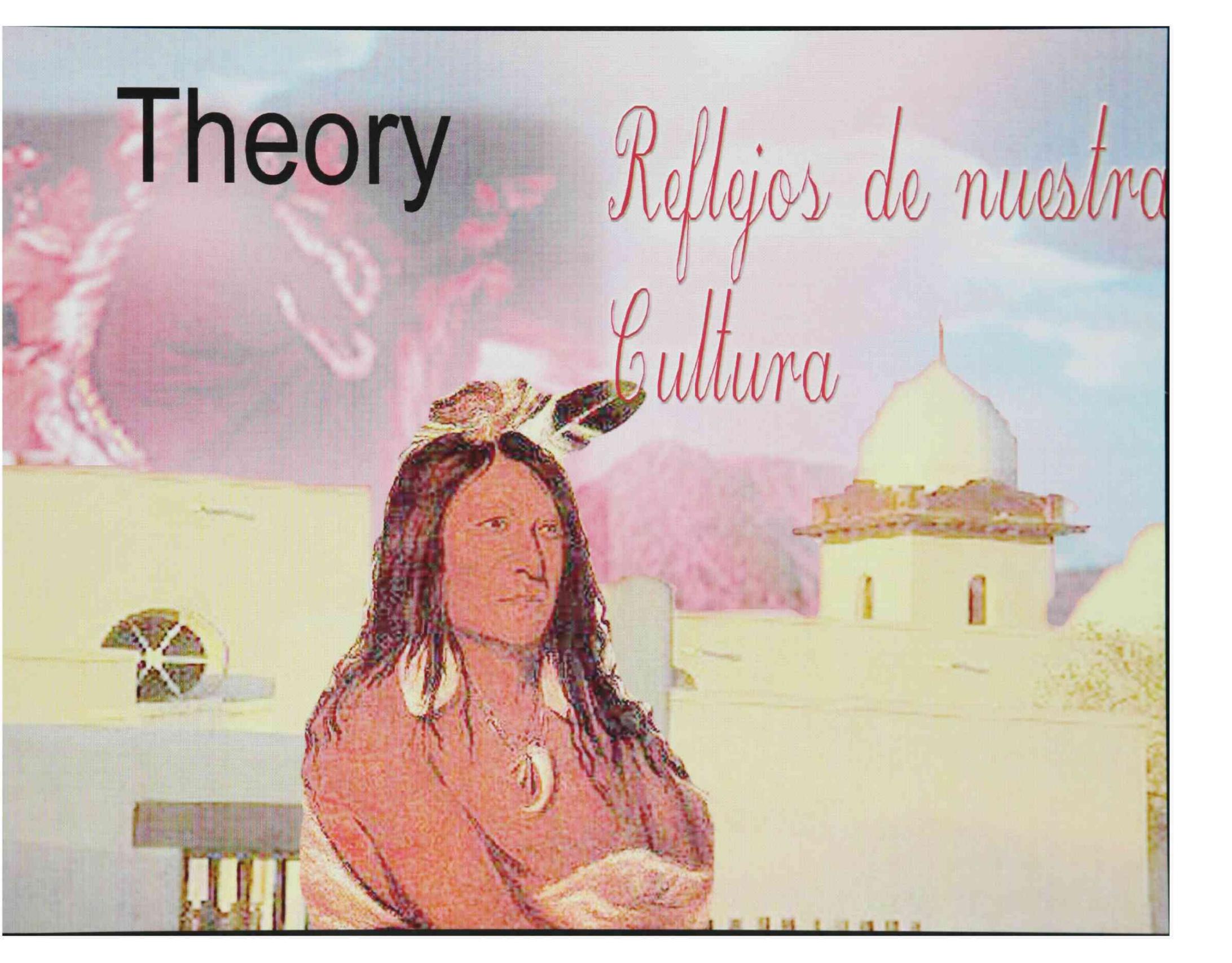
The cultural center will be a gathering place for people of the community and tourist to experience what life is and used to be. The facility will have a theater and a small museum with outdoor spaces throughout the site.

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Theory

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# Theory

People go through life experiencing spaces without taking notice why. There are many factors that are to be considered in identifying the surroundings of the environment. These factors are the five senses and the “visual sensations of color, shape, motion, or polarization of light”.<sup>1</sup> In doing so, how do the forms of the surroundings affect human behavior. Geometry is defined as the branch of mathematics that deals with points, lines, planes, and figures, and examines their properties, measurements, and mutual relations in space by the Webster's New World Dictionary. People experience places as geometry. There is a connection between present and past experiences, and the nature of buildings and streets of a city affect human behavior.<sup>2</sup> Designers can affect the way we feel and perceive things. Therefore, there are issues that will be discussed in how the human behavior is affected by geometry or architectural forms.

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Lynch, Kevin The Image of the City. Cambridge, MA: The Harvard University Press, 1960

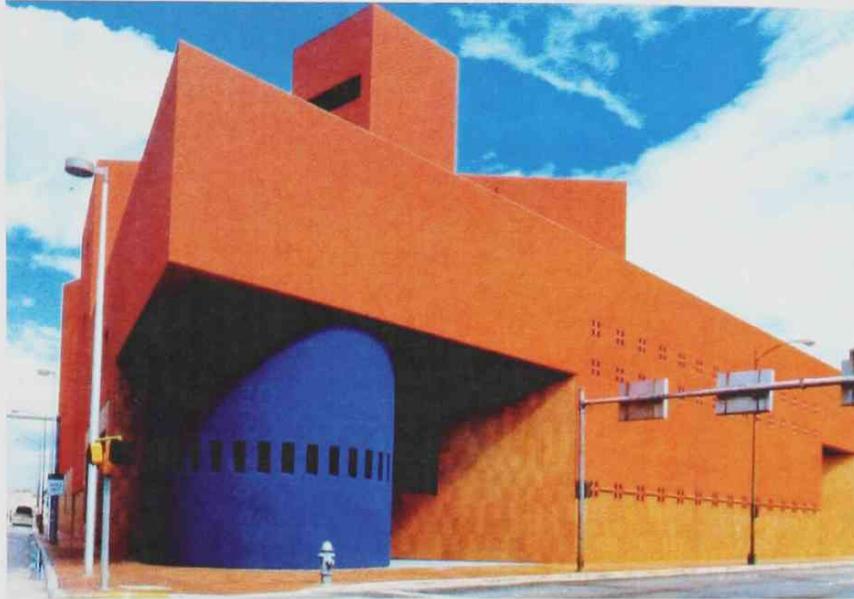
Deasy, C.M. Designing Places for People. NY: Watson-Guptill Publications, 1985.

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<sup>1</sup> Lynch, p. 3

<sup>2</sup> Deasy, p.9

## Theory Issues



San Antonio Main Library

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Lynch, Kevin The Image of the City. Cambridge, MA: The Harvard University Press, 1960

The first issue is **form quality**. People perceive forms in the most logical sense. If the form is too complex, people will break down the shape to a simple shape, such as a dome or a rectangle.<sup>3</sup> There must be some kind of continuity throughout the form in order to facilitate the perception of the form. Continuity is the “continuance of edge or surface; nearness of parts; repetition of rhythmic intervals”.<sup>4</sup> Both simplicity and continuity are needed to describe form quality, and are interrelated to the success of one another.

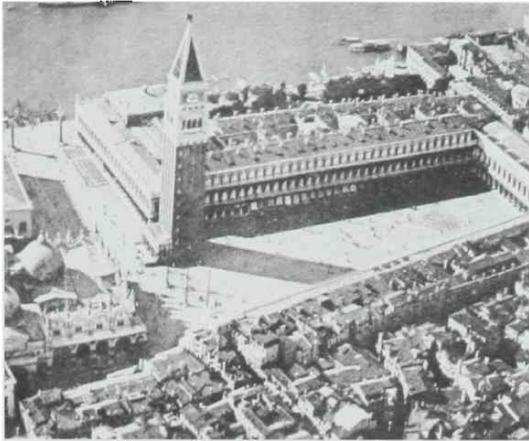
### **Potential Design Response**

A simple form is needed to have an affect on human behavior. The site already has a landmark, which is a simple element that is unique to the observer; therefore, the form should be different than the existing landmark. Yet in order for the form to have continuity, the form should be more complicated using simple forms. In other words, having the forms interlocking in some way.

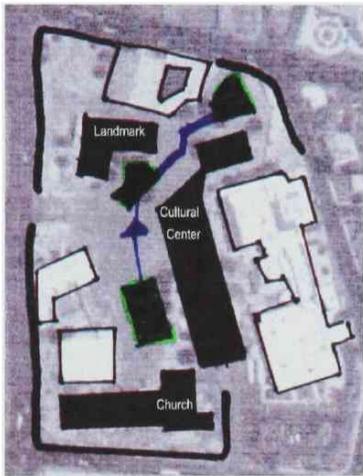
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<sup>3</sup> Lynch, p. 105

<sup>4</sup> Lynch, p. 106



Piazza San Marcos , Venice



Lynch, Kevin. *What Time is This Place?* Cambridge, MA: MIT Press. 1972

The second issue, is **spatial connection**. “Feeling locally connected where we customarily range is more important than our position at a national scale, although occasional realization of the latter can impart a brief thrill”.<sup>5</sup> A personal connection is needed in order to have an effective significance to the environment. The connection should be memorable and simple, for example photographs and footprints. There should be imprints of the environment throughout the surroundings.

### Potential Design Response

The facility shall be linked to the landmark and the new church. How can this link be made? The cultural center may be linked through outdoor spaces with small nodes that symbolize a certain significance to the site.

The cultural center should be the main imprint of the site, located in the center, reinforcing a personal connection to the environment.

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<sup>5</sup> Lynch, p. 61



Office block in Monterrey, Monterrey, Mexico

The third issue, is **identity**. When does form become a symbol that is significant to the environment? Only the users may determine that, but the community does have some common experiences through culture. "Identity and structure are the "formal" components of sense. Congruence, transparency, and legibility are specific components, which connect environment to other aspects of our lives"<sup>6</sup>. Since the community has common life experiences, an identity through the environment needs to be established.

### **Potential Design Response**

In order to show identity throughout the site, the cultural center shall be designed with contextual materials. The building itself would emphasize modern Mexican architecture.

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Lynch, Kevin. Good City Form. Cambridge, MA: MIT Press. 1981

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<sup>6</sup> Lynch. P143

## Bibliography

Deasy, C.M. Designing Places for People. New York: Watson-Guption Publications, 1985.

Lynch, Kevin. Good City Form. Cambridge, MA: MIT Press, 1981.

Lynch, Kevin. The Image of the City. Cambridge: Harvard University Press, 1960.

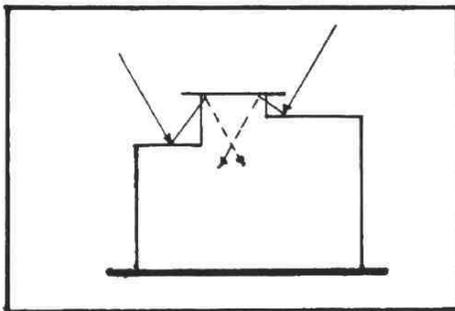
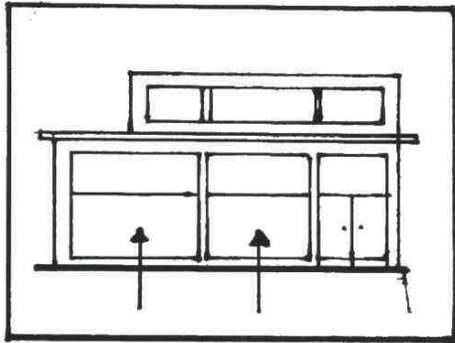
Lynch, Kevin. What Time is This Place? Cambridge, MA: MIT Press, 1972.

