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# Analyzing the Sustainability of Puppets to Create a Puppet Theater

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# ANALYZING THE SUSTAINABILITY OF PUPPETS
## TO CREATE A PUPPET THEATER

Thesis Preparation Book
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December 7, 2000

Committee:
Professor Brown
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## Thesis Statement

The revitalization of an urban community can begin with a public building and can incorporate sustainable design. Sustainable architecture is not only ecologically sound but programmatically flexible and utilizes the resources of the neighborhood. Sustainable design can therefore incorporate ideas of future use of a building. It can also be used in a way to inspire the people using the building so that their own lives become subsistent.

This thesis contends that through the analysis of the sustainability of puppets the construction of a community theater building can be fashioned. The a puppet's flexibility, layers, scale, structure and joints make it a sustainable object. Flexibility allows puppets to bend, twist and be agile as well as capable of changing their shape and function in different performances. The layers of a puppet including its structure, skin, clothing, and paint, give it depth. The scale of puppets can range from the size of a finger to twice life size or larger. Puppets have specific structure and joints that allow them to complete their tasks as reflectors of human nature and to work with their flexibility. Shadow, rod, hand and marionettes are the most common types of puppets, each with a unique structure and joining system. Puppets are perceived as either lifeless objects or living people. This duality creates ambiguity with the reality, material and emotional perception of puppets. The two-fold understanding of the sustainability of puppets can be analogous to the duality at play in sustainable architectural design.

## Site

The puppets in the theater bring life to the stage and spaces in the building. They animate their surroundings with their depiction of life.

The characteristics of puppets allow them to explore ideas in simplistic, precise manners. The puppet's abstraction of the human forms allows audiences to see it as a one dimensional character void of human complexity. In reality, puppets are not alive, yet they can enliven the space and carry multiple roles of educator and entertainer. The site must also be able to animate its urban surroundings. The site is a corner lot on Salina Street at the intersection of Lodi Street and Kirkpatrick Street in Syracuse, NY. This neighborhood use to thrive with small business. The move of urban centers to the suburbs has left Salina street down-trodden. The neighborhood contains a mix of businesses and residences with a school and hospital near-by. The immediate site is surrounded by parks. This three corner site is on a busy corner and receives pressures from all sides. Although Salina Street favors the front of the site, the back is not completely hidden as it backs onto a residential lot and the sides are prominent down the three streets. With all of these faces, the building will have opportunity to animate and retain a presence in the neighborhood.

Program

The puppet theater will help bring sustainability to Salina Street with support, endurance and subsistence. The site will become animated. The theater will be able to change with the future programmatic needs of the neighborhood. Throughout the urban chaos, a place where people can remove themselves from their cacophonous realities and watch a puppet, an inanimate object, and its interpretation of existence, is a place that will inspire its audience and revitalize its surroundings.

Design Problem as a Vehicle for Testing the Hypothesis

The puppet theater brings issues of scale, flexibility, and layers to the forefront. These are also issues present in sustainable urban revitalization. By understanding how the puppets operate through these ideas and how they themselves are sustainable, a similar relationship can

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be made as to how a theater in a sustainable urban site can operate. Puppets have sustaining qualities in their versatility and enduring nature. When revitalizing an urban site, sustainability helps to guarantee that the site will be useful and beneficial even after its original program changes.

II. SUPPORTING
DISCUSSION FOR
THESIS STATEMENT

A. Conceptual and
Theoretical
Foundations of the
Hypothesis

1. Puppets and Masks

"The human intellect feels at home among inanimate objects", Jemro Bergson in *Creative Evolution.*

Puppets are jointed figures which, by various devices, are made to move in imitation of persons or animals and to give dramatic performance under the control of their manipulators (Mulholland p. 14). Puppets were used as far back as ancient Egypt. Greeks used moving statues to express their religious beliefs. Today in China, Burma and Java puppets are used to tell traditional Buddhist epics. During medieval times puppets could be found at fairs, in markets, or in busy streets; wherever there were people to entertain and instruct. Puppets in the eighteenth century became attendants to commoners and noblemen alike. As Mulholland points out, it is not surprising that puppets, inanimate creatures which surely could not of themselves offend, were made the mouthpieces of satire. Although often playful, they were also at time vicious and found to be offensive by the people and the institutions being ridiculed (Mulholland p. 9).

At the beginning of the 20th century, puppet theaters began to establish more importance and to recognize the puppet-master's art. Permanent theaters, school curriculum, and the development of the art form and profession have all contributed to puppetry's popularity.

Today, puppets are easy to build and are portable. They are compatible for vivid explanations in educational settings. There are many styles of puppets, many requiring specific stage sets and all with unique structure and skin. Shadow puppets, glove or hand-puppets, rod-puppets and marionettes are the most common types.

The fantastic is a comprehensible theme in puppet plays. The ability of puppets to do things humans can't is accepted by the audience. Flying, magic and fantasy are all possible with puppets. The audience is free to laugh at the puppets since they are removed from the human. People are able to displace the actions of the puppets with their own; they don't relate to them like they do to actors.
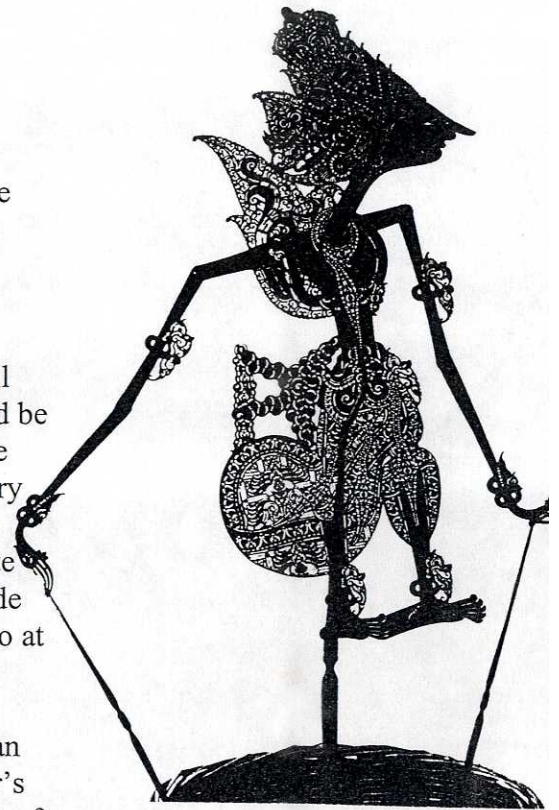
Puppets can be understood in two ways, either as lifeless objects or living people. This duality leads to two opposed responses:

| OBJECTS | LIVING |
|---|---|
| unreal | real |
| inanimate (merely material) | animate (illusion of life) |
| grotesque and comic | mysterious and wondrous |

(Shershow p. 215)

This duality explains the wide variety of uses of the puppet in the theater (Shershow p. 215). Puppets can be used to explore abstract ideas that can not take human or animal form and therefore become objects that are tangible but representative of inanimate ideas. In this case, the themes of comedy or tragedy are easier to explore because people are not relating to these objects as representations of themselves. They are removed from the comedy or tragedy and can therefore, with the absence of human form, see the irony and suffering. Puppets perceived as real, living individuals can be seen as mysterious as they animate life. Even when you know they are not alive, their movements and abstracted forms become realistic the longer they perform and tell their story.

The duality of puppets as either objects or living things is not without some confusion. For example, puppets are comical because they are seen as puppets who are trying to represent *life*. Also, puppets are conceived as *real* when the emphasis is put on their manifestations of life but when the accurate perception of them as wooden inanimate objects makes them comic and grotesque, the wood is *real*.

Masks are an unequaled technique in the theater (Smith p.183). The mask hides the face at the same time that it is representing it. The face reveals the most about our moods and emotions and is the most common visual aid we use to identify people. For centuries the mask has been used for religious ceremonies and to express social concerns. Today, masks are mostly used in our culture to explore psychological topics in secular settings. Their simplicity allows for an isolated examination into human emotion as well as abstract thought.

Masks free actors of social restraints. They can express happiness, anger or sadness openly. With masks, actors can mimic and make fun of people and situations anonymously. Masks give temporary form to imagination and ideas, normally intangible objects that now become reality with the use of a mask. Successful masks must have a stage and an audience. As Smith suggests, an

actor who finds themselves without these has no need for the mask since they can be themselves when alone and don't need to hide or change their identity (Smith p. 3).

At the same time as offering freedom to their actors, masks also put restraints on them. The mask remains the same throughout a performance and so the character is limited to the movements of the actor and theatrical elements such as lighting and props. This can bring a sort of simplicity to the script as the author must use concrete images and uncomplicated characters. With the use of masks, authors may also put abstract idea into form, using the mask to break through conventional images of animate objects.

Although a potentially simplistic addition to a costume, the mask is an additional layer onto the images of the theater. The line between reality and imagination is further blurred as the actor hides behind this facade. Masks play with the duality present between the abstraction of a text and a device of the stage. These ideas of disguise, reality versus imaginary and abstract versus divisive methods in the theater all can translate along with the methods of puppet analysis into ideas about form making in architecture.



2. Architectural and Urban Sustainability

Sustain: keep, support or hold up; endure; confirm.

"Sustainable development improves people's quality of life within the context of the Earth's carrying capacity" The International Union for the Conservation of Nature (Girardet, p. 177)

Sustainable design in architecture and urban development can be seen as an opportunity to stop the destructive use of land and materials. If architecture is built in a manner that constantly considers its effects on the site at multiple scales, the people at the site and at the building, and the energy used to construct and operate the building, our built environment will become healthier and more appealing to live in.

Many times, architecture is seen as an opportunity to control nature rather than to work with it. Urban sprawl has proved unhealthy, unattractive and wasteful to our land. People build, expand and franchise to demonstrate their wealth and to become wealthier. As alternative, low energy materials are starting to be used in new buildings, the ideas of sustainable architectural design need to become integral in the building process.



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Sustainability involves the following:
- Resource budgeting
- Energy conservation and efficiency
- Renewable energy technology
- Long-lasting built structures
- proximity between home and work
- Efficient public transport systems
- Waste reduction and recycling
- Organic waste composting
- A circular metabolism
- Supply of staple foods from local sources

(Girardet p. 179)

Cities are losing their identities as companies with multi-national offices are moving into downtown. People must live and work locally in businesses that directly impact their neighborhoods. The close-knit neighborhoods, workshops, cafes, shops, markets and cultural centers have been sacrificed to suburban sprawl.

In order to ensure healthy citizens cities must:
- Provide clean and quiet environments
- Air free from pollution and toxins, freedom of movement
- Stimuli to senses
- Minimal stress
- Access to open spaces
- Supportive neighborhoods
- Minimal individual insecurity

(Girardet p. 135)



Cities like Florence, Salzburg and Prague have narrow, human-scale streets with big gathering spaces (Girardet p. 118). Their organic growth, economic activity and cultural energy make these cities friendly to the people. Girardet notes that urban living at its best is a reflection of the human mind's capacity for quirky, joyful creativity and celebration of city life (Girardet, p. 118). Cities need to remember that they aren't just temporary places for people to work, but rather centers of civilization, learning, culture and excellence.

Global warming, the overuse of cars, lights, and electricity adding to the haze hovering over cities, sewage and industrial waste, polluted water, deforestation, cheap food ruining the soil, the human scale disappearing in the city, crowded and unhealthy apartment living and multiple other problems are straining the planet and stressing the people. Breuste, Feldmann and Uhlmann suggest that the achievement of sustainable urban development
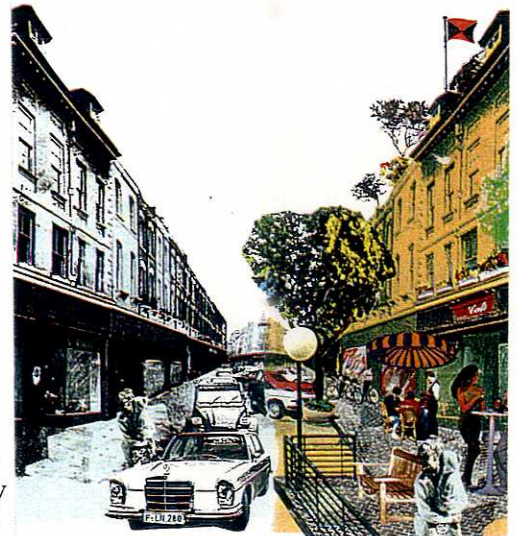
should not be considered to be just a matter of technological efficiency, economic instruments and planning competence, rather it should be considered to be a social and political challenge ( Breuste, Feldmann and Uhlmann, P. 203).

Sustainable design at the architectural and urban scale needs to be not only ecologically resourceful but programmatically flexible. Urban design that compliments the natural tendencies of daily life and offers sustaining programs will enrich lives and establish cohesive neighborhoods. Sustaining architecture will accomplish many of the same things at the scale of each building. Designing a structure that allows for change and upholds community programs will animate its site and begin to revitalize and bring legitimacy to a community.

> B. Aspects of Program Which Act as a Vehicle for Testing the Hypothesis
>
> 1. Theater

Theater is a visual medium that is experience instantaneously, not in a reproduced form like a movie or television. The rules of a theater involve scripts and choreography that determine the actions of the actors. Sometimes a contrived language, action or atmosphere is used to get the desired emotional response from the audience. The theater in history was used not only to entertain but for religious ritual, teaching morals, politics and to alter people's ideas. Theater can range from realistic storytelling to abstract movement. Sets, props, lighting, costumes, makeup and masks along with the stage and auditorium make up the basic parts of a theater. The parts aren't fixed. For example, the stage and the auditorium have different relationships depending how they are arranged. Theater encompasses art and architecture, literature, music, dance and technology.

Theater can be presented in one of two forms (Encarta 96). One is presentational theater. This form emphasizes the theatricality of the performance. Nothing is hidden and the audience is always aware that this is the theater, not an attempt to re-create reality. The other form is representational which is a more illusionistic form of theater. Most often, a combination of these two form are used for a production.

Theater explores the relationship of "spectator" and "spectacle". The theater, like puppets, is a mirror onto the lives of people. Multifaceted relationships exist within the theater in the scale of its stage and the scale of its urban setting. The design of a

community-oriented puppet theater will need to address these relationships of audience to players, players to stage, stage to building, building to site and site to the urban scale. In creating a building in which the audience is constantly changing and in which the program has the ability to change, the architecture must be sustainable.

Re-use of existing buildings supports the ideas of sustainability. In order to make this building adaptable to future programmatic needs, a sustaining, flexible structure will be necessary to ensure the ability to change the size of spaces and have the opportunity to add or take away from the total form. The most adaptable types of future programs are a community or cultural center. Not only will this theater help to animate the present site, it will be designed in a way that will ensure sustainability for the future.

One way the theater will start to animate the site is through its flexibility to physically change throughout the day and the seasons. The building will be used for different functions by different groups during the day and night for educational and entertainment purposes. Designed to use the benefits of natural lighting, different accommodations will have to be made for summer and winter weather. All of these changes will not only make the building more comfortable and functional but will also give the people using the building an opportunity to be a part of their environment. This flexibility, of structure, spaces and systems will create a living building that is never static.