# Facility

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## Facility Issues



## Lighting

One major facility issue for the museum is lighting. It is imperative that the museum has adequate lighting. As objects need light in order for them to be appreciated, some objects may be destroyed depending on the type of lighting. The requirements may vary from one side of the museum to the next.

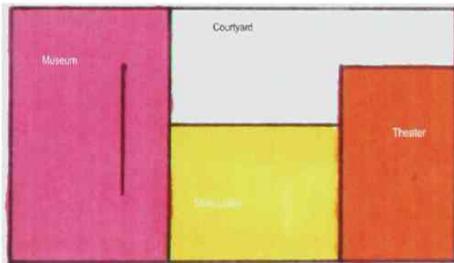
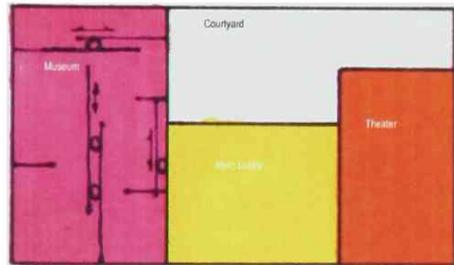
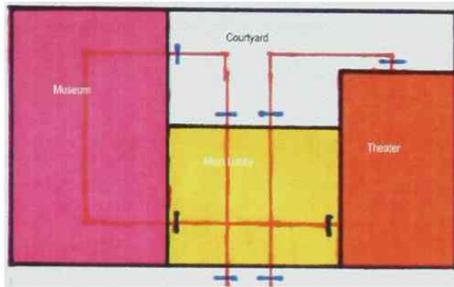
### **Potential Design Response**

A potential design response for incorporating natural light throughout the building is by supplying direct natural light in the main lobby, which is the main gathering space for both the theater and museum.

Even though windows are not recommended in museums, indirect light may be supplied throughout the museum by having a skylight with a reflection device to distribute the natural light throughout the gallery. In addition to indirect light, the gallery will be supplied with

track lighting where the natural light doesn't penetrate. The storage and collection areas also have to be protected from UV filtration.

Therefore, this space will be lighted with fluorescent lights to avoid UV penetration.



## Circulation

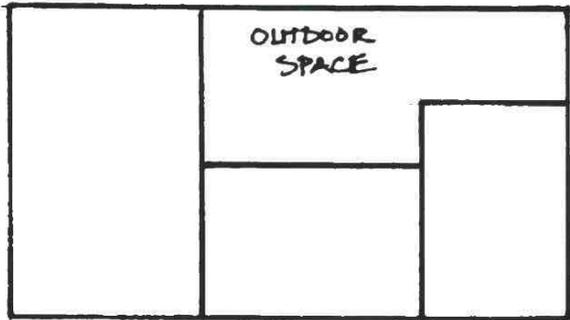
Circulation will provide security, a format for display space, and climate control.

### Potential Design Response

Security throughout the building will be achieved through circulation. Having a specific circulation pattern defines specific entries and exits; therefore, providing security.

Circulation designates the display space of the gallery. The display room is to be flexible for different exhibits, but emphasizing specific circulation throughout by supplying movable exhibit walls.

The physical separations of galleries and other public areas will provide a circulation pattern, which will then achieve climate control.



## Social Interaction

Provide an environment to support social interaction. The Mexican culture is all about social interaction.

### Potential Design Response

A common outdoor space, such as a courtyard between the theater and the museum, will provide social interaction. Not only that, but a different outdoor space provides a link between the cultural center, the new school, and the Mission Ysleta.

## **Bibliography**

Gast, Klaus-Peter. Louis I. Kahn. Birkhauser: Germany, 1999.

Buttiker, Urs. Louis I. Kahn Light and Space. New York: Wastson-Guptill Publications, 1994.

## Case Studies

The Kimbell Museum

Architect: Louis I. Kahn

Location: Fort Worth, Tx

The Menil Museum

# Context

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## Context Issues



Aerial photo of site

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Timmons, W.H. El Paso A Borderlands History. El Paso, TX: Texas Western Press. 1990

## Built Environment and Issue

The lower valley has many historic values, which are sometimes unappreciated. The built environment around this area has a historic landmark that is being ignored. This historic landmark is the Mission Ysleta. The Mission Ysleta was built in the late 1600s.<sup>1</sup> This mission has been rebuilt twice due to the damage it had occurred in the natural disasters. Even though the mission is a historic landmark, the mission is now being undermined. The mission was built with adobe and heavy timber. However, How will the context respond to the Mission Ysleta.

### **Potential design response**

The cultural center shall be located in the existing parking lot between the old mission and the new school. This will create a central link to both the mission and the new church, which will then create a cultural site.

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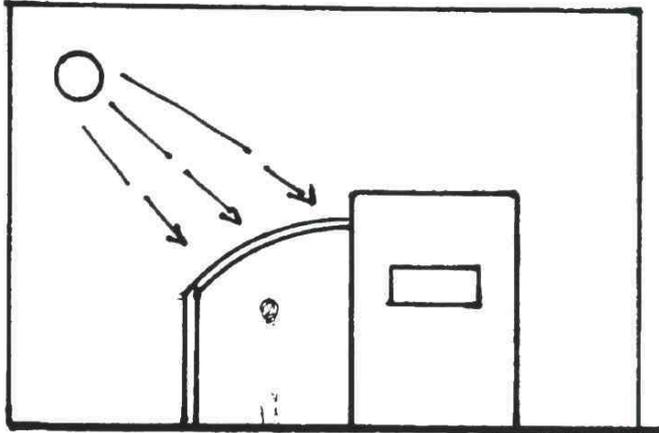
<sup>1</sup> Timmons, p. 73



## Natural Environment and Issue

The City of El Paso is the fourth largest city in Texas and the seventeenth largest in the United States (Demo pack). It is a city along the border of the United States and Mexico. This city is not only in the edge of Mexico, but in the edge of New Mexico. What separates the City of El Paso and Mexico is what is known as the Rio Grande. The common denominator of El Paso and the state of New Mexico are the mountains. The highest mountain peak is 7,200 feet with El Paso having an altitude of approximately 4,000 feet (Demo Pack).

The natural environment of El Paso is desert. The weather is normally warm considering throughout the year the city holds 202 days of clear skies, and a mean high temperature of 76.8 degrees F (Demo Pack). This is why El Paso is usually referred to as the Sun City. The mean low temperature is 50.6 degrees F. The city of El Paso does experience the beauty of rain, but not very often. The precipitation level in the city is an average of 8.65 inches per year, which gives us the

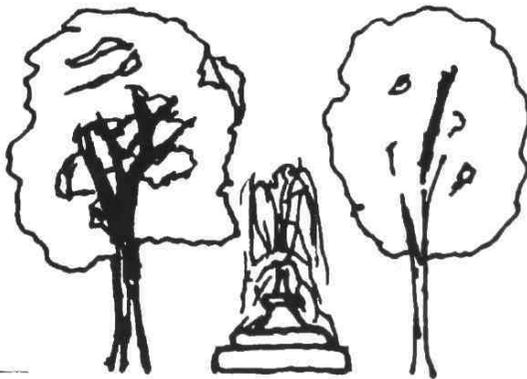


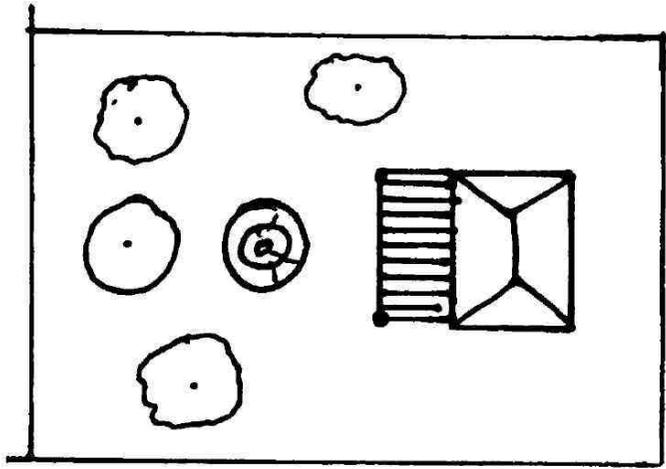
average of cloudy days of 108 per year. Not only does the city experience rain, but also it experiences wind velocities of 1.1 miles per hour winds. The wind is usually directed from the southwest at 229 degrees.

One important issue of the natural environment is climate. It is obvious that the city is considerably warm throughout the year. Since the average high throughout the summer months is 95 degrees, the issue is to keep the facility cool.

#### **Potential Design Response**

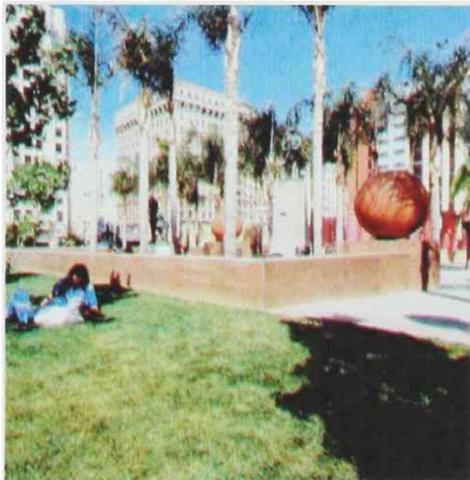
The facility shall provide a well air-conditioned interior. Even though the humidity factor is not a high issue in El Paso, the facility itself needs to have no humidity in the building.





In addition, the facility will provide pleasurable outdoor spaces throughout the site. The weather in El Paso allows for many outdoor activities: therefore, the facility will provide plenty of shade with trees, or some covered structure.

Not only that, but the facility will have shading devices, such as louvers, on the south and west fenestration.



## Cultural Environment and Issue

The city of El Paso is a multicultural community with the benefit of knowing two worlds. The city's population majority is Hispanic by 69%. The estimated population is 1,827,803 including the population in Juarez, Mexico.

El Paso's economy is growing in the sense of manufacturing. The great economic increase is due to the retail sales and the success of the maquiladoras in Juarez, Mexico. Due to this economic growth, the employment rate is 2.4% in growth, which made a 4,900 job increase in the year of 1996.

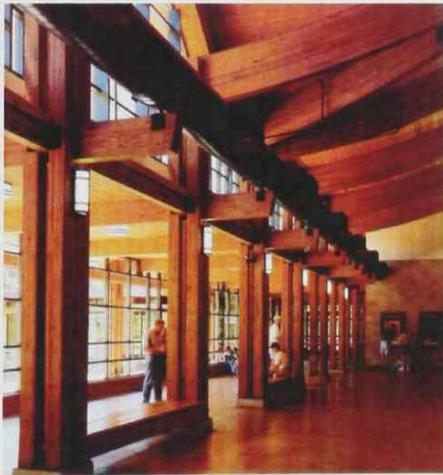
As El Paso keeps growing as it did in the late 1600s, when the Spanish conquistadors, Indians, Asians, and Europeans settled in the boundary of what is now Mexico and the United States, El Paso has developed a range of cultural significance. Yet, for this situation the cultural significance will be that of the Spanish and the Indian.



Office block in Monterrey, Monterrey, Mexico

### Potential Design Response

The facility will be designed with heavy timber and emphasize color, light, and a dominant structure as modern Mexican Architecture.



## **Bibliography**

Timmons, W.H. El Paso A Borderlands History. El Paso, TX: Texas Western Press, 1990.

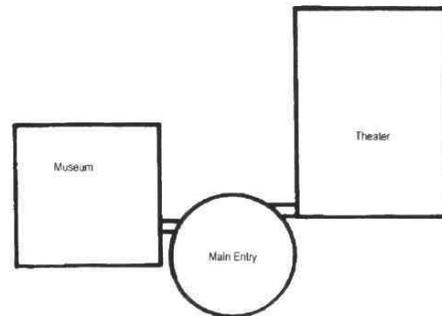
City of El Paso Texas 1990 Census Profiles: Department of Planning, Research, and Development

# Space Analysis

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## Spatial Analysis



Time Savers for U.S. F.

### Main Foyer

- ❖ Area: 1500 U.S.F.
- ❖ Participants: Visitors and Employees
- ❖ Number of participants: 1 to 300
- ❖ Activity: This area will be the main entrance for all the three facilities within the cultural center.
- ❖ Adjacency: The main foyer will be adjacent to the theater, museum, and exhibition gallery.

### Public Restroom

- ❖ Area: 150 U.S.F. two sets of men and women; 2 lavatories and 4 water closets. ( Graphic Standards)
- ❖ Participants: Public
- ❖ Number of Participants: 1 to 5
- ❖ Activity: An area of personal hygiene
- ❖ Adjacency: The rest room should be adjacent to both the Theater and museum.

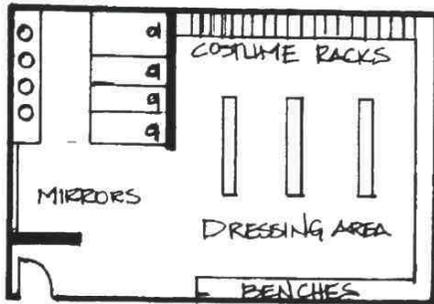


## Theater

- ❖ Area: 1790 U.S.F.
- ❖ Participants: Visitors, Employees and Maintenance
- ❖ Number of Participants: 253
- ❖ Activity: The theater will be a place for small performances, such as, dance, music, and theatrical productions.
- ❖ Adjacency: The theater should be located off the main foyer and should have a small lobby.

## Stage

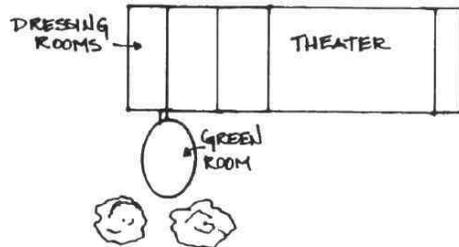
- ❖ Area: 900 U.S.F.
- ❖ Participants: Performers and public speakers
- ❖ Number of Participants: 1 to 15
- ❖ Activity: The stage will be the area for the performances to take place. Either the dance, music, theatrical productions, or film and lectures.
- ❖ Adjacency: The stage should be located in front of the seating area of the theater. It will also have a backstage that is approximately the same size as the stage.



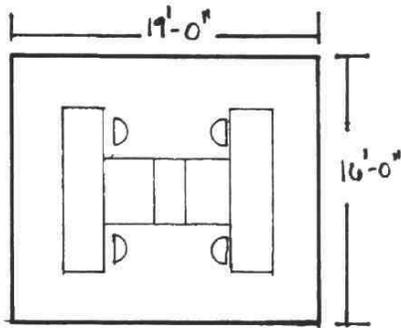
### Dressing Rooms

- ❖ Area: 300 U.S.F. for both men and women
- ❖ Participants: Performers and public speakers
- ❖ Number of Participants: 1 to 15
- ❖ Activity: It is an area for performers to change into costumes and personal hygiene.
- ❖ Adjacency: This area should be located off the backstage without interfering with the backstage movement, such as, performers and scenery.

### Green Room



- ❖ Area: 200 U.S.F.
- ❖ Participants: Performers, public speakers, and stage manager
- ❖ Number of Participants: 1 to 15
- ❖ Activity: It is a place for performers to have breaks and a sense of relaxation.
- ❖ Adjacency: The green room should be adjacent to the dressing rooms and the backstage.

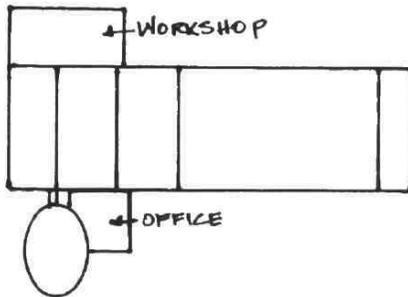


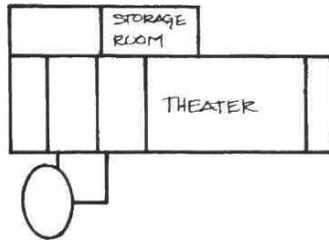
#### Office

- ❖ Area: 304 U.S.F.
- ❖ Participants: Stage managers
- ❖ Number of Participants: 1 to 4
- ❖ Activity: This space will be where business will be conducted. Such as, office activities.
- ❖ Adjacency: The office will be adjacent to the backstage and green room.

#### Work shop

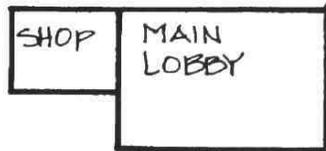
- ❖ Area: 500 U.S.F.
- ❖ Participants: Employees
- ❖ Number of Participants: 1 to 3
- ❖ Activity: This place will be where sets are built or repaired.
- ❖ Adjacency: This workshop should be adjacent to the backstage.





### Storage Room

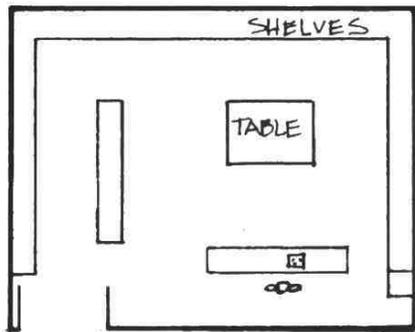
- ❖ Area: 300 U.S.F.
- ❖ Participants: Maintenance and Employees
- ❖ Number of Participants: 1 to 5
- ❖ Activity: This space is for storing sets with a specific area for storing cleaning supplies.
- ❖ Adjacency: The storeroom should be adjacent to the workshop.

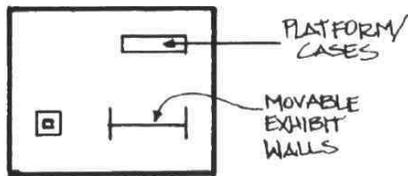
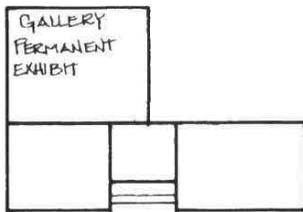
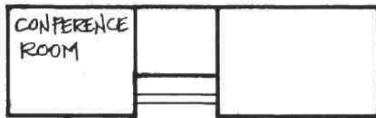
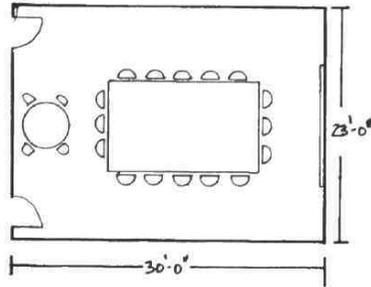


### Museum

#### Museum Shop

- ❖ Area: 850 U.S.F.
- ❖ Participants: Visitors and Employees
- ❖ Number of Participants: 1 to 10
- ❖ Activity: This space will be a small retail space for the museum.
- ❖ Adjacency: The retail shop should be adjacent to the main lobby.



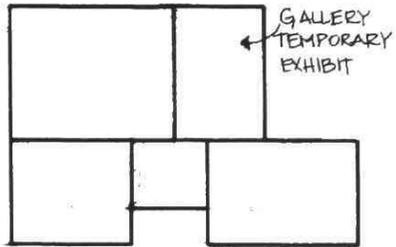


### Conference Room

- ❖ Area: 690 U.S.F.
- ❖ Participants: Employees and Visitors
- ❖ Number of Participants: 1 to 20
- ❖ Activity: This space will be used for lectures and business meetings.
- ❖ Adjacency: This space should be adjacent to the gallery.

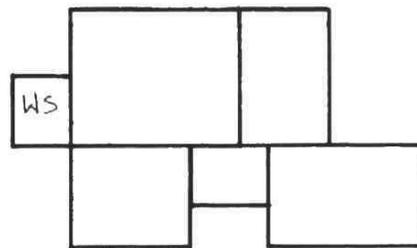
### Gallery Permanent Exhibit

- ❖ Area: 1,500 U.S.F.
- ❖ Participants: Employees and Visitors
- ❖ Number of Participants: 1 to 15
- ❖ Activity: This space will be used to display small- medium sized artifacts, art, and traditional sculptures.
- ❖ Adjacency: The gallery should be adjacent to the conference room.



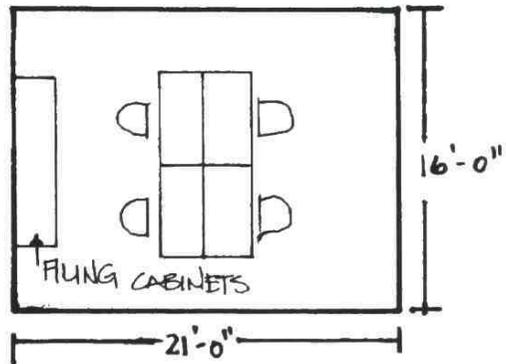
### Gallery Temporary Exhibit

- ❖ Area: 900 U.S.F.
- ❖ Participants: Employees and Visitors
- ❖ Number of Participants: 1 to 20
- ❖ Activity: This space will be used to display temporary art exhibits and small sculptures.
- ❖ Adjacency: The gallery should be adjacent to the permanent gallery exhibit.



### Workshop

- ❖ Area: 400 U.S.F
- ❖ Participants: Employees
- ❖ Number of Participants: 1 to 5
- ❖ Activity: This space will be used to store some to the temporary art or to repair the art and sets.
- ❖ Adjacency: The workshop will be adjacent to the gallery and storage.

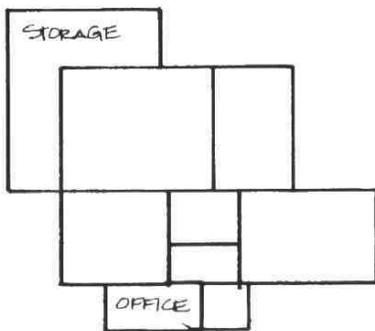


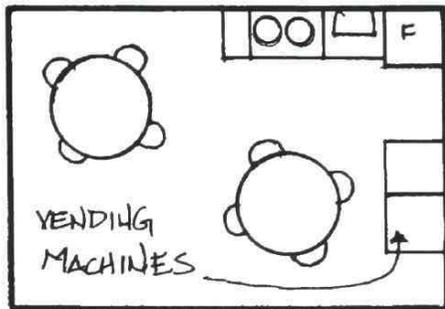
#### Office

- ❖ Area: 336 U.S.F.
- ❖ Participants: Employees
- ❖ Number of Participants: 1 to 5
- ❖ Activity: General office activities, such as, filing.
- ❖ Adjacency: The office should be adjacent to main lobby and gallery space. It should also be adjacent to the break room.