Sustainable architecture will bring the audience and community, players and building into an understanding of their environment and the influences they have on each other. The puppets will enliven their stage and the theater and the building will exhilarate its site and the neighborhood.
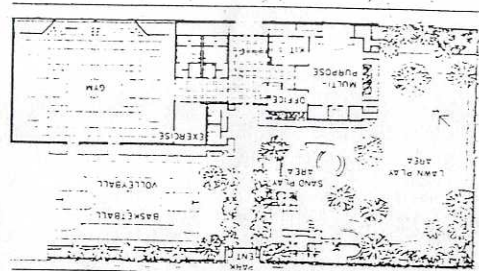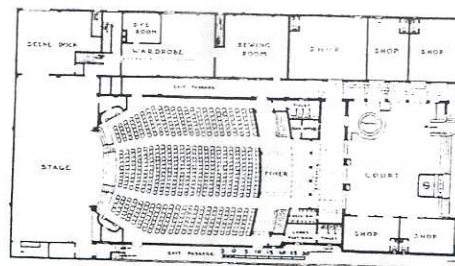
C. Aspects of the Site
Which Act as a
Vehicle for
Testing the
Hypothesis

The intersection of Salina, Kirkpatrick and Lodi Streets in Syracuse, NY, presents a corner site in a part of the city that use to be a vibrant neighborhood. Walking down Salina Street, one can see the images of past glory and layers of change. Each building is unique in its architectural design of mostly masonry construction yet they all work together to form a street facade. Gaps between the buildings give glimpses to the spaces behind the buildings. Empty

lots reveal markings on the walls of places where other building use to attach to the one that's been left. These lots are either used for parking now or for seemingly nothing and are filled with trash and weeds. Billboards advertising flour and biscuits are painted onto the old masonry of the empty lots; a sign that now all these spaces are valued only for advertising. The businesses on Salina Street range from a leather alterations shop to a retro furniture consignment store. There is even a private detective's office and a dog grooming salon. Many of these stores and businesses are unique to Salina Street. Although there may be shops with similar services elsewhere in the city, Salina carries with it a feeling of expertise if not professionalism. The stores offer their services in a simple fashion, ignoring trends of flashy shop window displays and lighted signs.

A mostly residential area makes up the neighborhood northeast of Salina Street. They are comprised of the same early 20th century clapboard and pitch-roofed houses that make up many of Syracuse's neighborhoods. The residents are working class families that range in ethnic backgrounds. To the Southwest are industrial buildings. Many are no taller that the buildings that line Salina street but they extend for the entire block. There are also old warehouses, many of which are deserted now. Further north and directly west of the site is the Carousel Center Mall. The mall sits on the site previously covered by oil tanks during the days when Central New York was an industrial powerhouse. The tanks were cleared for the mall to be built away from the city center and with direct access to route 81. Like malls in every urban center across the country, this one took business and urban life away from the downtown Armory Square area. It also took business away from the independently owned shops of Salina Street. Unable to compete with the giants of retail, many Salina businesses had to close. Thus began the slow decline of Salina Street.

The puppet theater will help to bring sustainability back to Salina Street. Theater can sustain society, culture and individuals. The presence of a creative community program that will offer to the residents performances and a chance to perform can initially bring spirit back to Salina Street. Theater can not solve the problems of corporate conglomerations and the dying line of small business owners but it can bring meaning to the life present and bring understand to the lives surrounding each other.

In a similar fashion of puppets animating their stage, this corner site at the intersection of three major city streets and with surrounding park space, can begin to animate the different scales of its surroundings; people inside the theater involved in performances, the immediate site which will include outdoor performance space, the Salina Street neighborhood and the urban setting.

The puppet theater brings issues of scale, flexibility, layers and sustainability to the forefront. These are also issues present in sustainable urban revitalization. By understanding how the puppets operate through these ideas and how they themselves are sustainable, a similar relationship can be made to demonstrate how a theater in a sustainable urban site can operate. Puppets have sustaining qualities in their versatility and enduring nature. When revitalizing an urban site, sustainability helps to guarantee that the site will be useful and beneficial even after the original program changes. The structure of the theater, like the structure of puppets, needs to be flexible to accommodate these changes.

When analyzing puppets, scale is an obvious issue to explore. Although hand puppets don't change scale much beyond the size of people's hands, shadow puppets can be the size of a hand puppet or large enough to fill the facade of a two story building or even larger. As the size of the puppet changes, its structure and joints must change to support its size. For this reason, when designing the final appearance of a puppet, its structure must simultaneously be designed. Similarly, the theater's outward faces to the street need to be carefully designed to animate the site at the same time that its structure is designed to accommodate the flexibility of the facade and interior spaces.

The flexibility of the structure involves the efficiency of its systems as well as its spaces. The ability for the building to
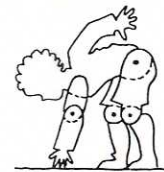
accommodate to the seasonal changes will prevent overheating or cooling. In a similar fashion, the designing of the form of the building, if done in an efficient manner, will make the most out of the spaces for the quality of light and air.

| Space | ft$^2$ | Height |
|---|---|---|
| Theater | | |
|    Auditorium Seating (236) | 3500' | 24' |
|    Stage | 1320' | 36' |
|    Control Booth | 144' | 9' |
| Backstage (Stage set prep and storage) | 720' | 36' |
| Prop Shop(combination of back stage and auditorium with removable seats) | 1500' | 24'-36' |
| Dressing Rooms (2 @ 200') | 400' | 12' |
| Lounge for Actors | 140' | 10' |
| Classrooms (3 @ 300') | 900' | 12' |
| Outdoor Performance Space | | |
|    Stage | 1400' | |
|    Seating (500) | 4000' | |
|    Projection Screen | | |
| Offices (3 @ 100')(Program, Artistic, PR) | 300' | 12' |
| Lobby (with Gallery) | 400' | 15' |
|    Atrium (one type of lobby) | 400' | Height of Bldg |
| Coatroom | 50' | 9' |
| Ticket Office | 280' | 9' |
| Gift Shop | 750' | 12' |
| Café (Seating, Storage, Preparation) | 1350' | 12' |
| Bathrooms (4) | 662' | 10' |
| Total | 12016' | Interior |
| | 5400' | Exterior |
| Mechanical 15% | 1802' | |
| Circulation 15% | 1802' | |
| Total | 15620' | Interior |
| | 5400' | Exterior |

     The auditorium will contain removable seating that can be put in different arrangements. When the seating is folded up to one

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side, the room can be used for practice space and prop building. A conventional proscenium stage will be installed although it can be changed to a thrust form. If desired, the performance could be right on the floor with the seats arranged in a circle around the center of the room. There will be no balconies because these make it harder to hide the backstage or the mechanisms of the puppets. The seating could be on a slight slope of risers but not too high for the same reason. There will be a backstage area for the props currently in use and for actors awaiting their cues. The prop shop will have multiple tools and plenty of space to build the props and puppets. The auditorium will also have to be the best acoustical space so that outside noises don't interrupt the performance and so that the volume inside the auditorium will be comfortable the audience. Although natural lighting would have to be shut out during performance, it could be accessible in the auditorium during the day.

The actor's dressing rooms and lounge will be in the backstage area where they are removed from the public spaces of the lobby and café. Classrooms and offices will be in another part of the building with direct access from the street for people coming for classes. This will be the part of the building used on a daily basis. It should therefore have natural lighting capabilities. The classes will also have access though to the auditorium for exposure to the performance experience and the classrooms will be equipped with simpler equipment for puppet and mask making.

The lobby and ticket office will be the entrance at the most public side of the building with direct access to the auditorium. There will be bathroom off of the lobby as well as in the backstage area for the actors. The lobby will mostly be used on performance nights. If an atrium is used, it will contribute lots of natural light to the gallery and lobby.

The outdoor performance space may use the backdrop of the building for a projection screen. The seating can be in an amphitheater form. Extra large puppets too big for the inside stage can be utilized outside. This outdoor space will begin to animate the exterior of the building and engage the neighborhood.

IV. DOCUMENTATION AND ANALYSIS OF SITE

Parks
Major Shopping Centers
Theaters and Museums
Lakes

N

SYRA

Solvay

STATE
N. ST.
ISABELLE
BASIN
BASIN
KIRKPATRICK
UNION
TITUS ALLEY
UNION PL.
LILAC
UNION PL.
ST.
STEUBEN
KIRKPATRICK
ALVORD
DANFORTH
SALINA
NORTH
N. SALINA
LODI
SUNSET
KIRKPATRICK
1st AVE
1st A.
D-3
COUR
Parks
Business
Residence
Warehouse
Views
N
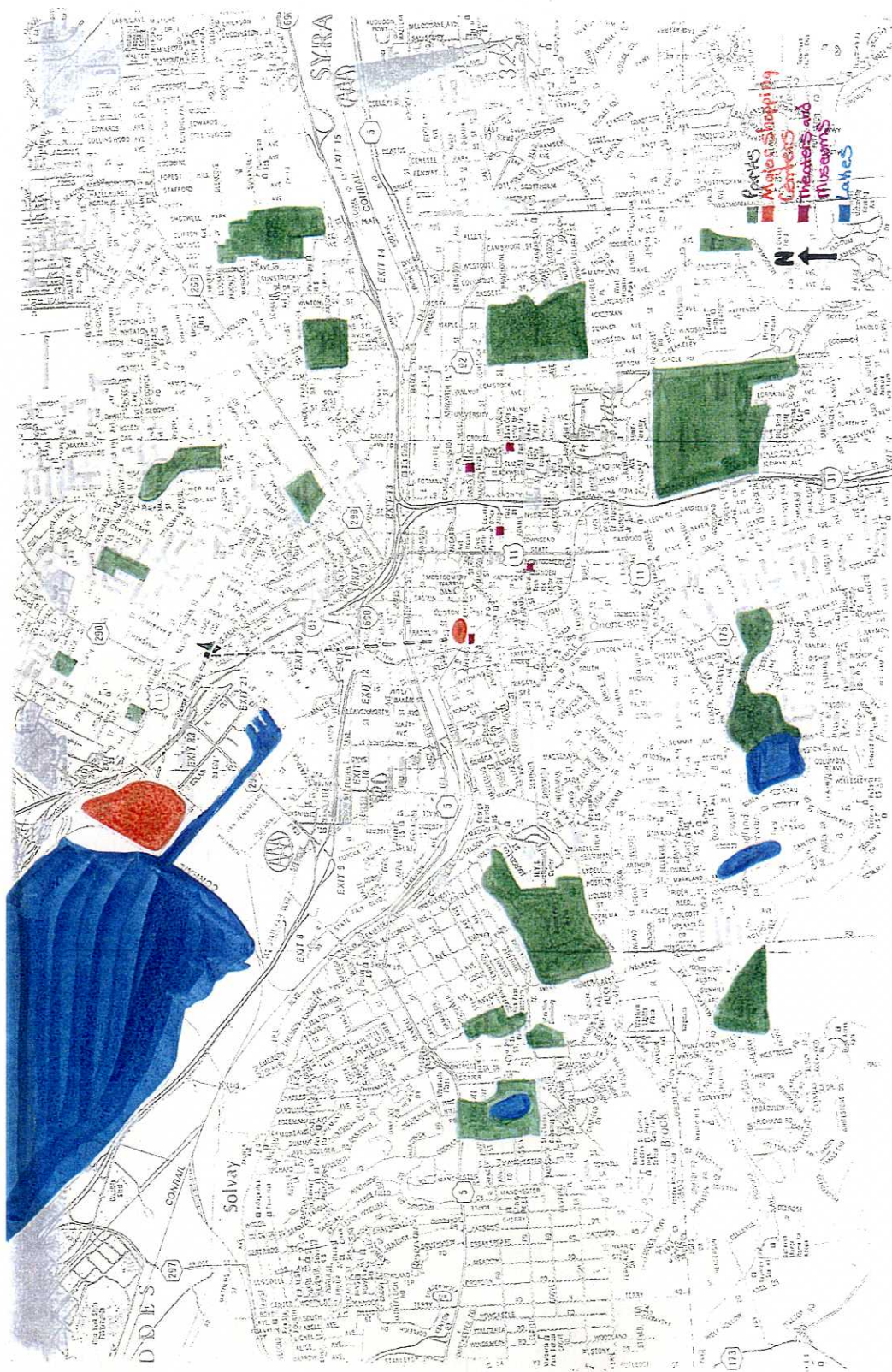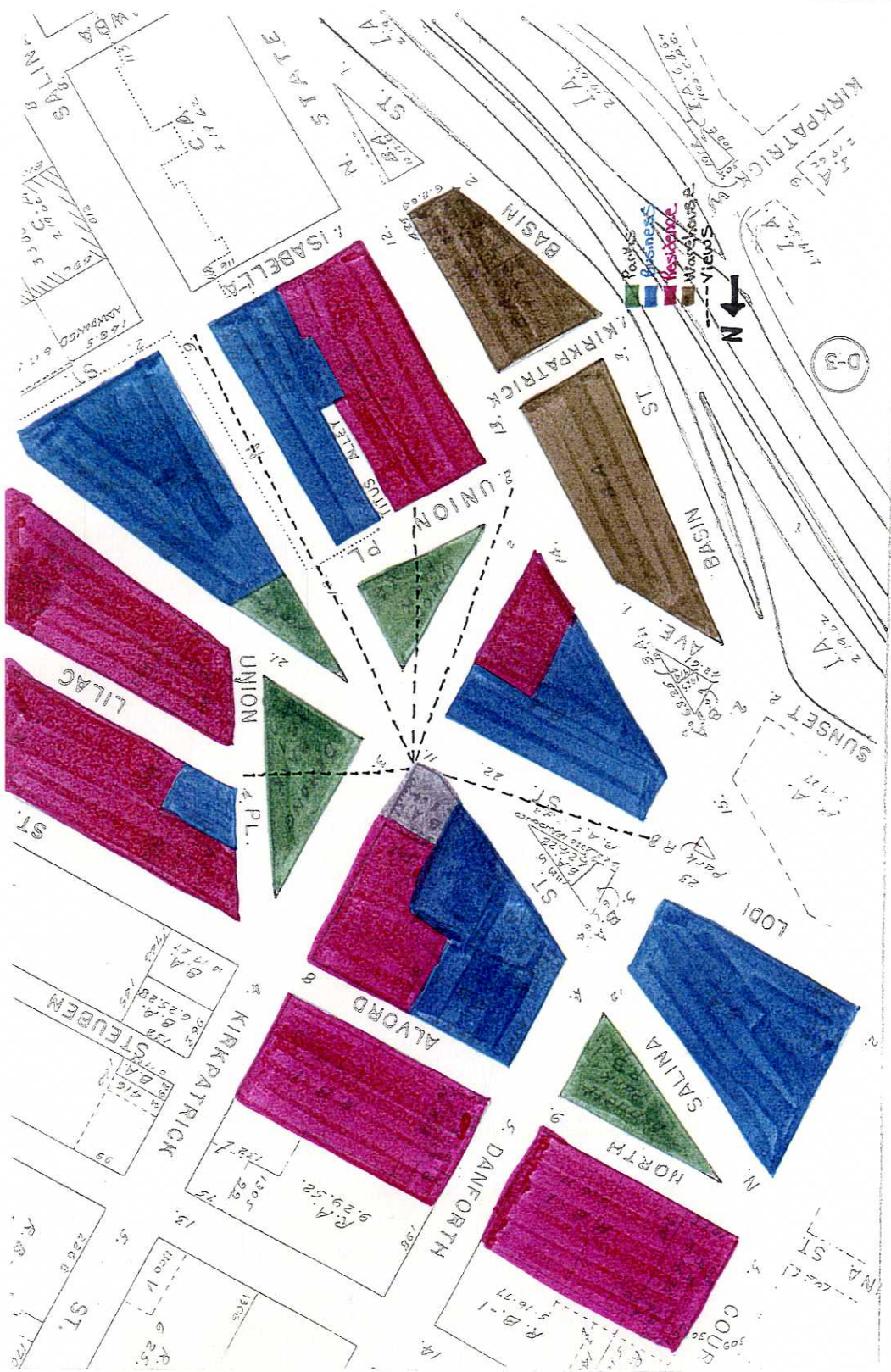
Centre Pompidou, Renzo Piano and Richard Rogers, Paris, France, 1977

Every floor plan in the multi-purpose arts center, is 170m x 48m x 7m high with no fixed vertical interruptions from structure, mechanical services or circulation. In this way, the users' freedom is not limited or fixed. These large spaces are serviced from the floor (14cm high computer floor) and the ceiling (exposed ducts and conduits for ease of change). All the partitions are moveable and take from one minute to one day to change. The corridors, ducts, fire stairs, escalators, lifts, columns and bracing are exposed on the east and west side of the building, completely opening up the floor

plan.  In essence, the building is inside-out which makes it easy to change technically.  The exposure of al the structure, mechanical and circulation system also gives the building scale.  The Centre is in the middle of historic Paris.  Around the immediate site, the buildings are of 17th to 19th century stone construction and only 24 to 34m high.  In the square next to the Centre, some roads were closed off to make the space exclusively for pedestrian use.  The square has become a place for street entertainers, tourists and shoppers to congregate in an urban context without the annoyance of cars.