#### Storage

- ❖ Area: 900 U.S.F.
- ❖ Participants: Employees and Maintenance
- ❖ Number of Participants: 1 to 5
- ❖ Activity: This space is for general storage and a collection space.
- ❖ Adjacency: This storage should be adjacent to the loading dock and the workshop.





### Break Room

- ❖ Area: 160 U.S.F.
- ❖ Participants: Employees
- ❖ Number of Participants: 1 to 5
- ❖ Activity: This space is for lunch breaks or general breaks. The break room includes a small kitchenette.
- ❖ Adjacency: The break room should be adjacent to the office space and the main lobby.

### Private Restrooms

- ❖ Area: 60 U.S.F ; 2 water closets and 1 lavatory
- ❖ Participants: Employees
- ❖ Number of Participants: 1 to 3
- ❖ Activity: An area of personal hygiene.
- ❖ Adjacency: One restroom should be adjacent to the office of the Museum. The other restroom should be adjacent to the office of the theater.

# Space Summary

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## Space Summary

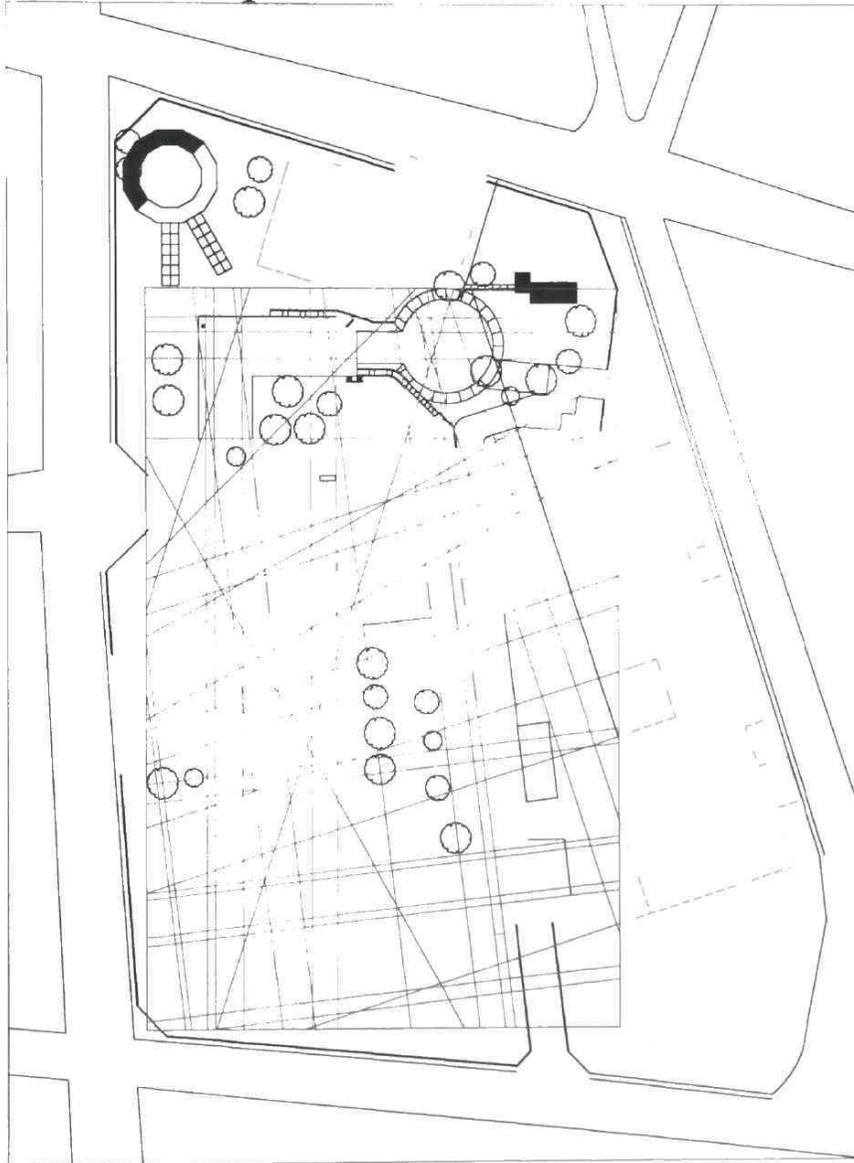
Space	Quantity	# of Users	Space Standard	Usable S.F.	Final
Main Foyer	1	250	Time Savers	1500	960
Public Restrooms(W)	1	6	Graphic Standards	250	375
Public Restrooms (M)	1	5	Graphic Standards	250	270
Private Restrooms	2	3	Graphic Standards	60	225
Theater	1	253	Time Savers	1790	2,304
Stage	1	15	Time Savers	600	840
Dressing Rooms	2	15	Time Savers	300	320
Green Room	1	15	Time Savers	200	0
Office	2	3	Time Savers	304	300
Work Shop	1	3	Time Savers	500	320
Storage Room	1	5	Time Savers	300	320
Museum Shop	1	10	Time Savers	850	960
Conference Room	1	20	Time Savers	690	690
Gallery Permanent	1	15	Time Savers	1500	3,100
Gallery Temporary	1	20	Time Savers	900	1,920
Museum Work Shop	1	5	Time Savers	400	690
Office	1	5	Time Savers	336	623
Storage Room	1	5	Time Savers	900	920
Break Room	1	5	Time Savers	160	225
Mechanical	1	1		600	195
Net total				At 1.3 Gross	15,557
				Total	20,224

# Design Concepts

*Reflejos de nuestra  
Cultura*

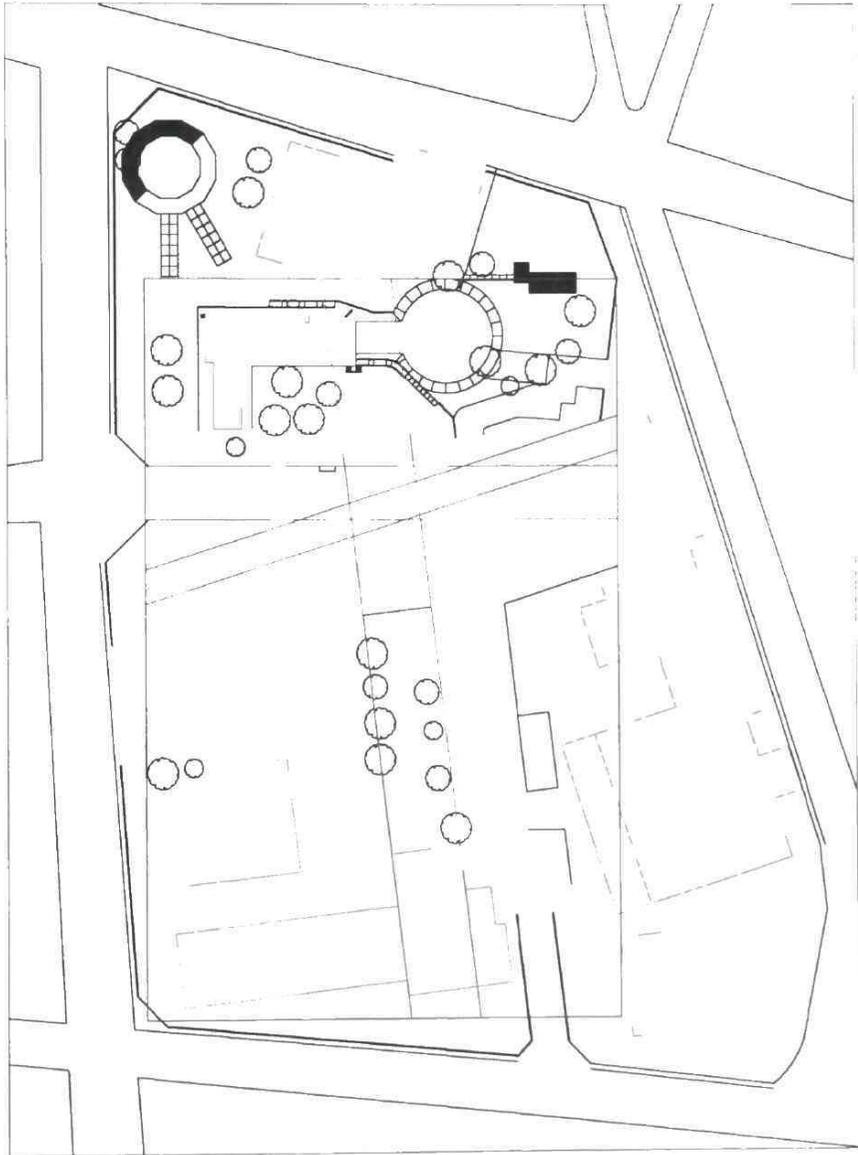


# Design Concepts

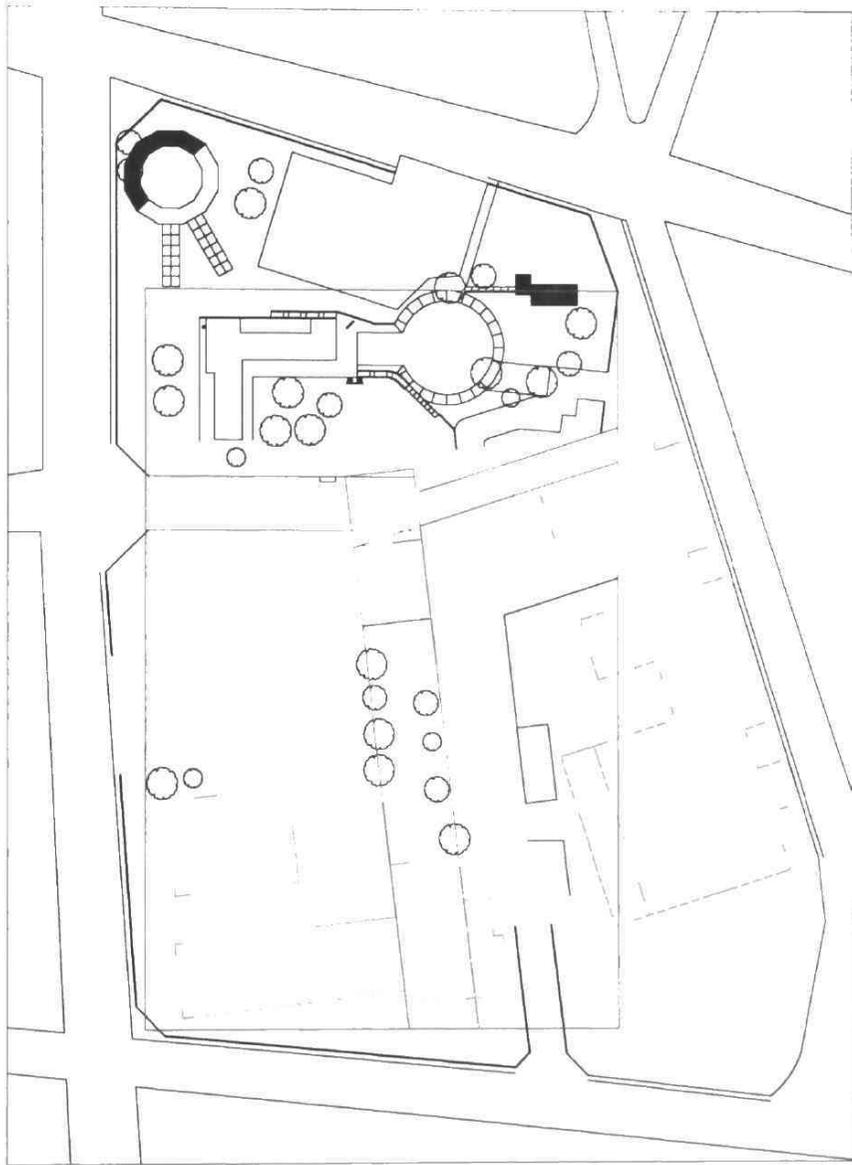


1

Lines radiating  
for each building

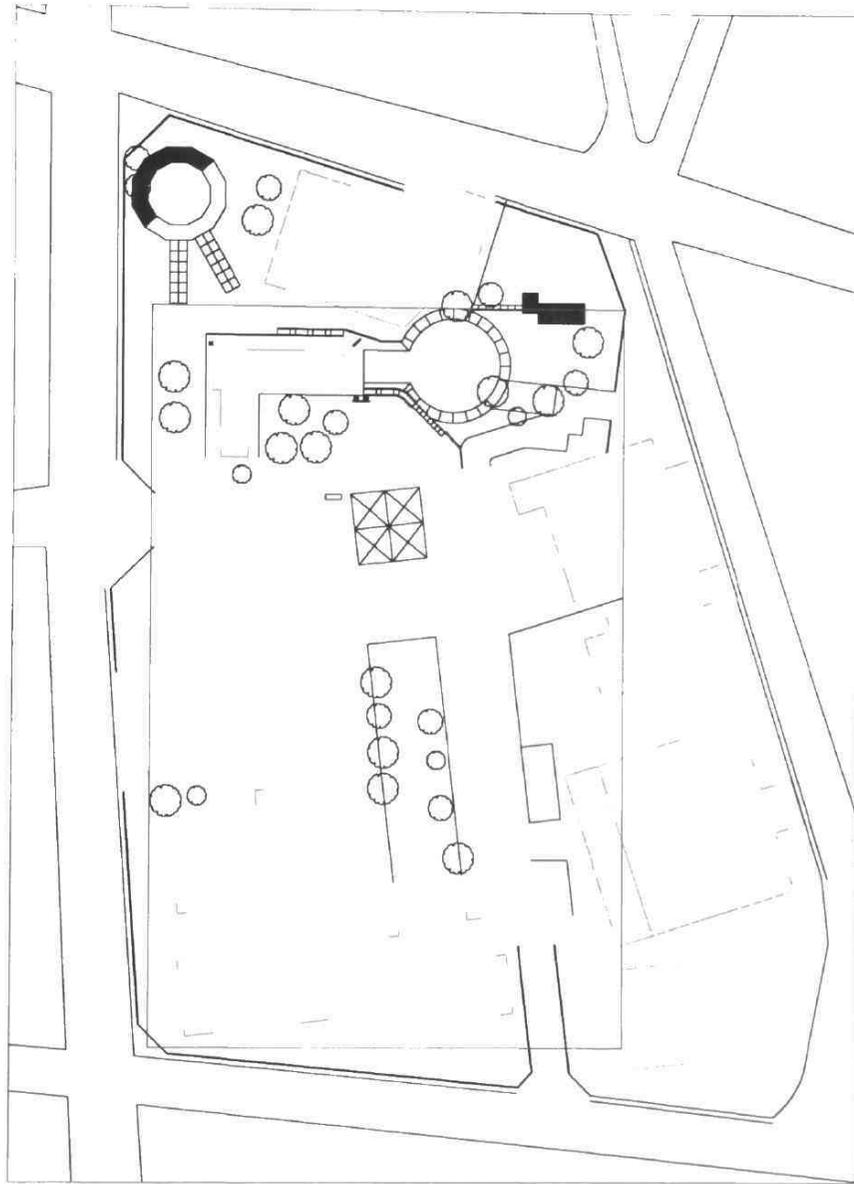


Determined main axis  
from New Church and  
Intersection of main entry  
and the Casino's