FACADE                                                     SQUARE



SECTION AND PLAN SHOWING OPEN FLOOR PLAN
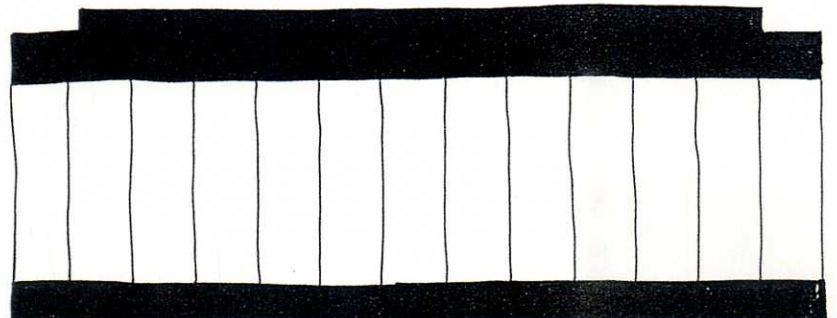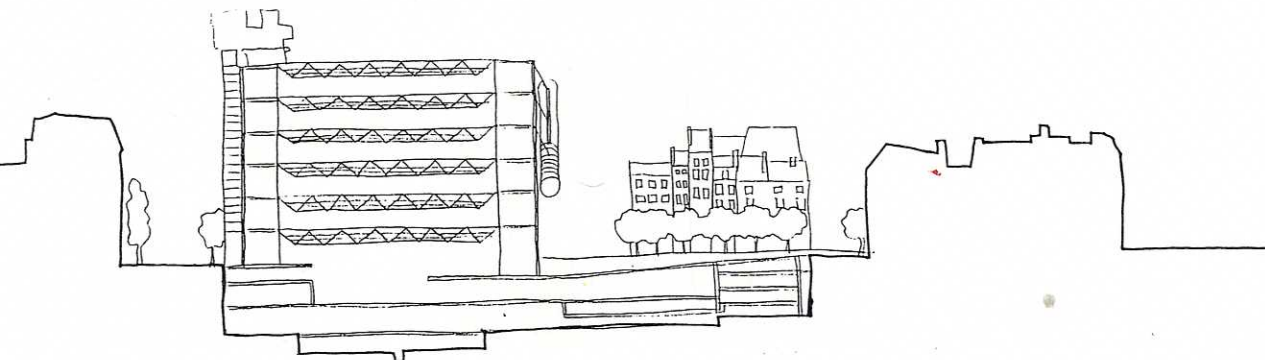
IRCAM, Renzo Piano and Richard Rogers, Paris, France, 1977

      The Institute for Research and Coordination in Acoustics and Music is part of the Pompidou Centre program but in a separate building. IRCAM is a cellular research-based facility with special performance demands. The main program is an underground complex of labs and studios with very high acoustic performance requirements. The structure is of a reinforced concrete primary structural box sunk 16m into the ground. The cells are a prefab multi-level system with floors and the roof supported on a two-directional column grid. The roof forms public piazza at street level. The building embodies the concept of flexibility for the purpose of its research function. Some of its flexibility includes: 9 different studio types; interchangeable panels for every studio to create reverberate, directionally reverberate, or extremely dead and dry sound; 4000 cubic meters projection space changeable in volume and acoustic qualities, moveable ceilings and floors; one demountable studio that is of kit construction and can go into any room and has the option of ordering new parts to change it; load-bearing columns with one load-bearing wall between the projection room and the research zone and moveable infill walls that can be rearranged within a one year time period; all spaces are audio-linked to dispatching computer and main computer and some with closed-circuit TV both of which marry the user to the building functions.
SECTION WITH FACADE
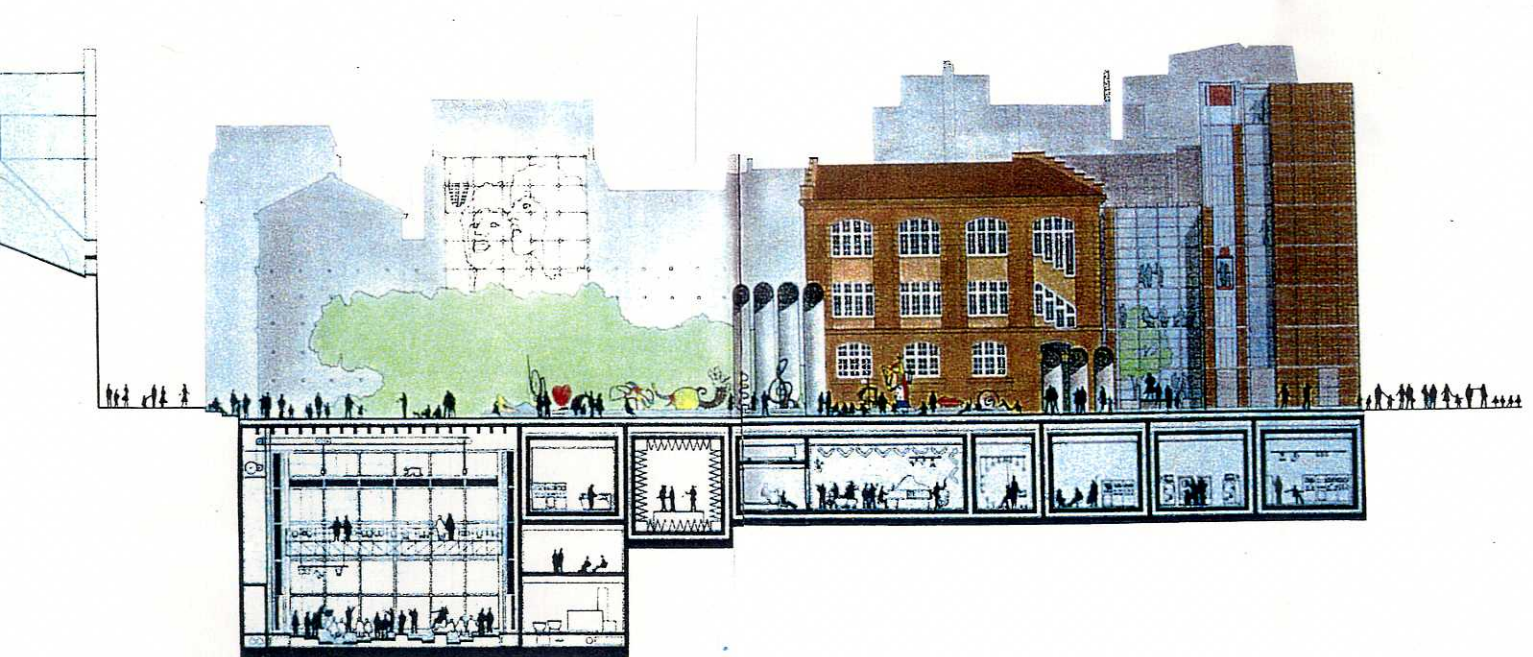
SECTION OF CELLS
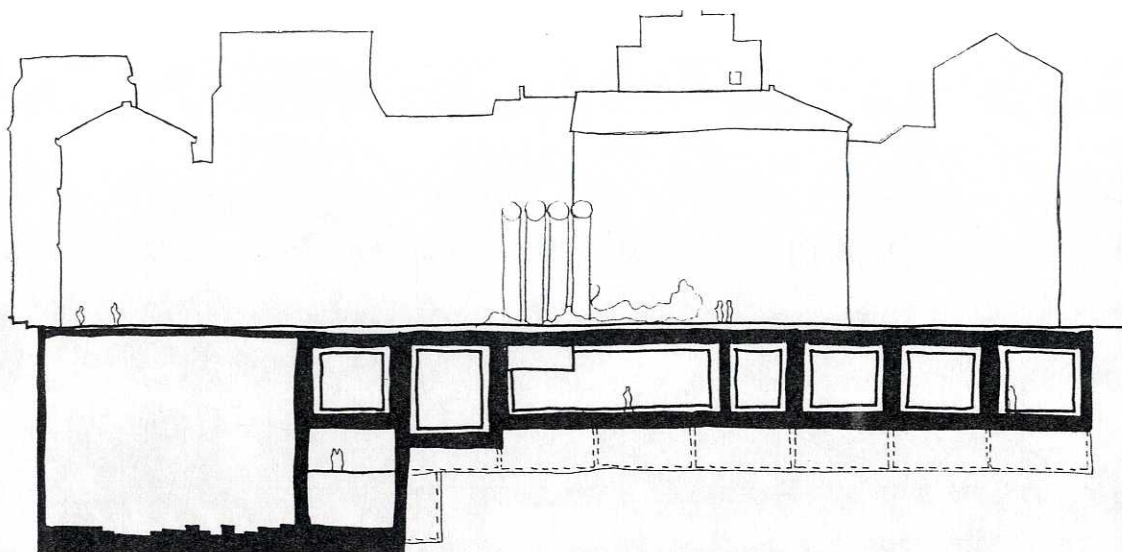


SECTION OF PROJECTION ROOM WITH CHANGING
CEILING AND FLOOR
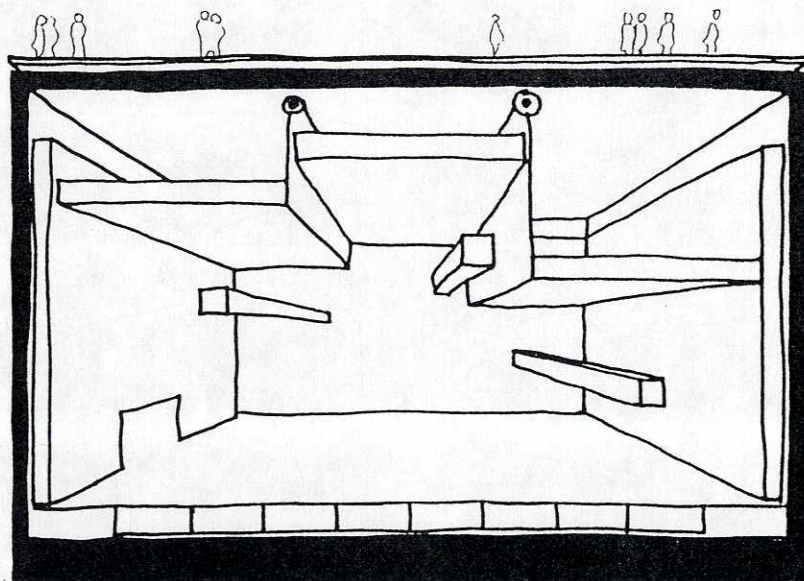
Gates Community Center, Turner Brooks, College of the Atlantic, 1993

Beyond the attempt to conserve energy with its triple-glazed windows, super-insulated walls, non-toxic materials, according to the architect the building is

> "…its own peculiar creature, which bends and flexes to insert itself between the existing buildings and other constrictions of the site. It is, in a sense, an organic creature, with its own head, body and tail", Turner Brooks.

Its slightly skewed site plan makes spaces between the other buildings on the campus ambiguous and dynamic. A variety of events take place in the college community center such as plays, concerts, story-telling and college-wide meeting and lectures. The gallery displays not only work from the students of the college but also regional artists' work. The clapboard and vertical wood siding, punched windows, fireplace and porch all help this building to keep a "non-institutional" appeal. The same is true of the 300 seat assembly room with a 34 -foot-high ceiling contains exposed trusses, painted pine wainscoting, maple floors, and big windows.
GATES COMMUNITY CENTER