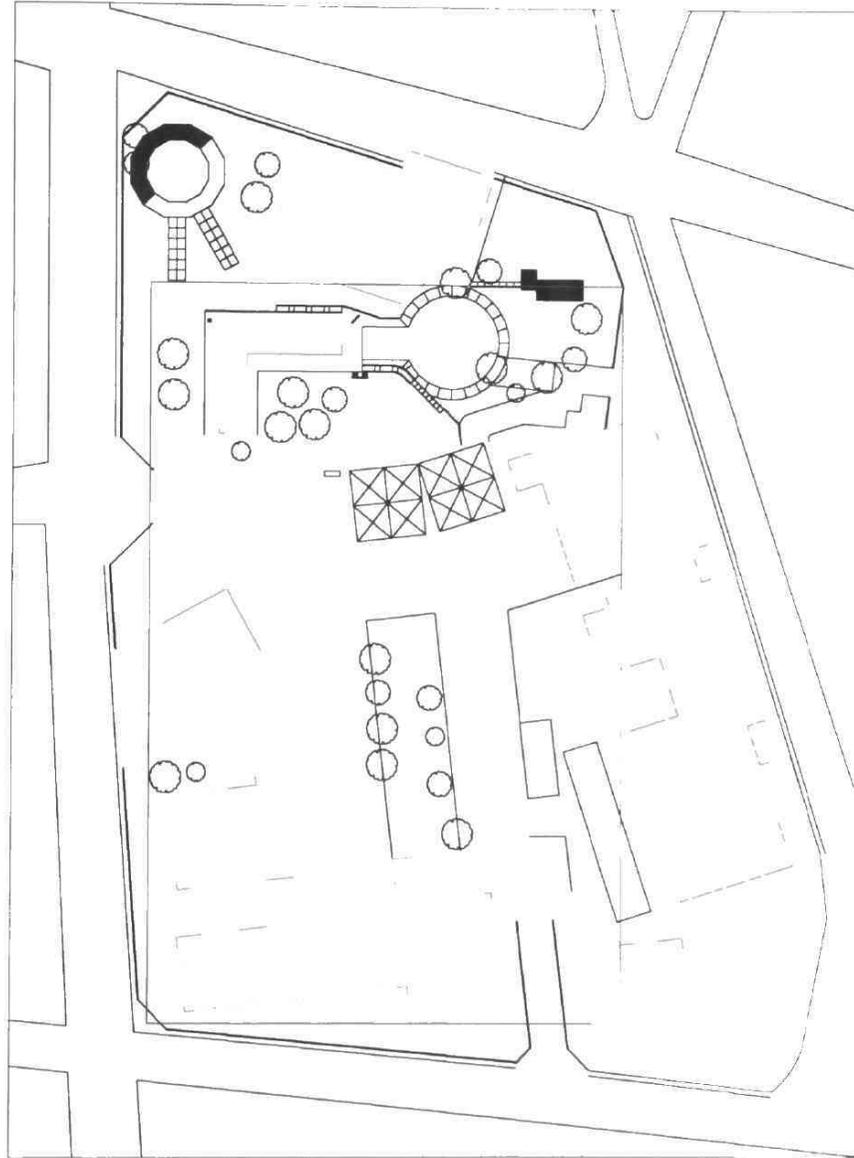
3

Yellow box determined  
a 64'x64' grid



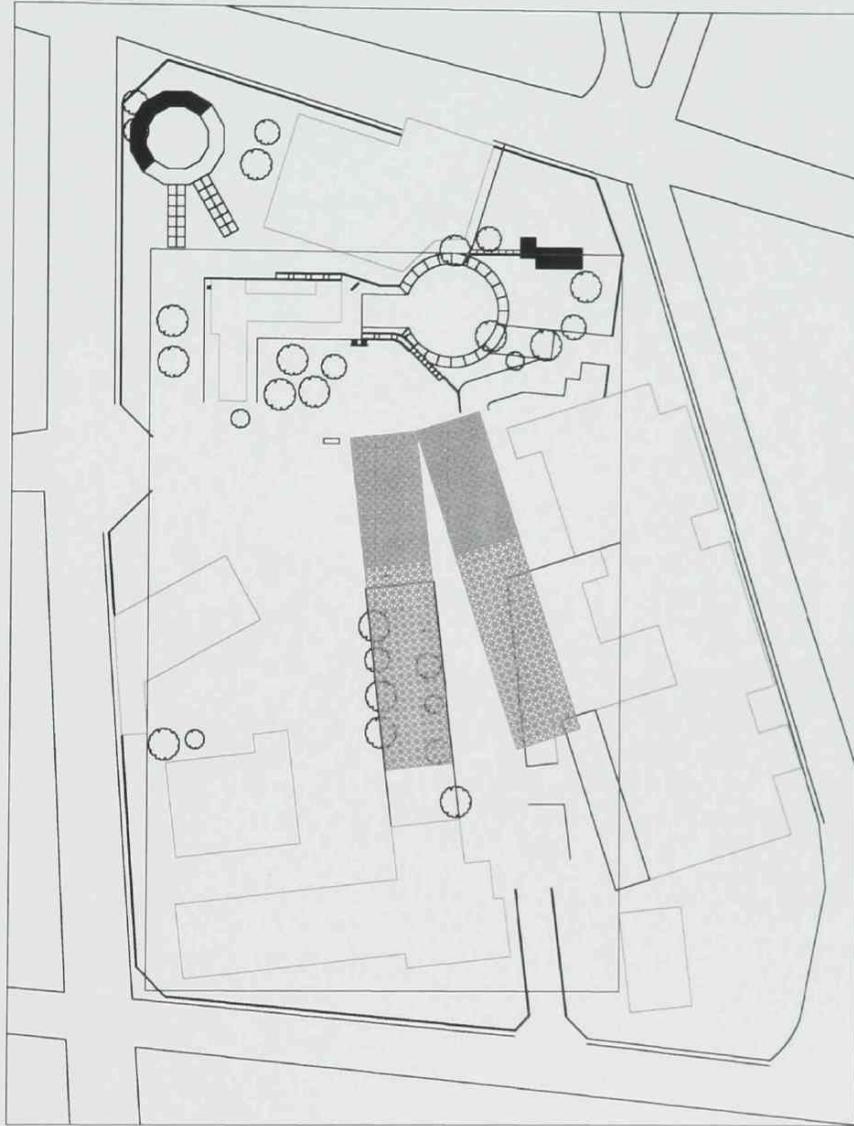
4

The box was then  
divided into smaller  
boxes and triangles



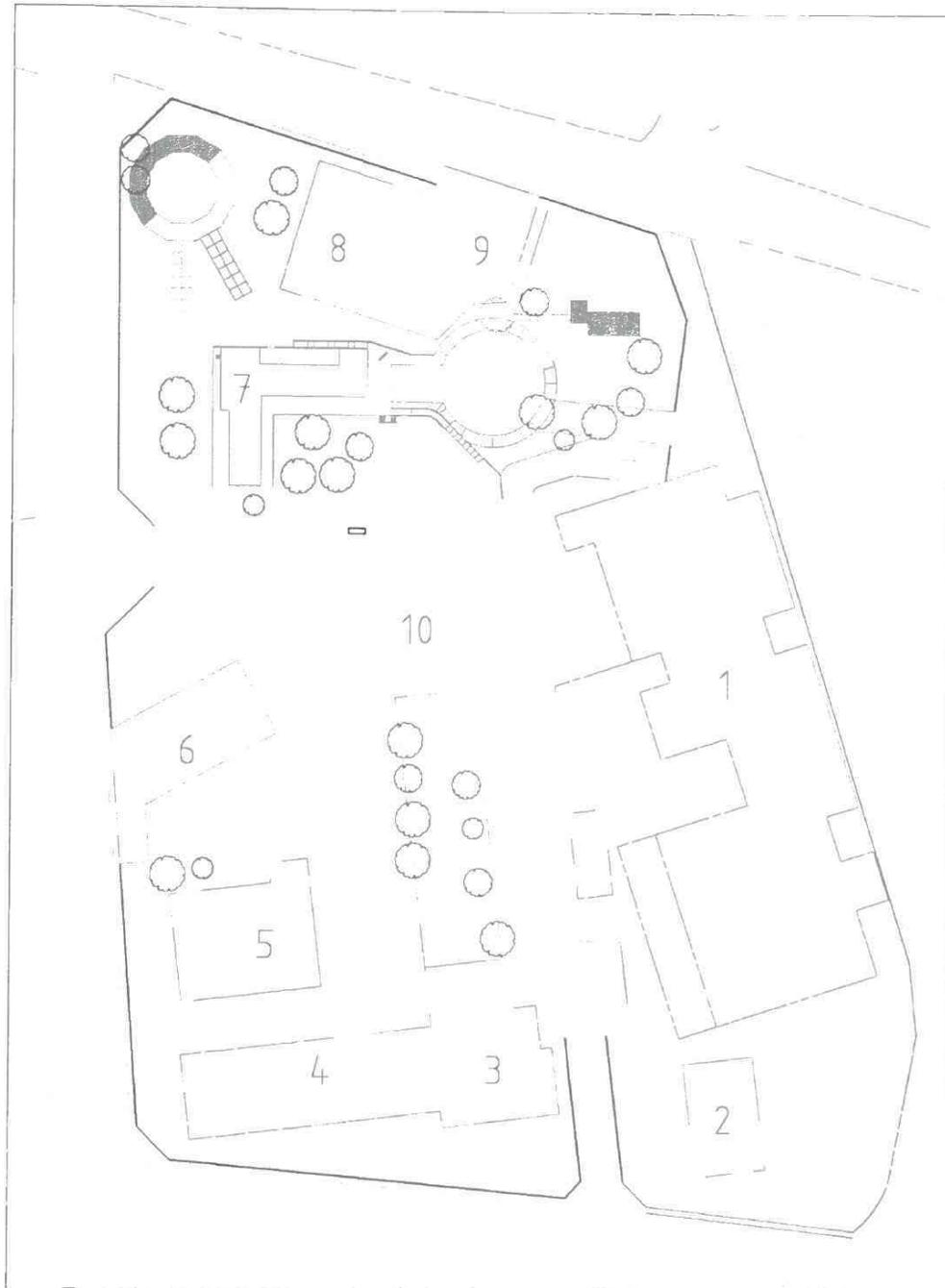
5

The pink grid was turned to an 18 to follow the radiating lines of the



6

Both grids were then  
extended

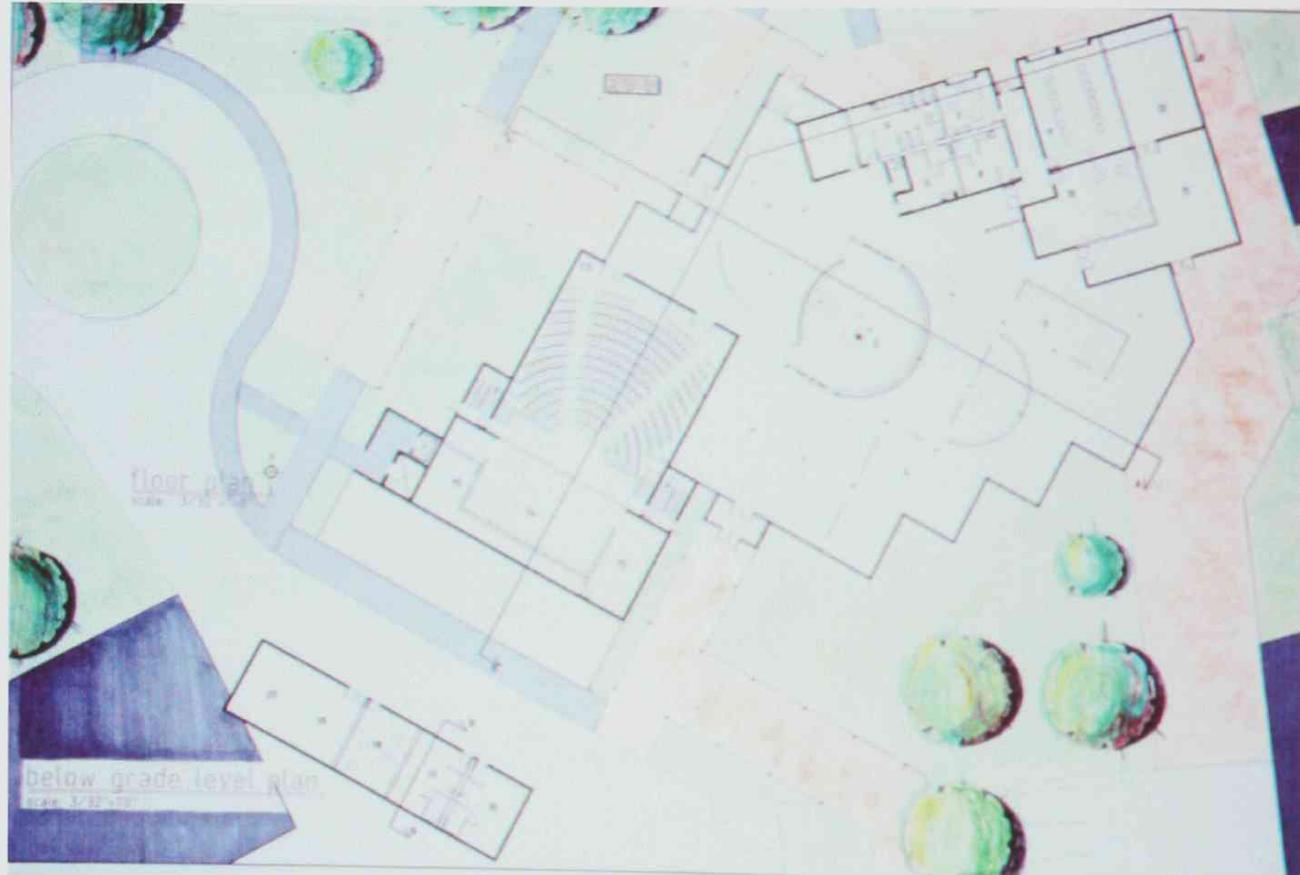


1. Tigua Indian Casino
2. Tigua Indian Gas Station
3. Mt. Caramel Catholic Church
4. Private Catholic School
5. Parish Hall
6. Priest Quarters
7. Mission Ysleta
8. Jesuit Hall
9. Main Office
10. parking