1. ASSEMBLY HALL
2. LECTURE
3. LOBBY
4. OFFICES
5. CIRCULATION
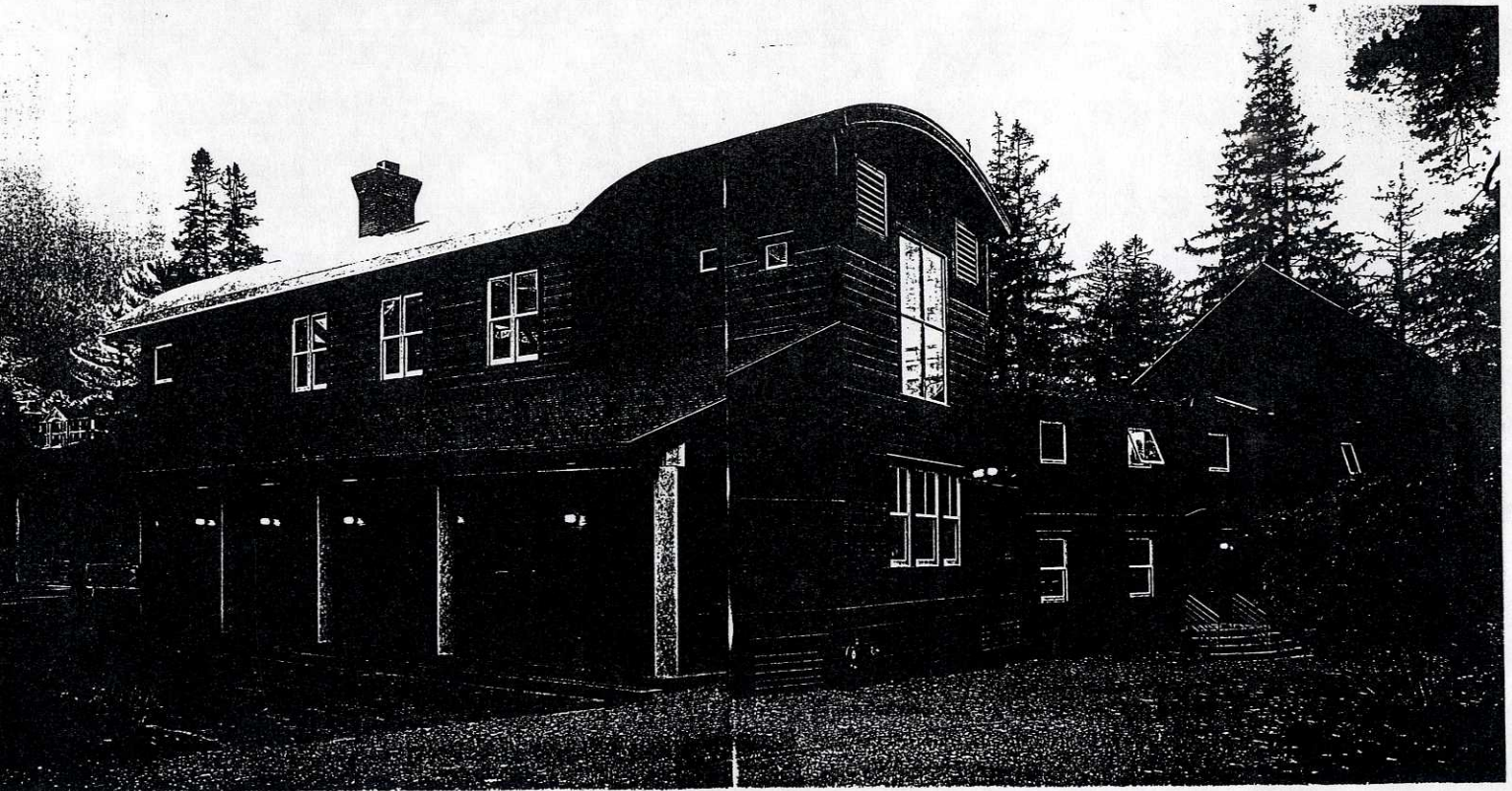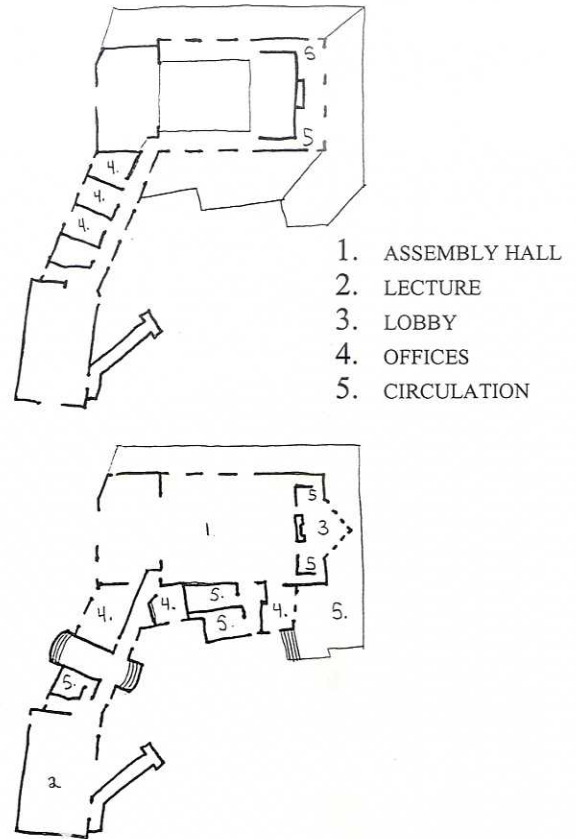
Art Museum Bregenz, Peter Zumthor, Bregenz, Austria, 1990-1997

      This building is made of glass and steel and a cast concrete stone mass which endows the interior of the building with texture and spatial composition.  From the exterior, it looks like a lamp as it absorbs changing light of the sky, the haze of Lake Constance, or reflects light and color.  The changing surface color, dependent on the angle of vision, daylight and weather, implies the presence of its inner life.  The skin is made up of finely etched glass giving the appearance of  feathers or scales.  The glass panels rest on metal consoles held in place by large clamps.  The multi-layered facade its an autonomous wall construction which acts as a weather skin, daylight modulator, sun shade and thermal insulator.  The spatial arrangement of the slabs varies the orientation of the light and generates shadows and reflections.  This gives mood and depth to the room.  All of this fluctuating light brings building to life.

# CHANGING COLORS OF FACADES
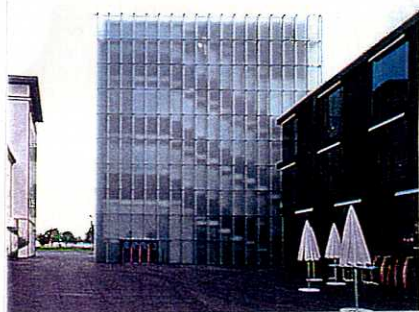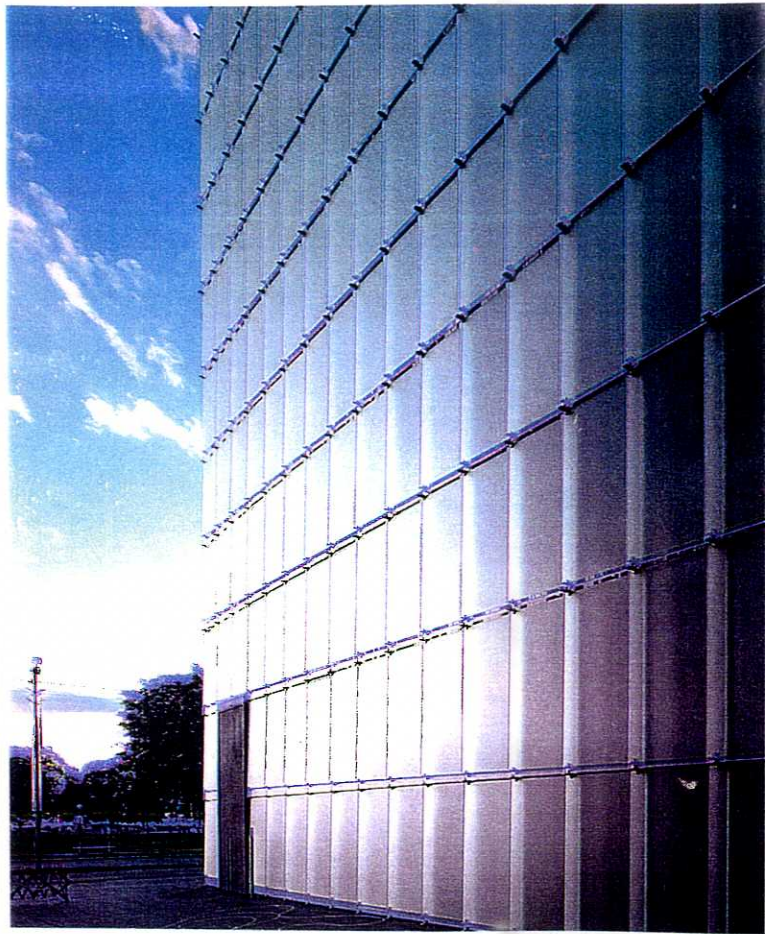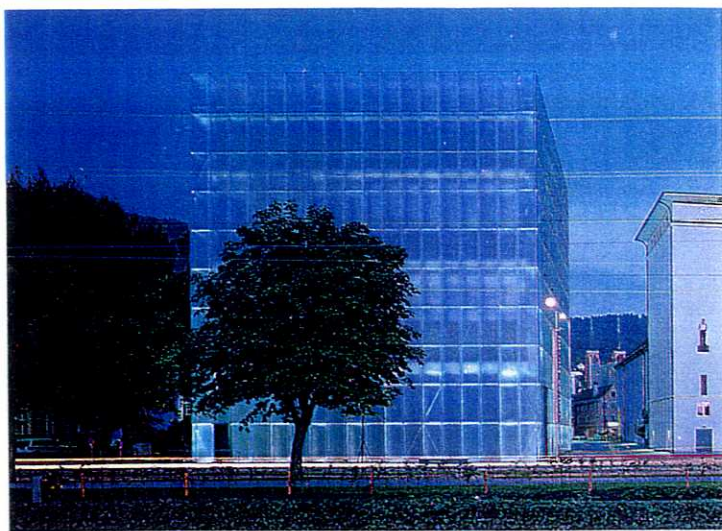




## PLAN AND SECTION OF FACADE
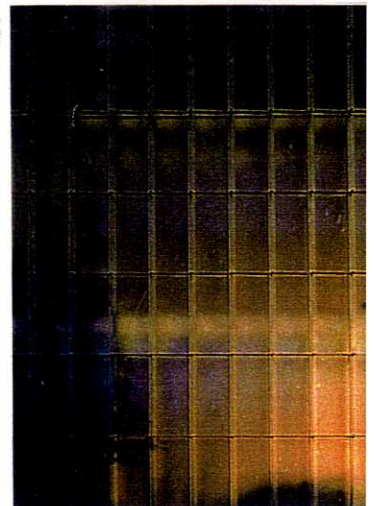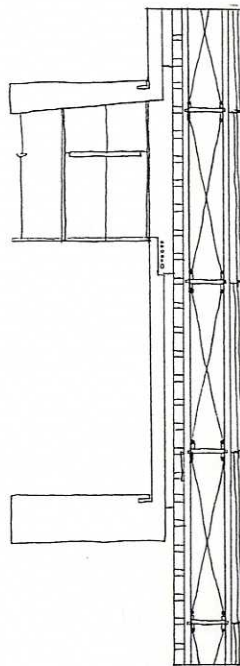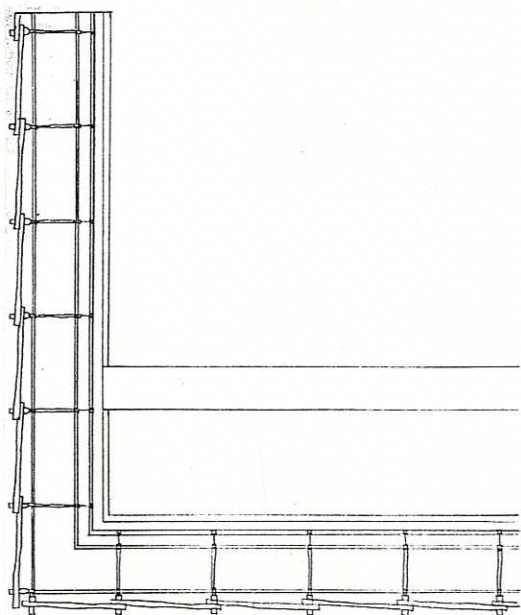
Second Stage Theater, Rem Koolhaas and Richard Gluckman, Manhattan, 1999.

   To get into the 236-seat house, the audience members must walk from the narrow unprepossessing ground-floor lobby up the stairs to the lobby vestibule at the rear of the auditorium on the second floor and then to the auditorium without having to pass through doors.  The lobby vestibule, bathrooms and seating are all in one design gesture as a mass in the middle of the plan.  The bar and stage are at the opposite ends of this central mass of program.  There is no backstage so the actors must enter the stage via the third-floor dressing rooms and thread their way to the stage behind a translucent paneled wall of polycarbonate glazing sheets on the north side.  This wall also creates a mezzanine space for additional seating in the auditorium.  In the auditorium are 12 foot high windows, three of which serve as  a backdrop on the stage and five run and down the south side of the auditorium.  Soft light filters through the windows during spring or summer evening.  The 27 x 55 foot stage has no proscenium so a side wall of drapes act as stage curtains (pulled over side windows, not infront of stage) when the performance begins.  Koolhaas calls these windows a  "curtain on the city".

MEZZANINE, FACADE, SECTION, PLANS
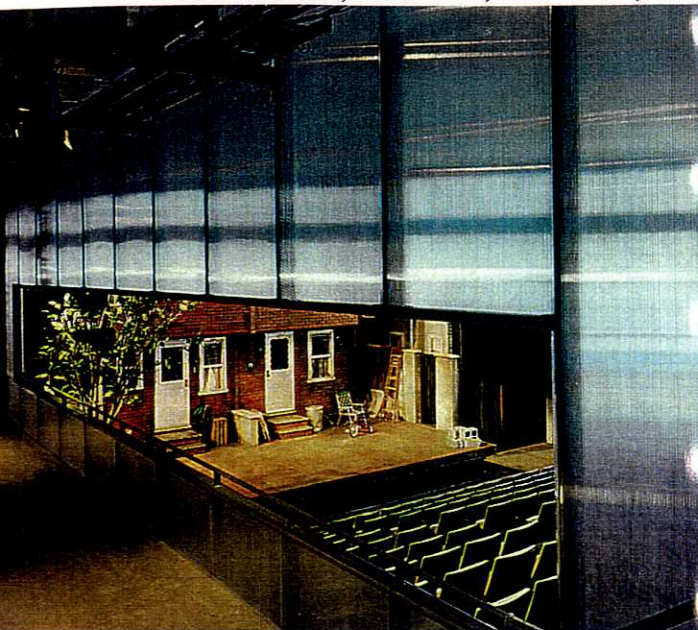


1. LOBBY
2. TICKET BOOTH
3. CENTER CORE
4. STAGE
5. DRESSING ROOMS
6. BACKSTAGE
7. GREENROOM
8. LOUNGE
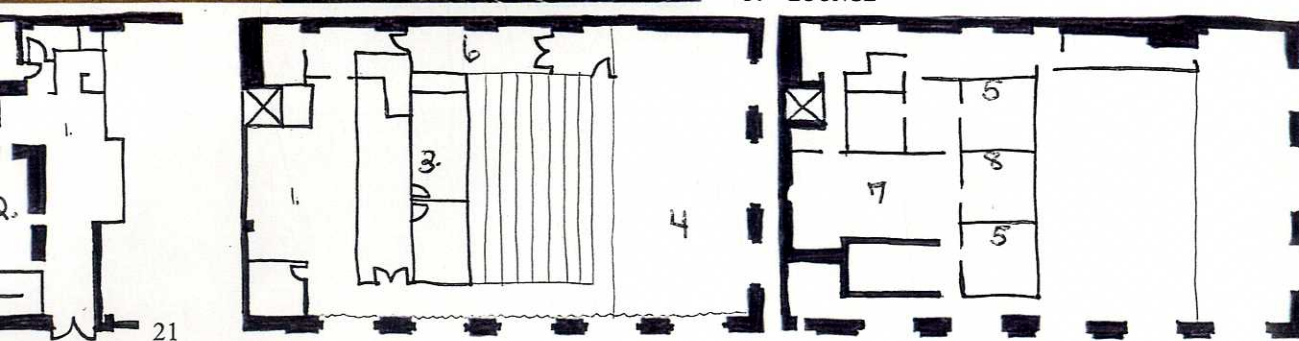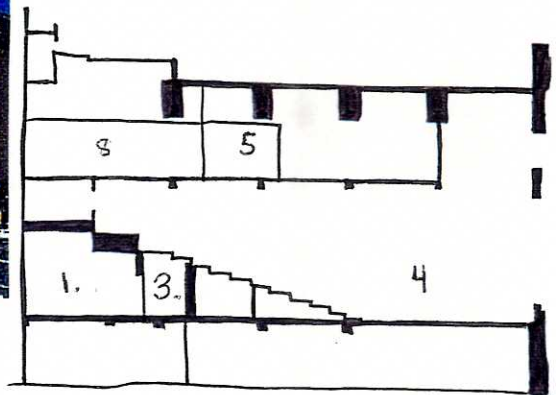
## Diagrams of Different Stages for Conventional Theaters

Proscenium Shape. The audience faces the performing area on one side only and sees the performing area through an architectural opening that often has an elaborated architectural frame. The performing area can project out a nominal distance into the auditorium in the form of what is called a forestage or apron. This is not an intimate theater shape since the audience and the actors are each in separate, but connected, interior rooms.
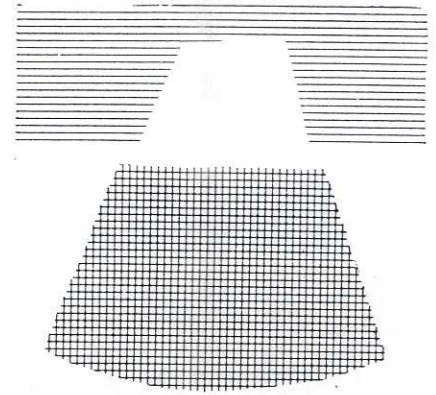


Arena Shape. Theater-in-the-round. Stage surrounded on all sides by the audience. Puts the greatest number of the audience in intimate proximity with the performer. Both audience and actor are in the same room. Doesn't involve elaborate scenery usually associated with the proscenium tradition.
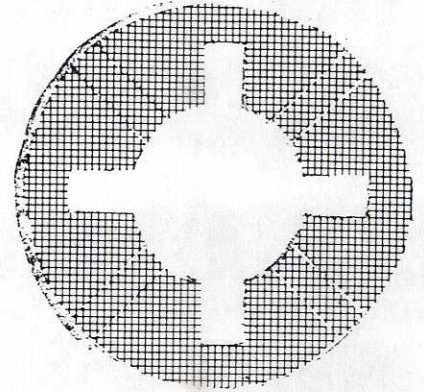


Open-thrust Shape. Brings greater intimacy to theater. Part of the proscenium stage extends into the audience so there are people siting on three sides of the extended piece. Also eliminates some of the need for elaborate stage scenery.
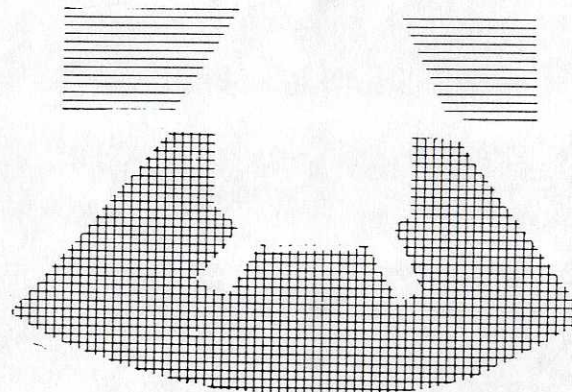
The proscenium, arena and open-thrust shapes can be used in all different kinds of seating arrangements. These diagrams demonstrate how these stages would operate in a round auditorium.
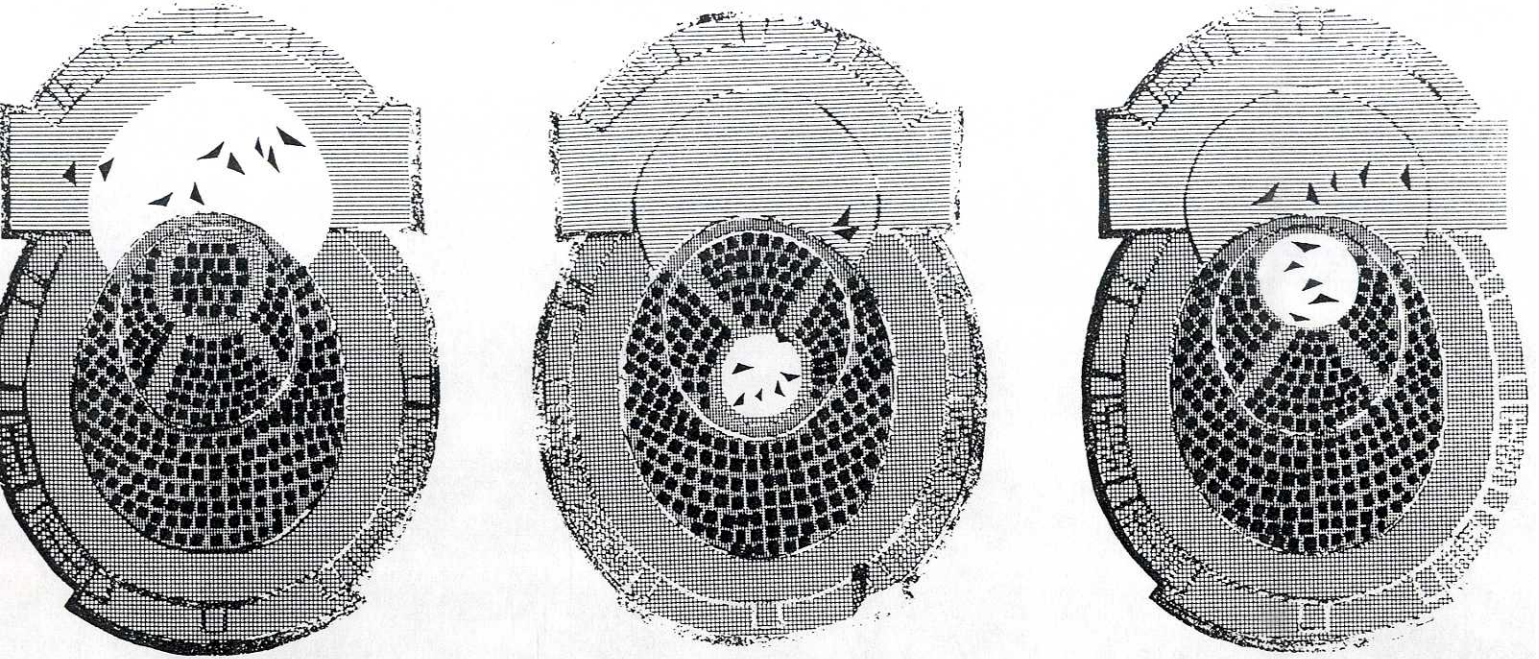


Diagrams of Different Stages for Puppets

Stages for hand puppets have to be able to give the audience a clear view of the action while hiding the puppeteer. If the puppeteer is standing, the audience needs to be far enough back for a comfortable view. If the puppeteer is sitting, the screen can be shorter and then the audience can sit closer. Multiple screens can also be used for multiple puppeteers and multiple layers of puppets.

Stages for shadow puppets require a screen and a direct source of light behind which the puppeteers stand. The smallest image is obtained with the puppet right against the screen. As the puppeteer moves the puppet toward them, the shadow will grow. The puppets are held parallel to the screen and their connections held perpendicular so the puppeteer usually needs to stand for better mobility.

On a marionette stage, the puppeteer needs to be at a level above the puppet so they can look directly down on the puppet. A screen hides the puppeteer as the walk along the bridge manipulating the puppet.

5'9"

stagefront

Bridge Rails

- Hook

Bridge

Backdrop

Stage

Ladder
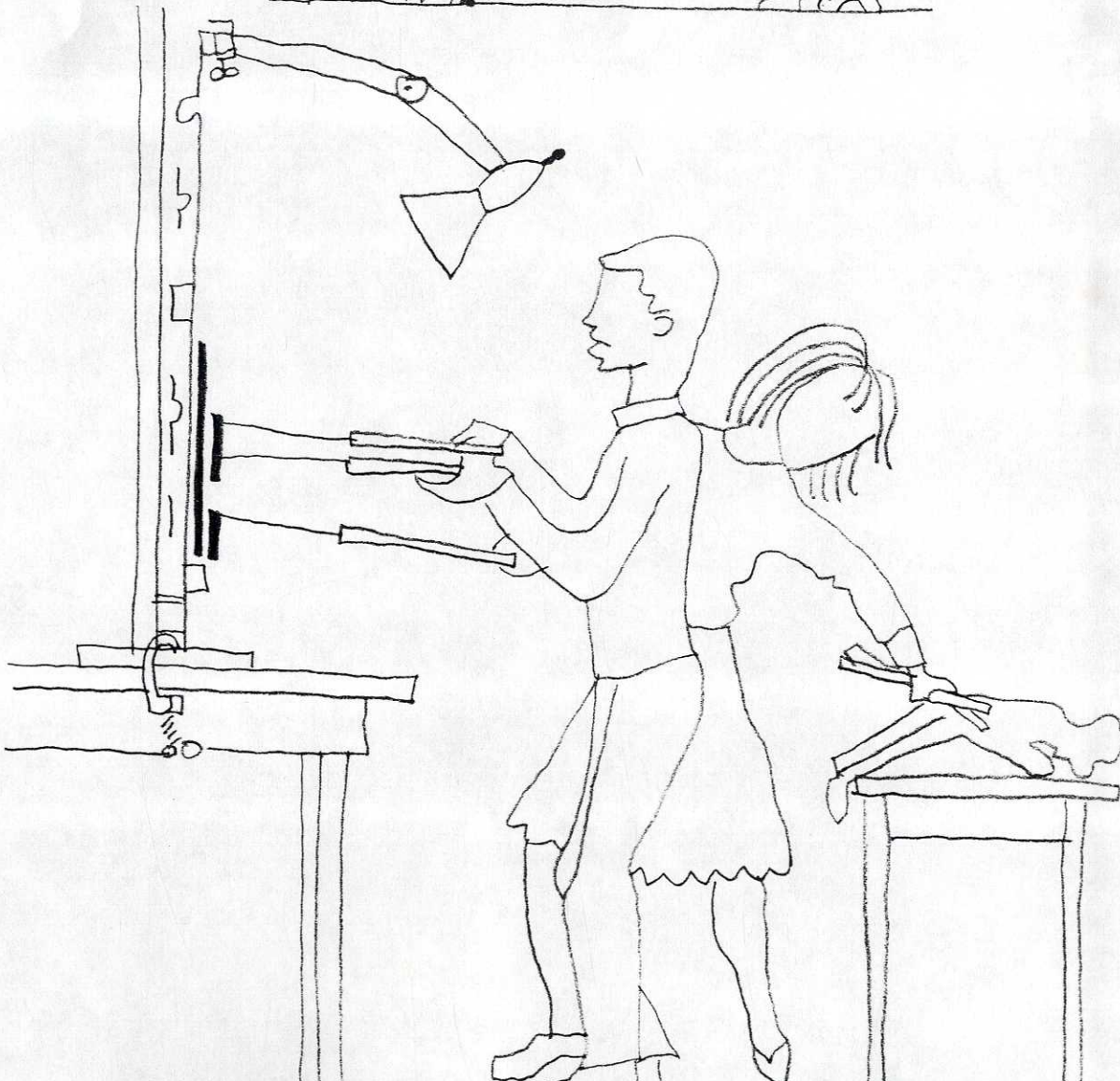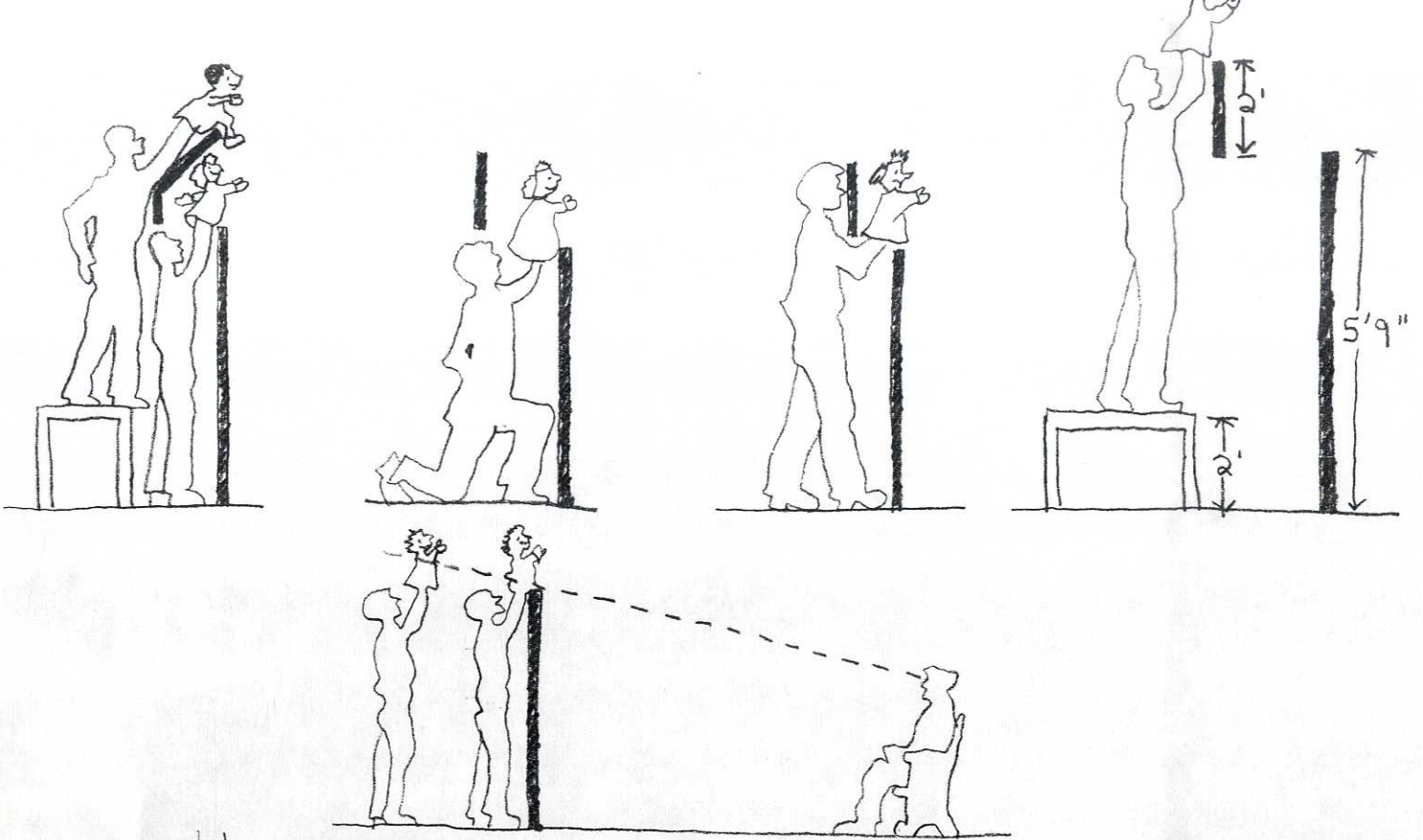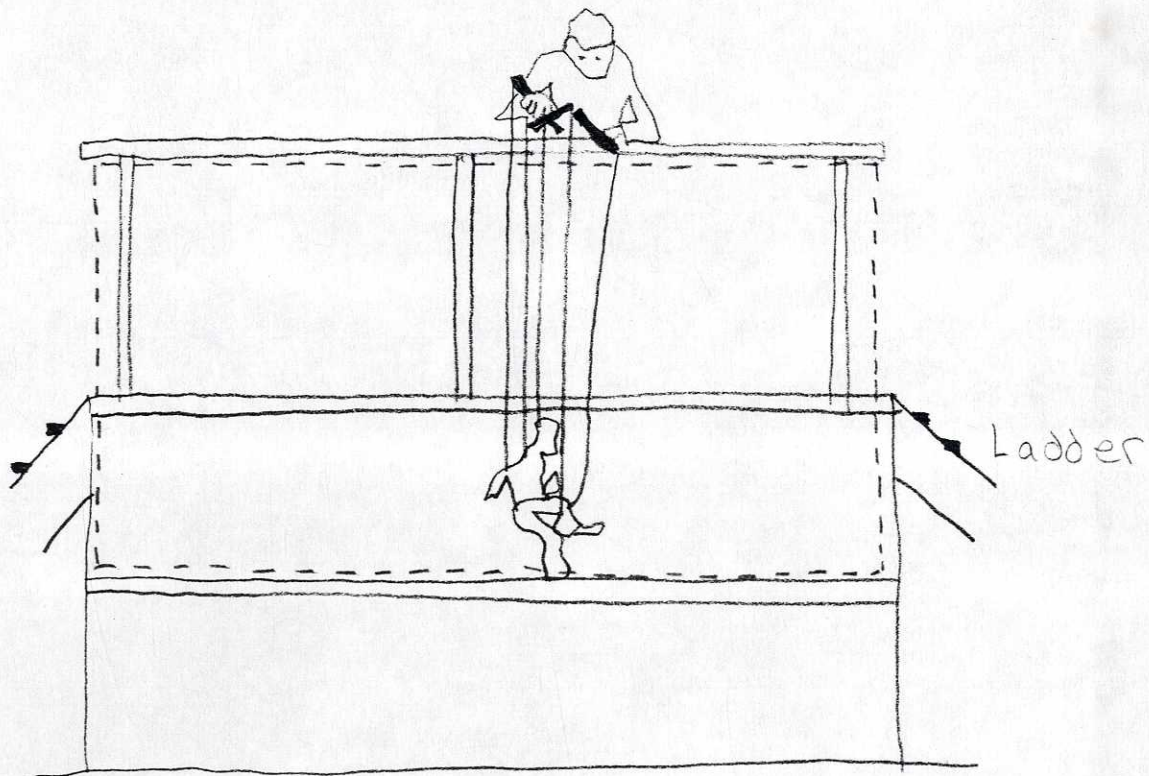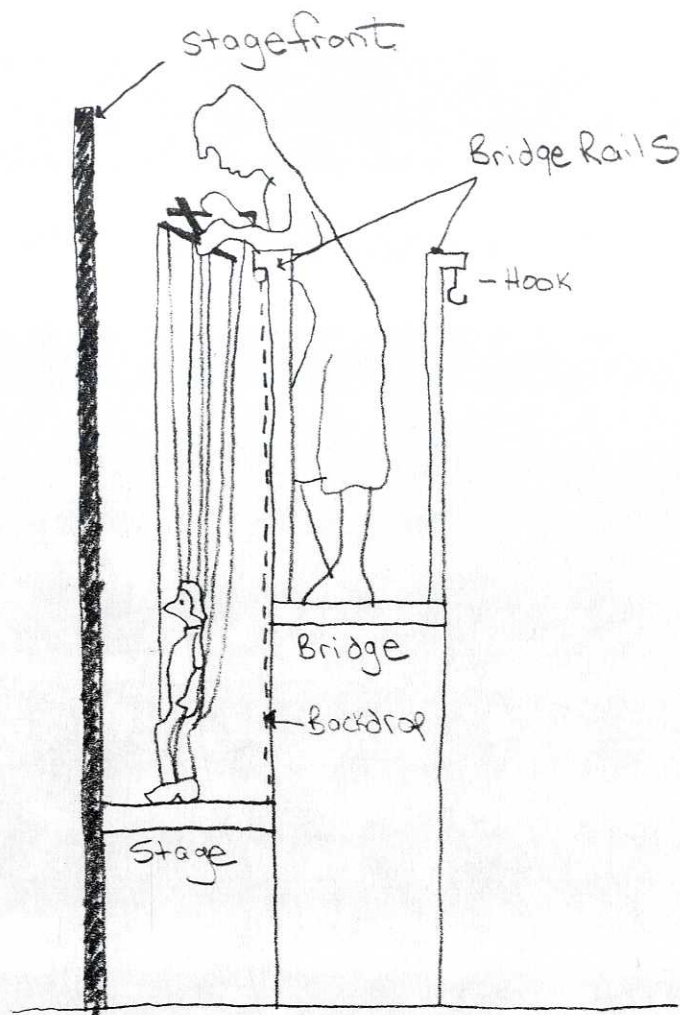
Puppets have unique structures that allow them to be manipulated in human-like manners. The structure can be someone's hand, wire, wood, plastic wood, string, or clay. The structure is covered by a skin of paper, cloth, paper-mache, paint, wax, or yarn. Sometimes though, the structure is revealed like with a marionette. A puppet's structure dictates it's capacity for movement. The joints used in the structure can be screw-eye, strips of cloth or leather, brass hinges, ball and socket, folded cloth, wire or tied with string. These are just as important as the structure. The actual joining allows the puppet to move and the correct placing of the joints ensures more realistic-like motions. The analysis of the flexibility, layers, scale, structure and joints of the different kinds of puppets can begin to set up an analogy with the design of an architectural form.