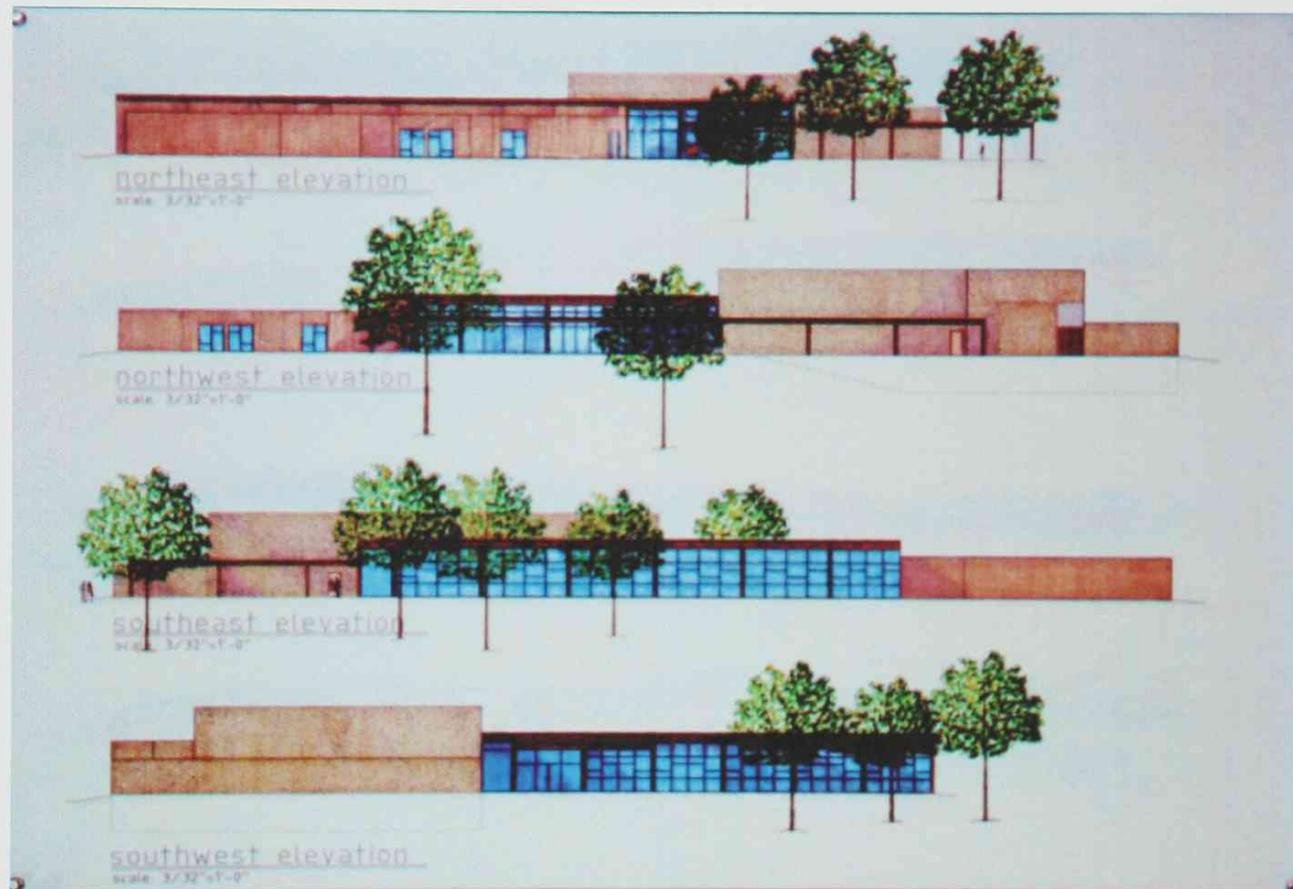
Site Plan



## Floor Plans



## Elevations



## Sections



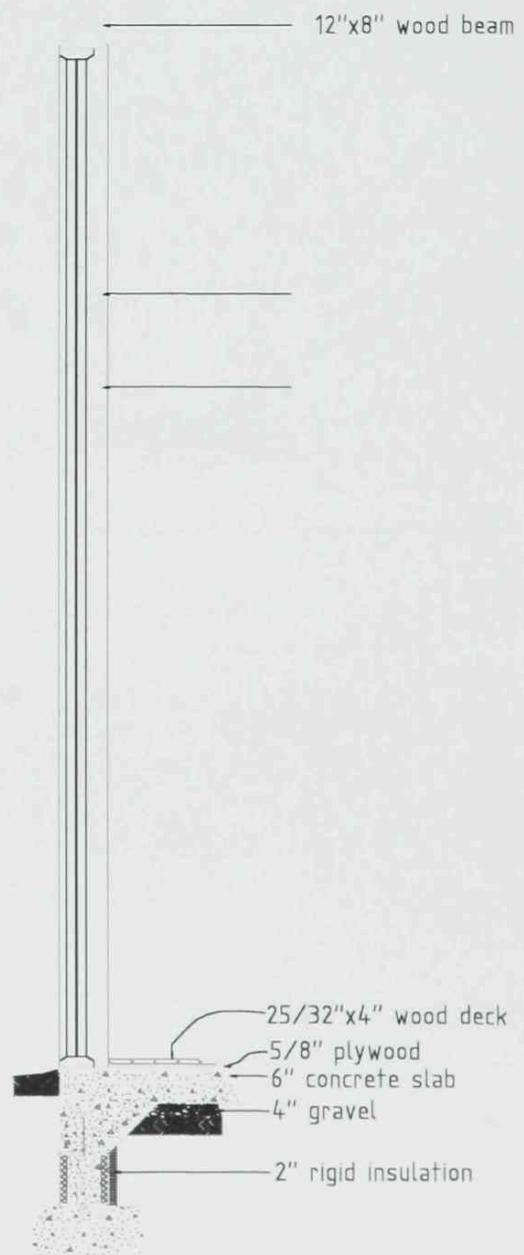
flashing

roof membrane

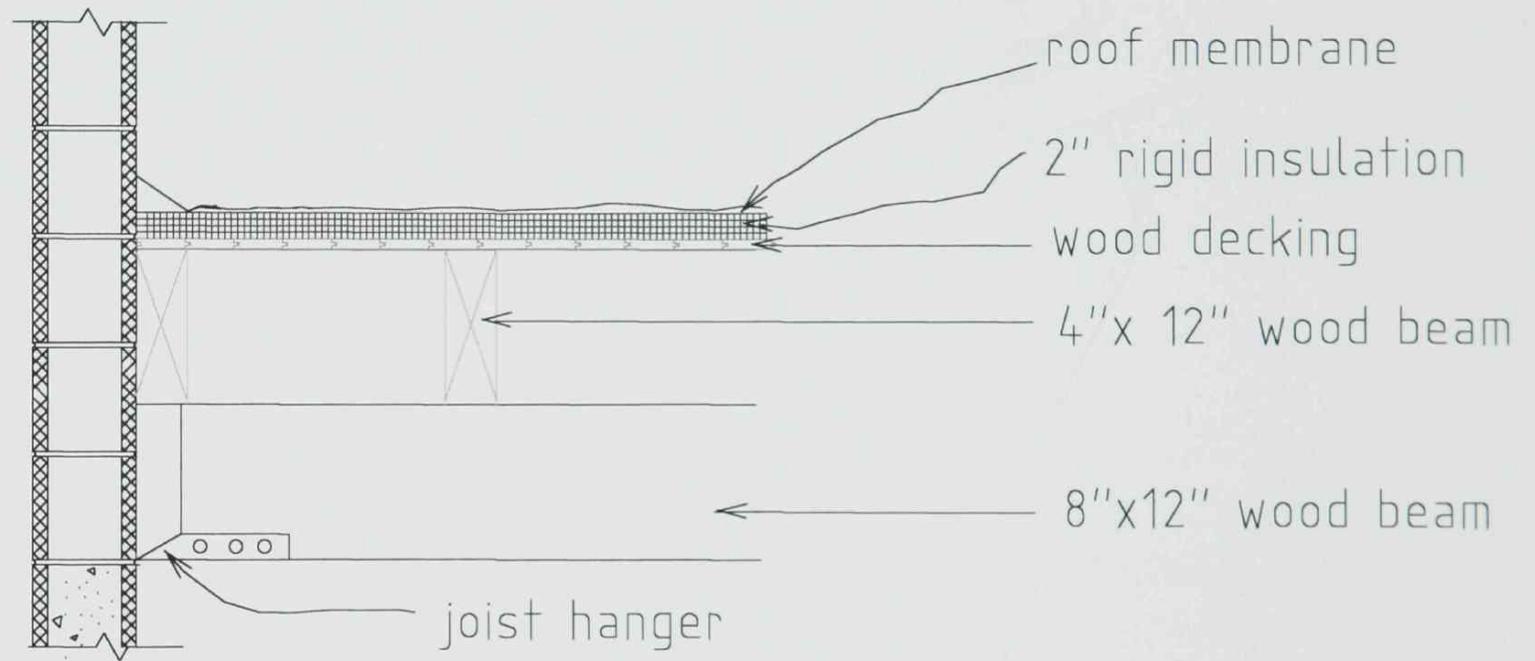
2" rigid insulation

wood decking

12"x4" wood joist

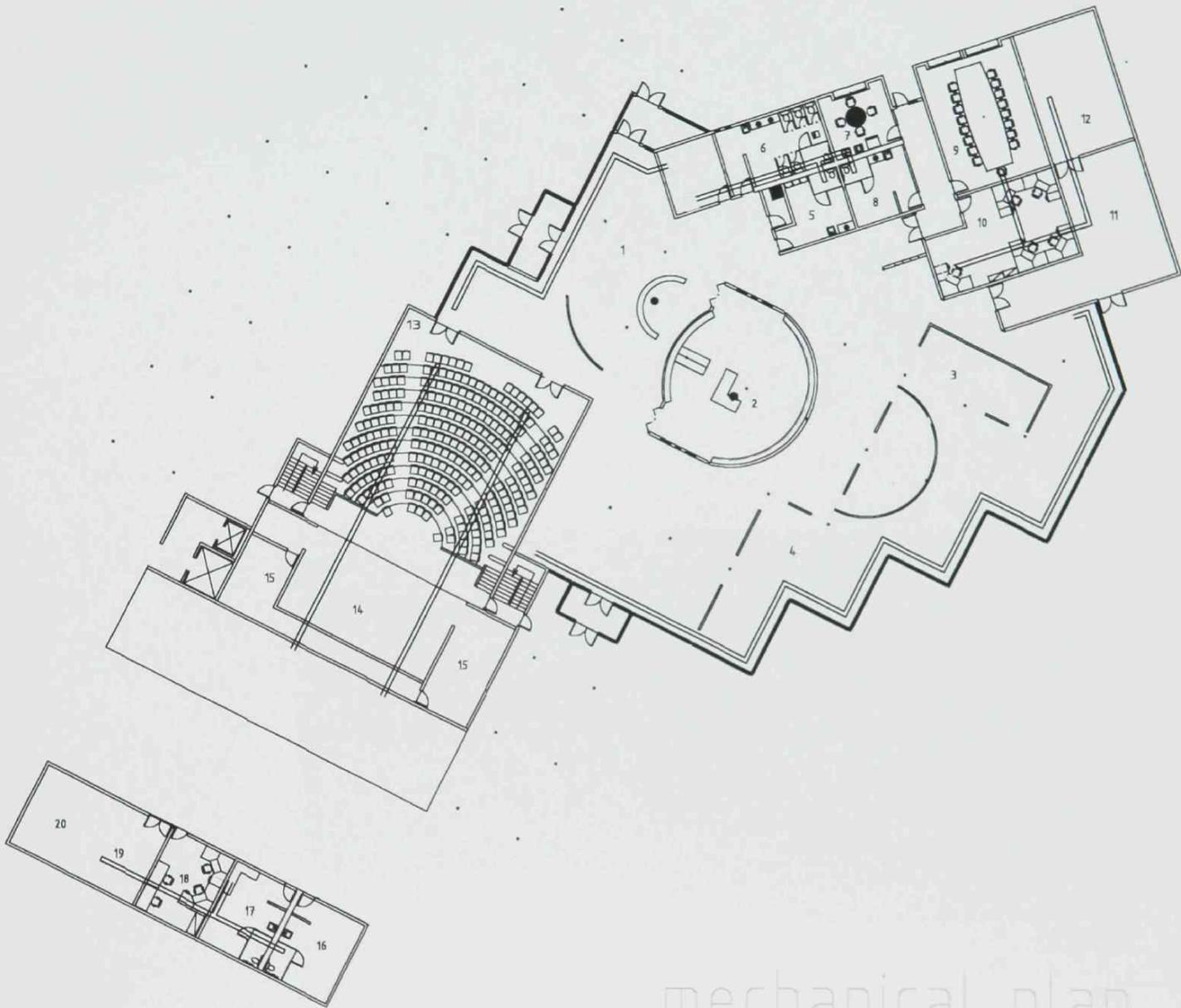


typical wall section for gallery  
 scale 3/4"=1'-0"