# Hand

# Rod
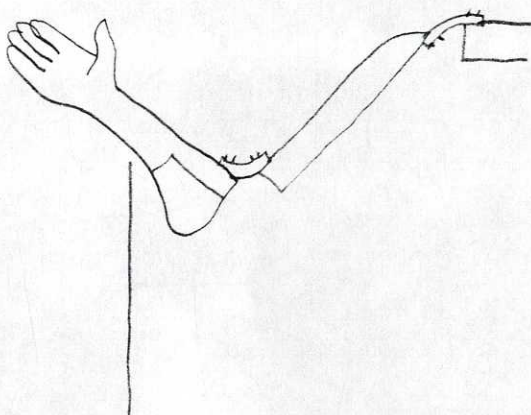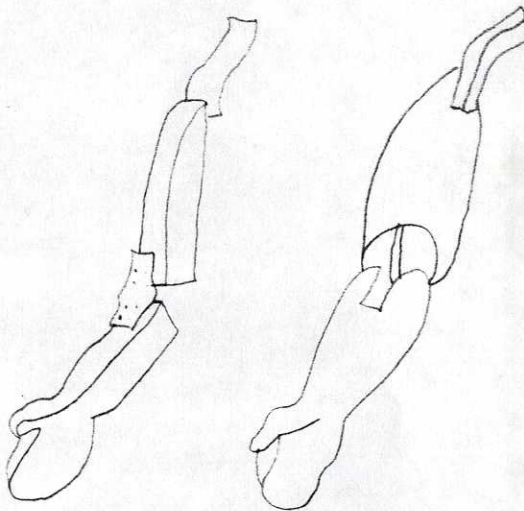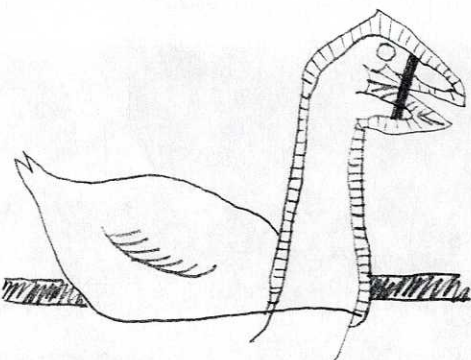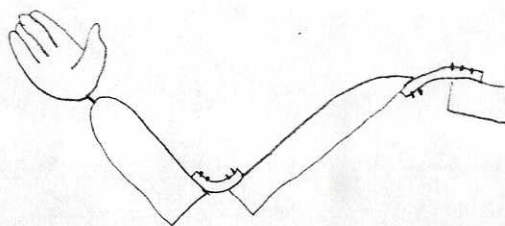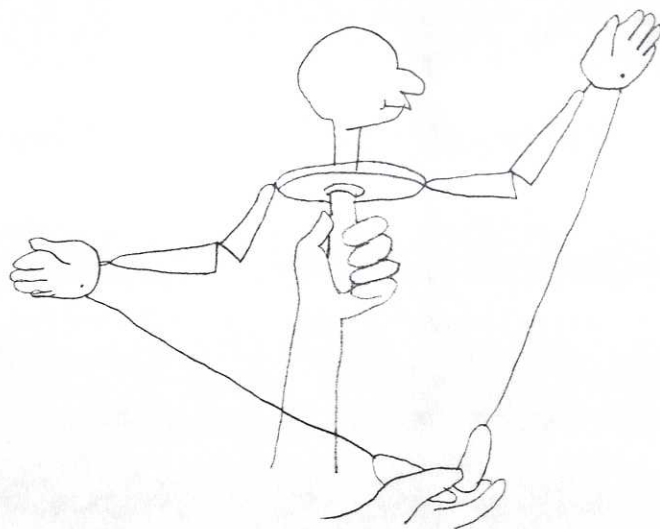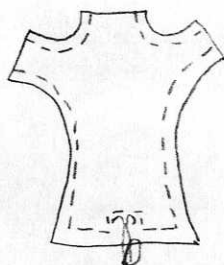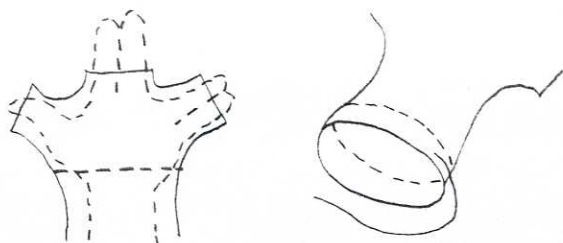
# Marionette
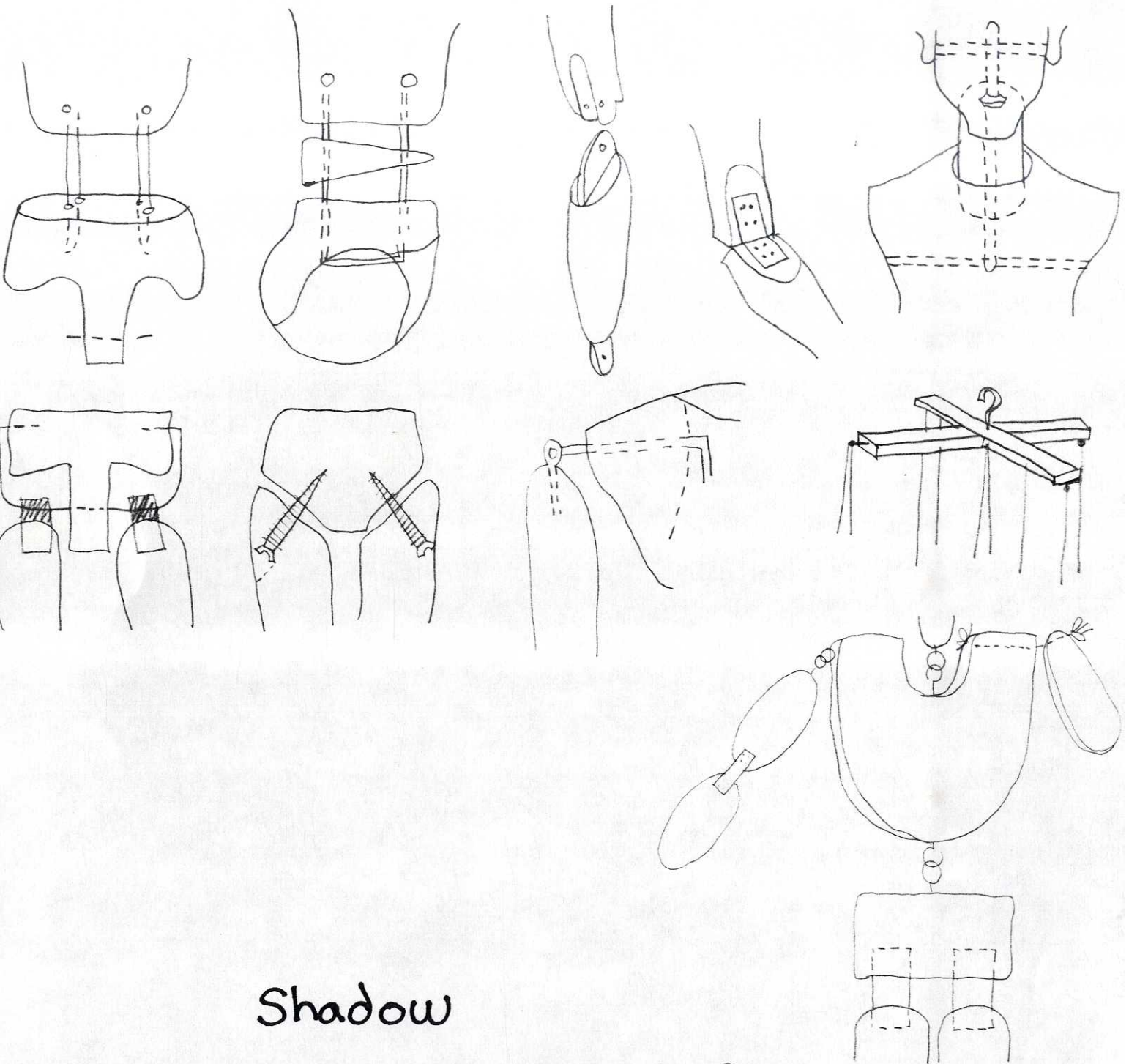
## Shadow
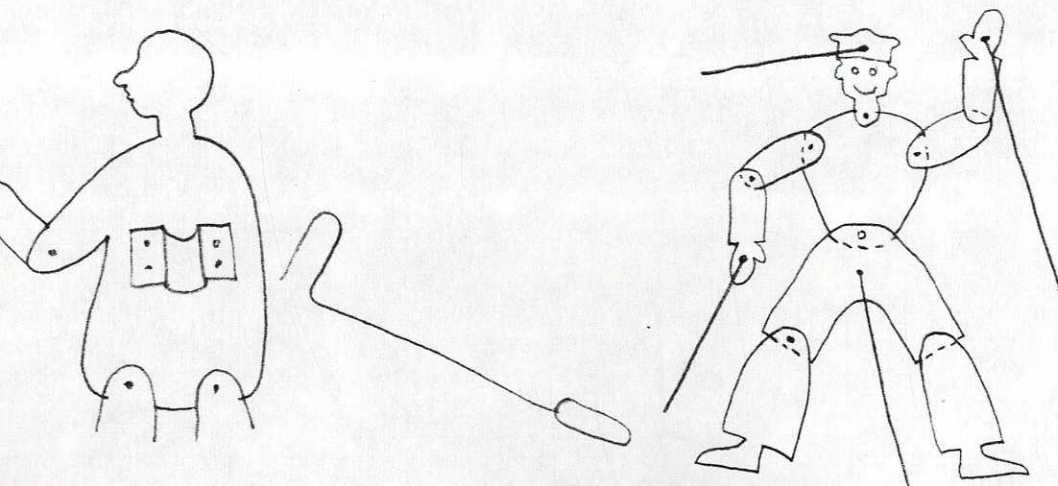
Appendix

limit of
sky view

internally reflected
component

sky
component

diffuse reflection
from atrium walls

'externally'
reflected
component

work plane

diffuse reflection
from atrium floor
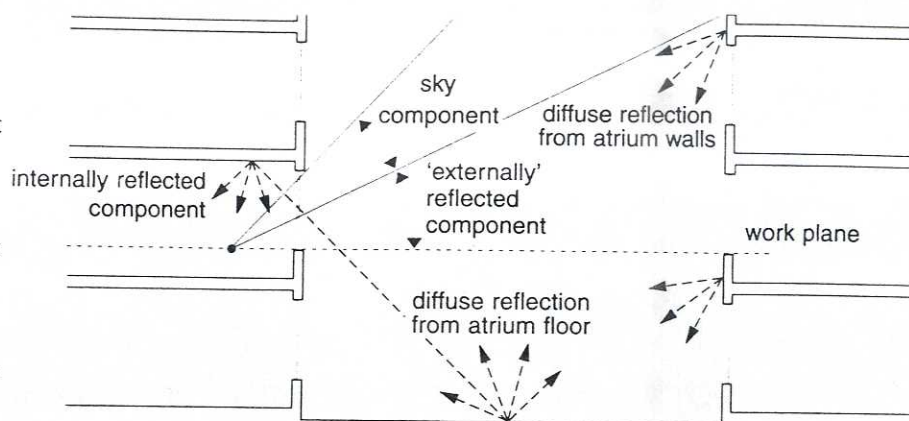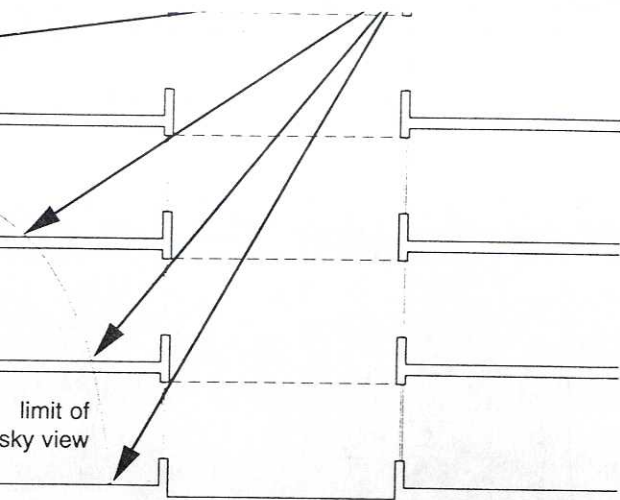
**9.6** *Reflected light plays a vital role as well as direct sky light when the atrium is intended to be a source of daylight.*
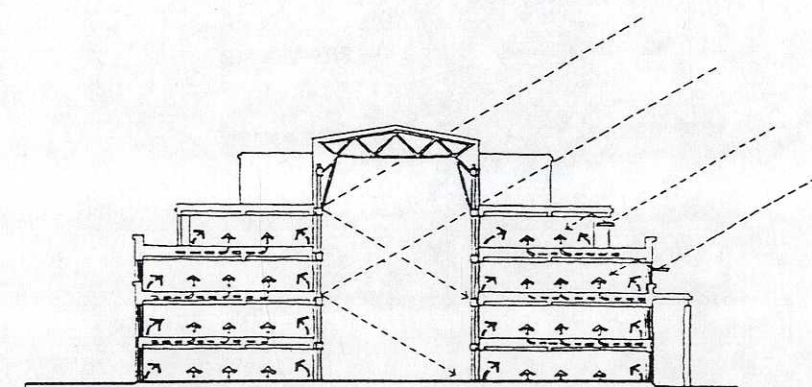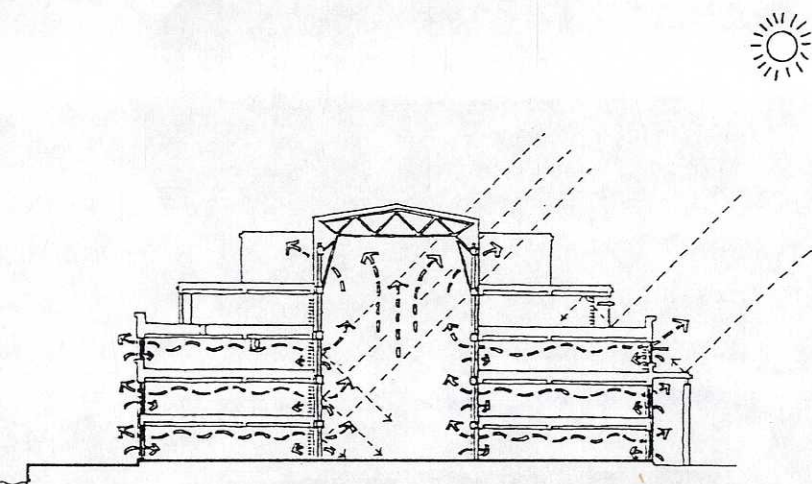
**Figure 11.7**
Buildings perform differently in the summer and winter. Design needs to respond to both conditions if energy use is to be reduced.
(RMJM©.)

N

side-lit zones

A ⌐               A

W                 E

non-passive zor

S                 2h

h = floor to ceiling height

non-passive          top floor central (passive)

top floor side-lit

side-lit passive

Winter Sun / Sun / Daylight level with sunscreen / Normal Daylight Curve

15%
12.5%
10%
7%
4%
1.5%

RAISED FLOOR

1M 2M 3M 4M 5M 6M 7M 8M
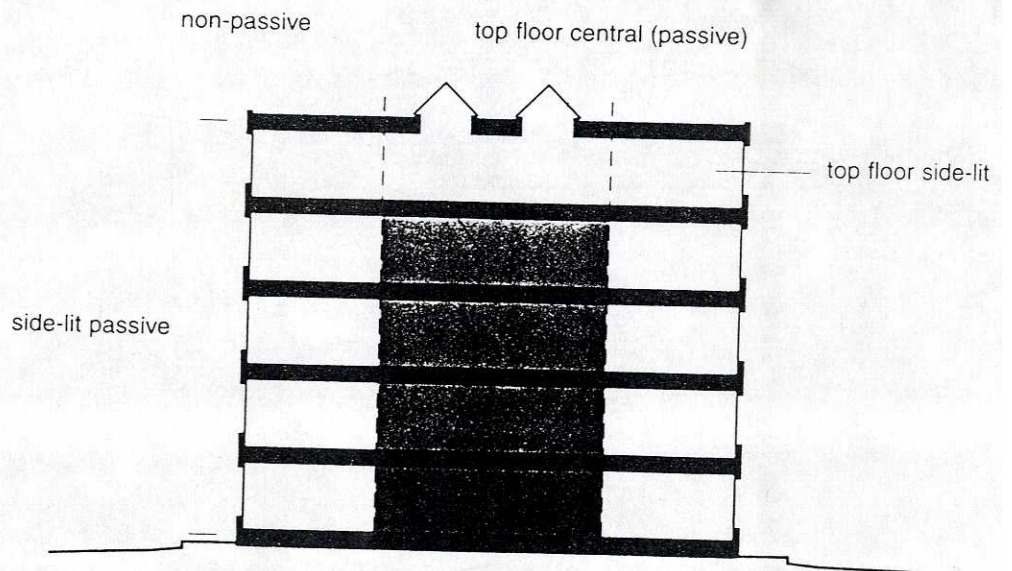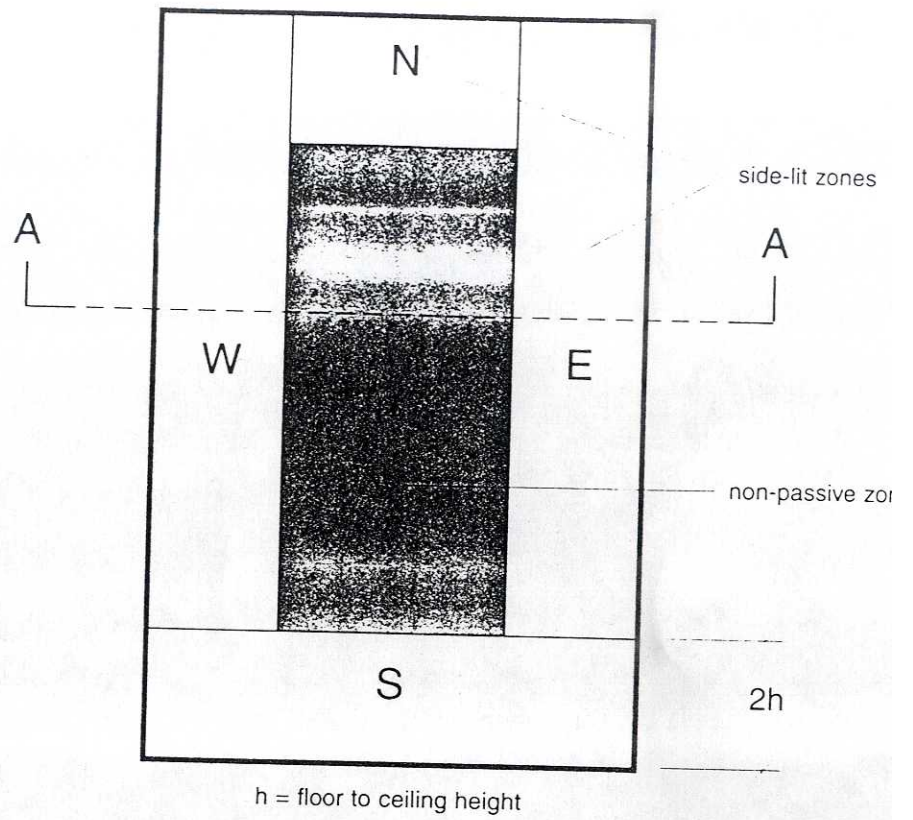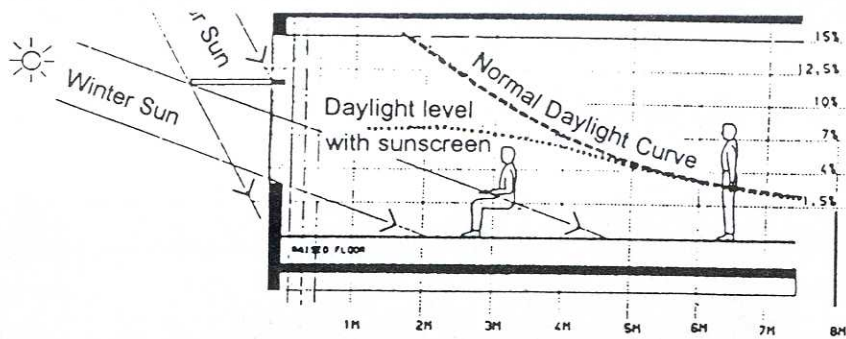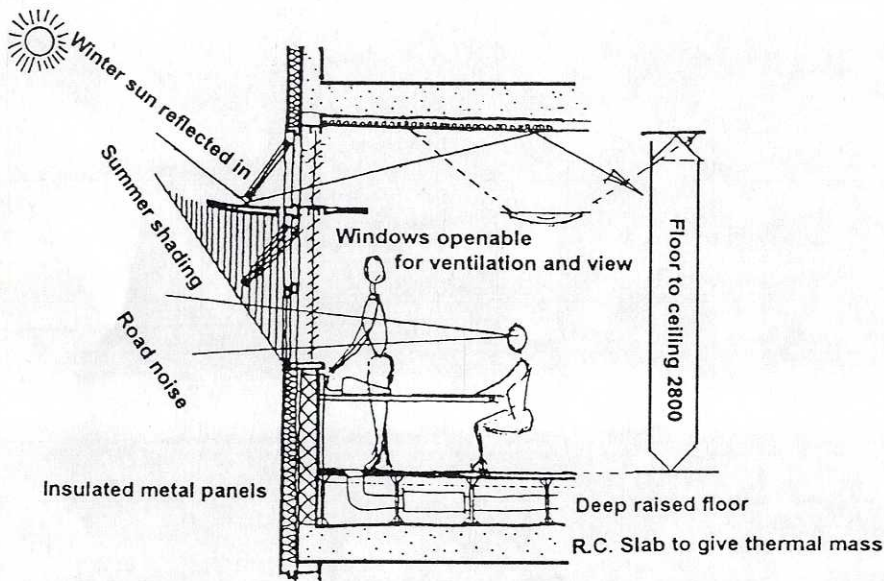
**Figure 11.3**
The Ionica Building in Cambridge uses environmental factors to determine the façade design. (R. H. Partnership©.)



Winter sun reflected in

Summer shading

Road noise

Windows openable for ventilation and view

Floor to ceiling 2800

Insulated metal panels

Deep raised floor

R.C. Slab to give thermal mass

$$\text{glazing ratio} = \frac{\text{unobstructed glass area}}{\text{total façade area}}$$

$$GR = \frac{\blacksquare}{\square + \blacksquare}$$

poor          good

$$\Delta p = 0.043 \; h . \Delta t$$

WINTER

automatic ridge ventilators

prevailing winds

exhaust air

preheated air

fresh air   return air

SPRING AND AUTUMN

automatic ridge ventilators

solar blind

exhaust air

fresh air   ventilation option

cooling

SUMMER

suspended acoustic panels

Acoustic absorption to reflect external noise

Free Standing Absorbent Partitions

Carpet

## Sound

HORIZONTAL SURFACE

SOUTHERN LATITUDE

VERTICAL SURF

NORTHERN LATITUDE

7-17. Reflecting surfaces.

MORNING    NOON    EVENING

7-18. The daily variation of reflecting surfaces.