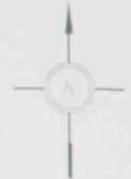
wall detail

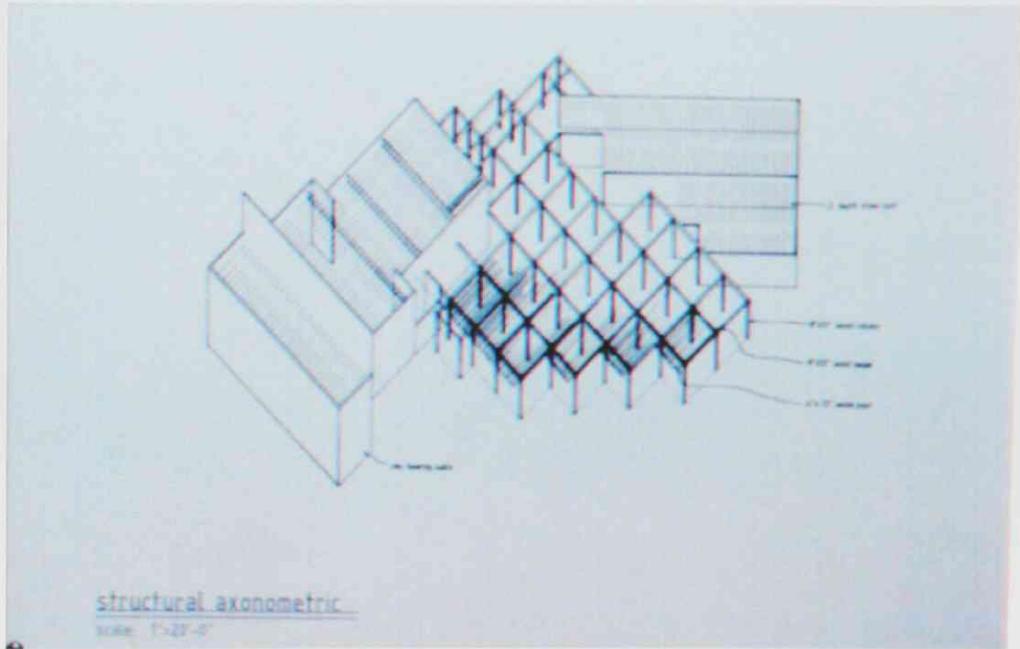
scale:  $3/4" = 1'-0"$



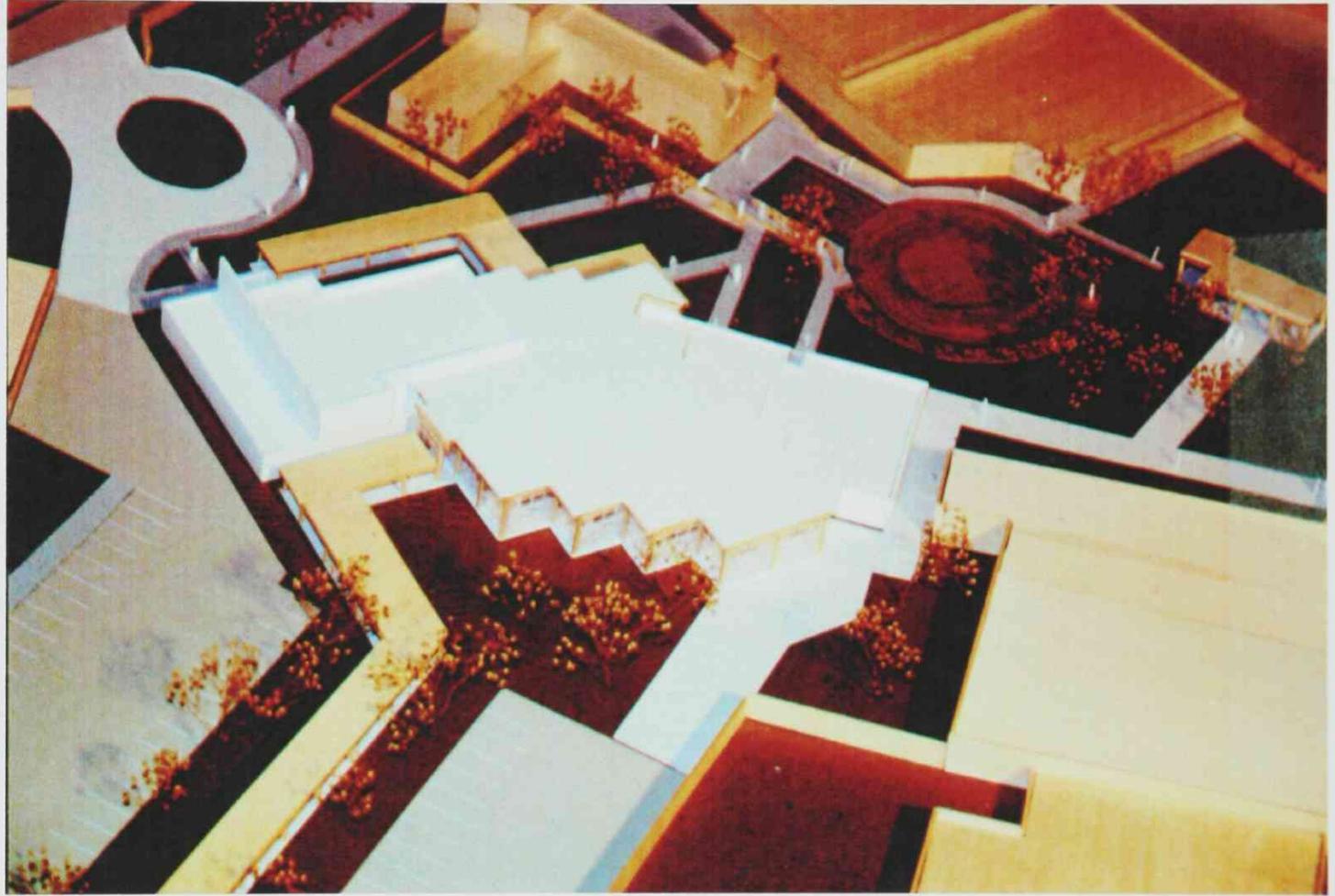
mechanical plan

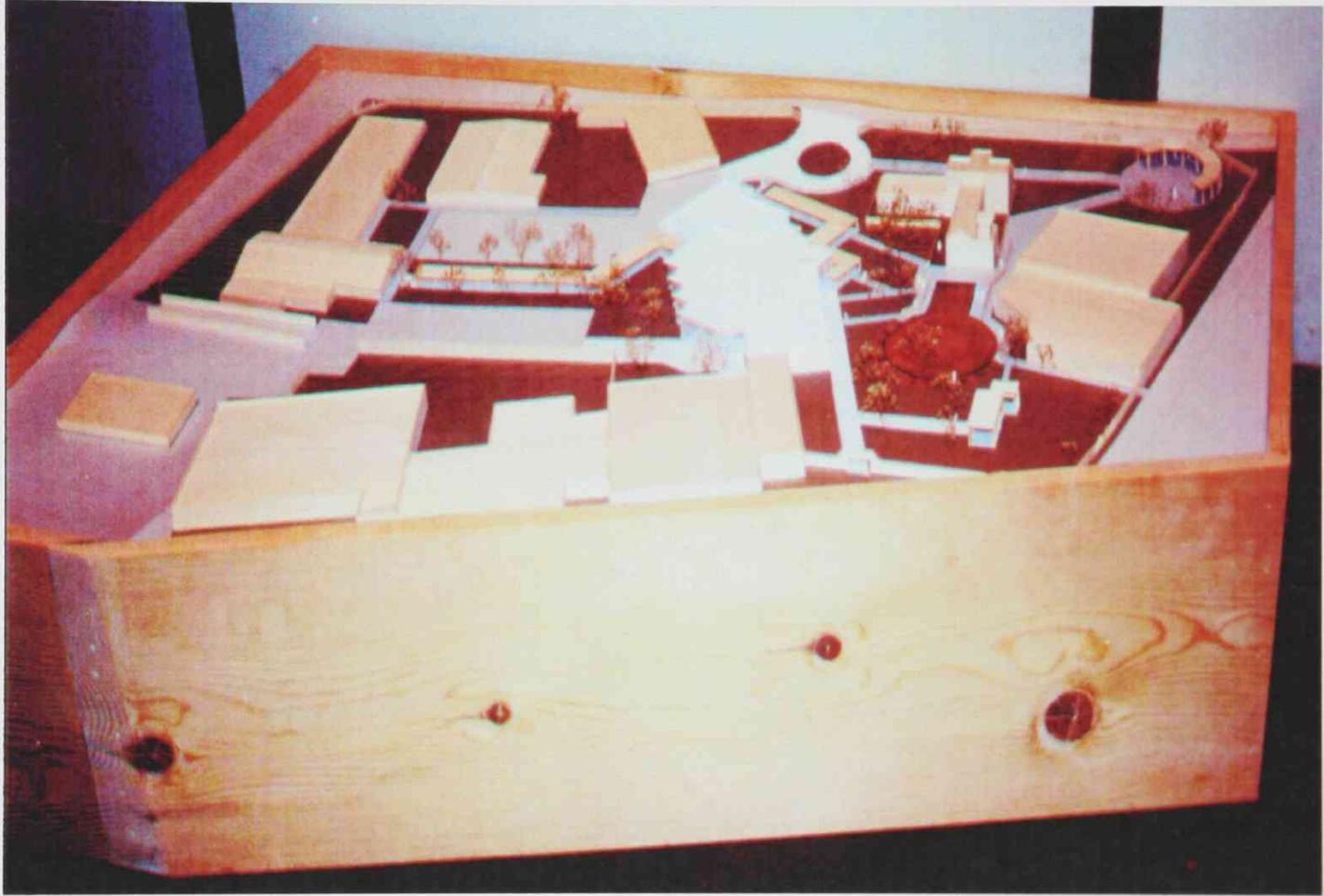
scale: 1/32" = 1'-0"



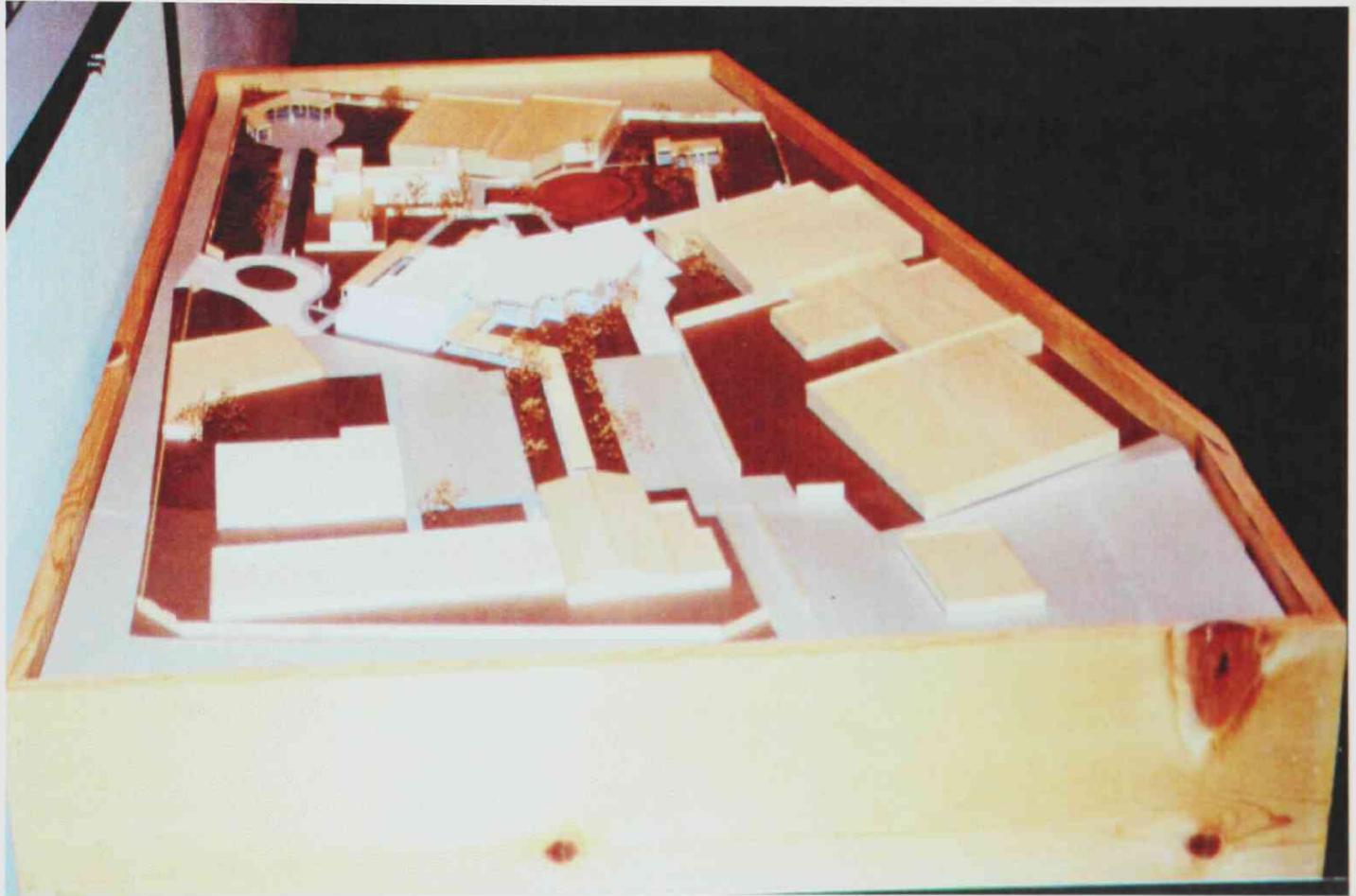


Model











Final Product