GAS

ENVIRONMENTAL STRATEGY

Summer Sun

Equinox Sun

Winter Sun

**Overhangs**
Protect softwood windows and glazing from
high altitude sun.

TYPICAL SECTION

top
light ven-
tilator

sound attenuation

lightshelf

solar shading

window

subframe

internal blind

acoustic absorption

summer

Autumn /
spring

winter

fixed overhang

louvres

moveable
blind
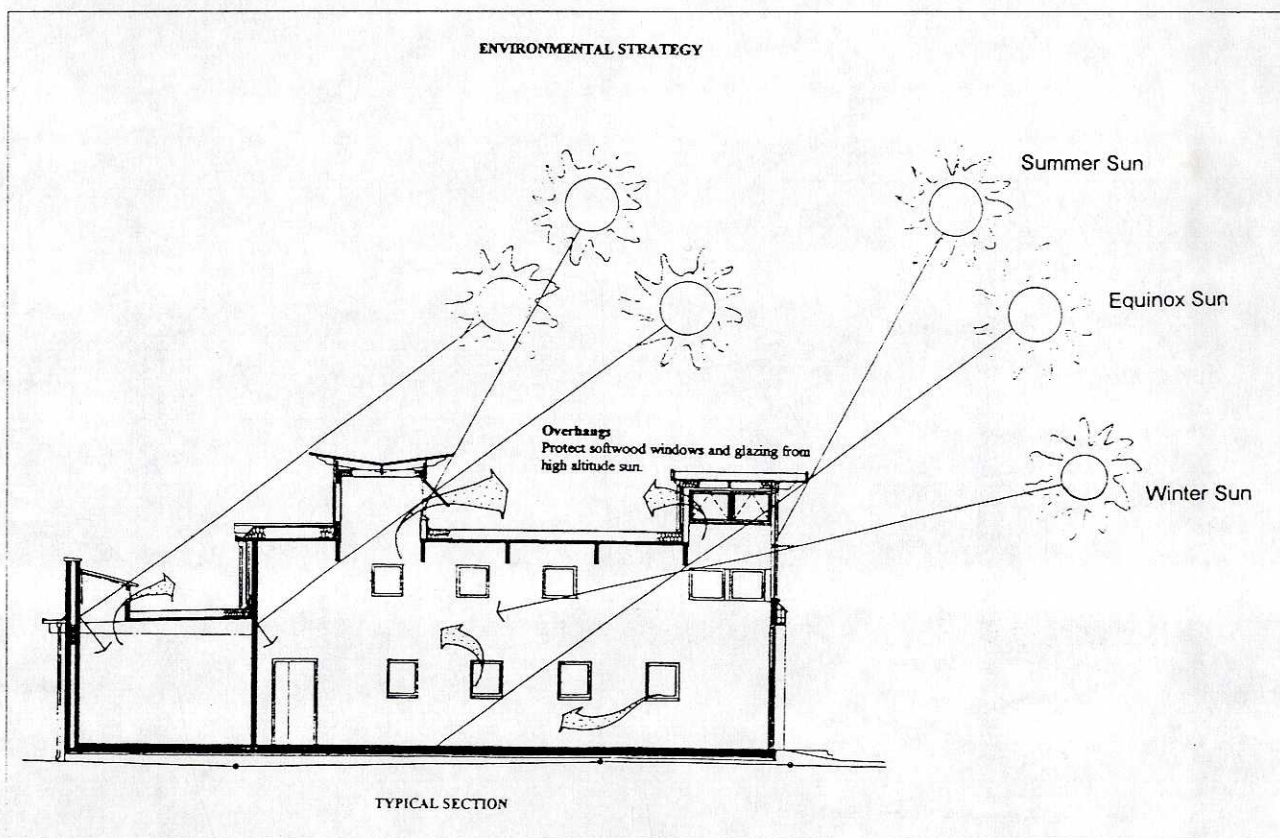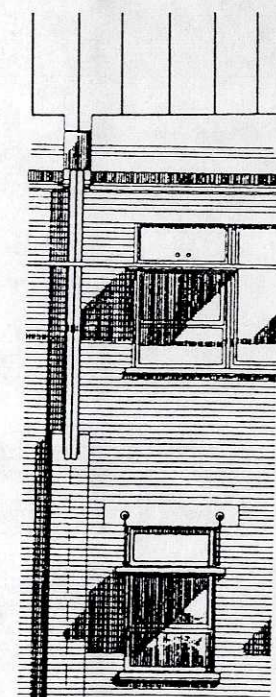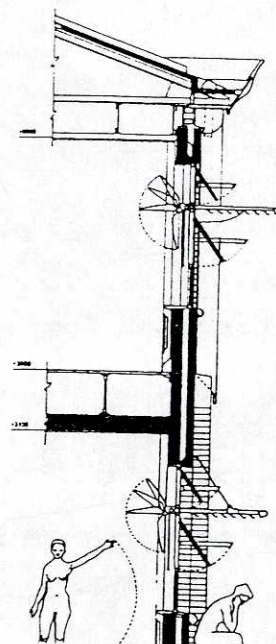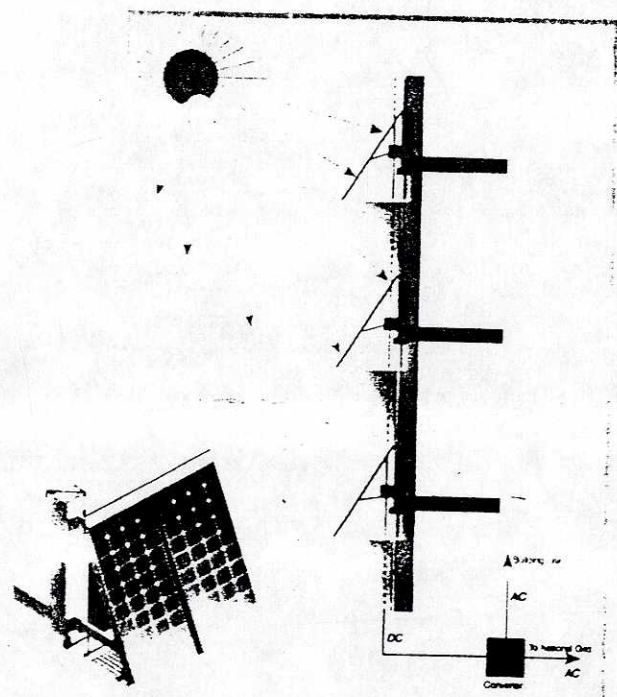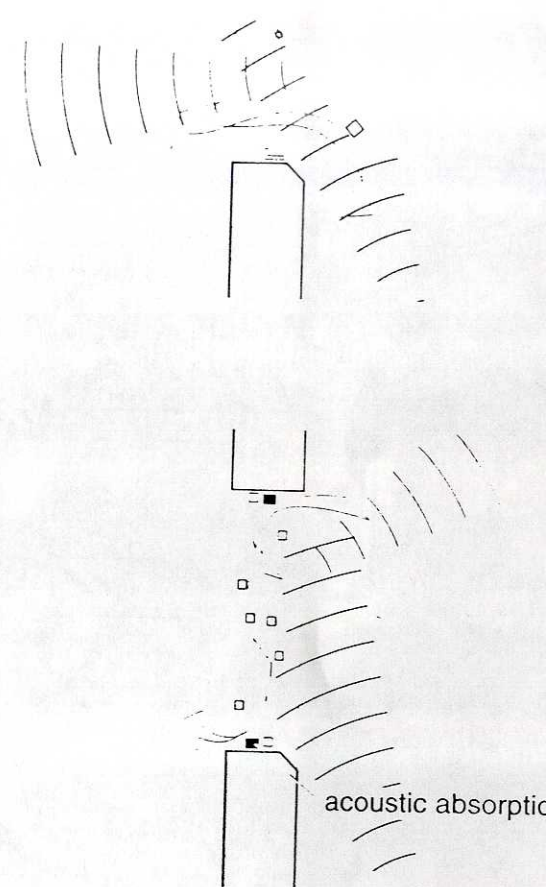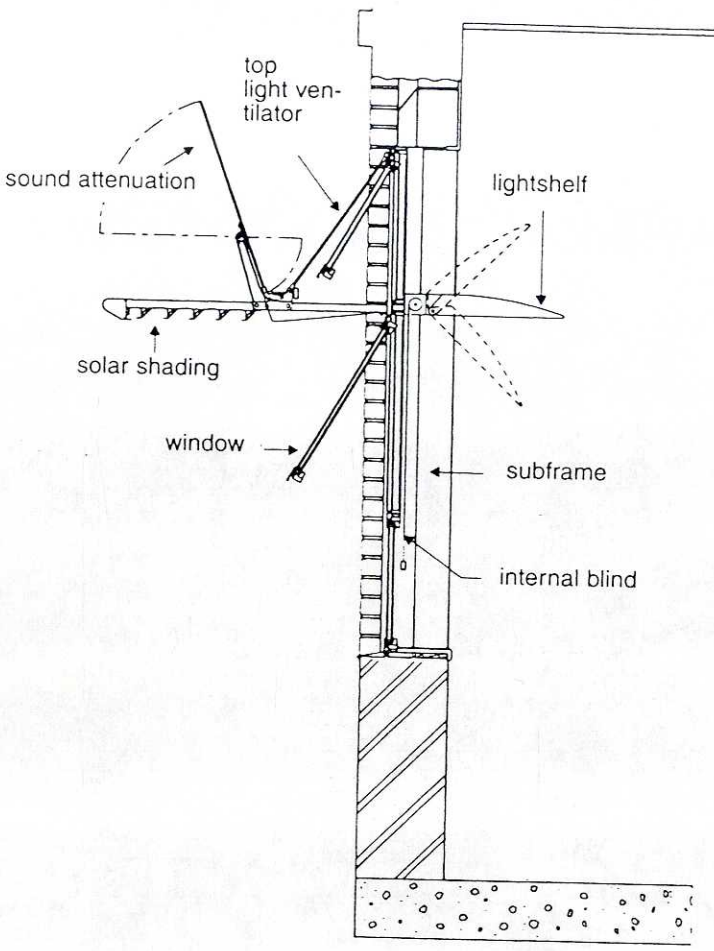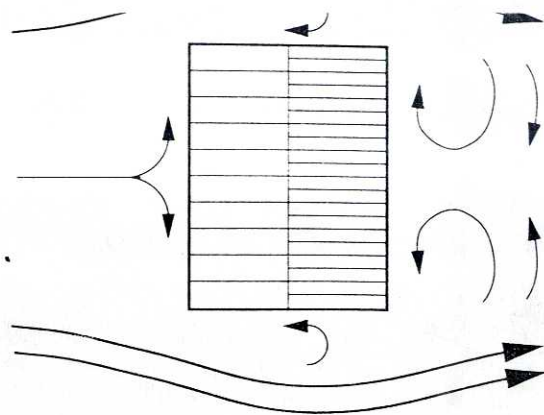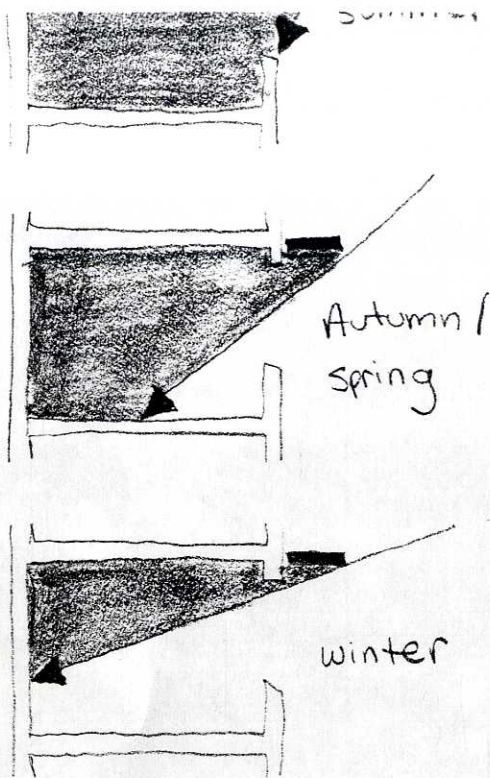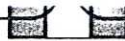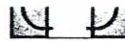
PLAN
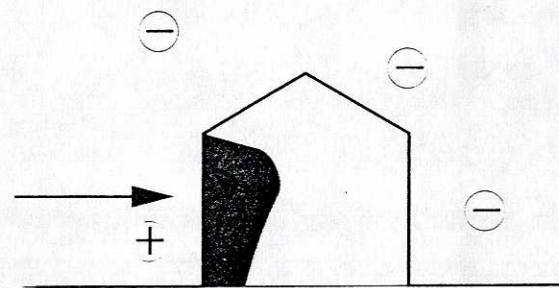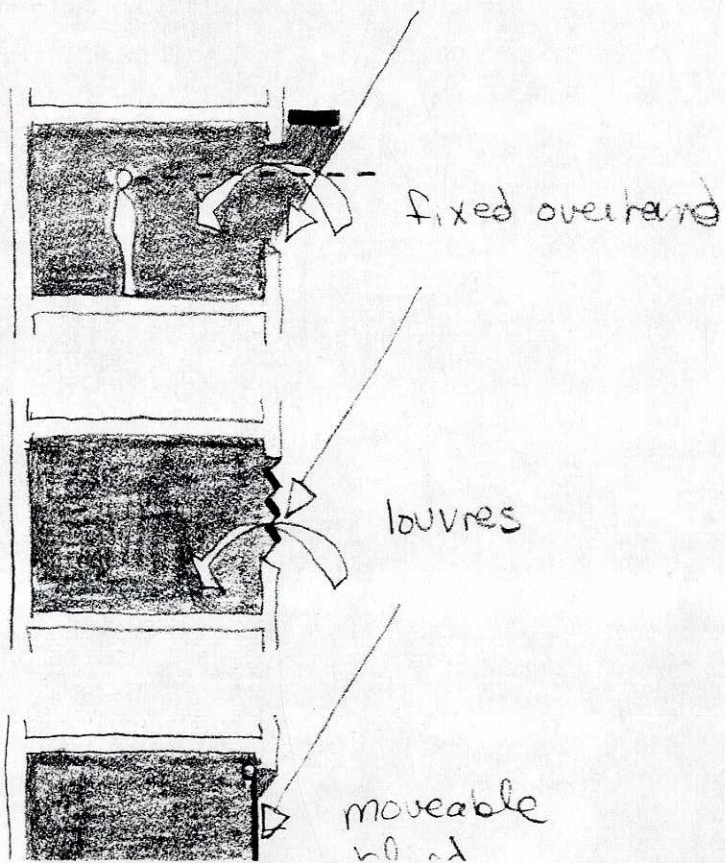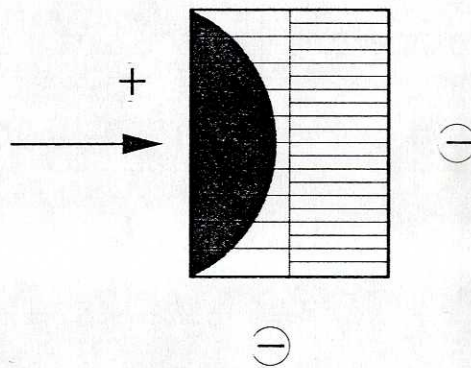
**7.5** *Distribution of wind-induced pressure over the surface of a building, in section.*

| config. type | x1 | x2 | x1 | x2 | x1 | x2 | x1 | x2 |
|---|---|---|---|---|---|---|---|---|
| 1 ▲N | 0.52 | 0.60 | 0.58 | 0.63 | 0.54 | 0.57 | 1.02 | 1.12 |
| 2 ▲N | 0.55 | 0.71 | 0.70 | 0.84 | 0.59 | 0.71 | 1.02 | 1.24 |
| 3 ▲N | 0.41 | 0.53 | 0.51 | 0.62 | 0.48 | 0.58 | 0.83 | 1.02 |
| 4 ▲N | 0.36 | 0.49 | 0.53 | 0.69 | 0.42 | 0.53 | 0.84 | 1.10 |
| 5 ▲N | 0.35 | 0.46 | 0.46 | 0.64 | 0.38 | 0.50 | 0.56 | 0.80 |
| 6 ▲N | 0.57 | 0.83 | 0.75 | 1.03 | 0.61 | 0.85 | 0.93 | 1.30 |
| 7 ▲N | 0.47 | 0.63 | 0.58 | 0.74 | 0.54 | 0.70 | 0.83 | 1.03 |
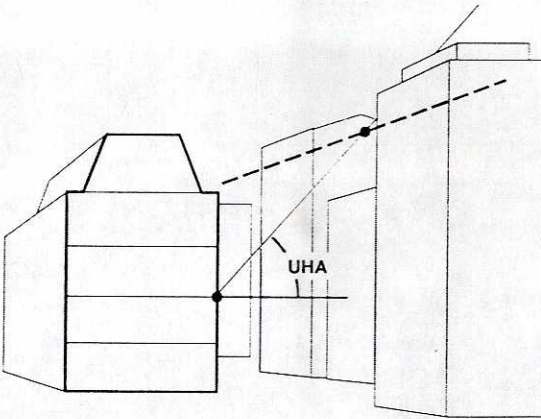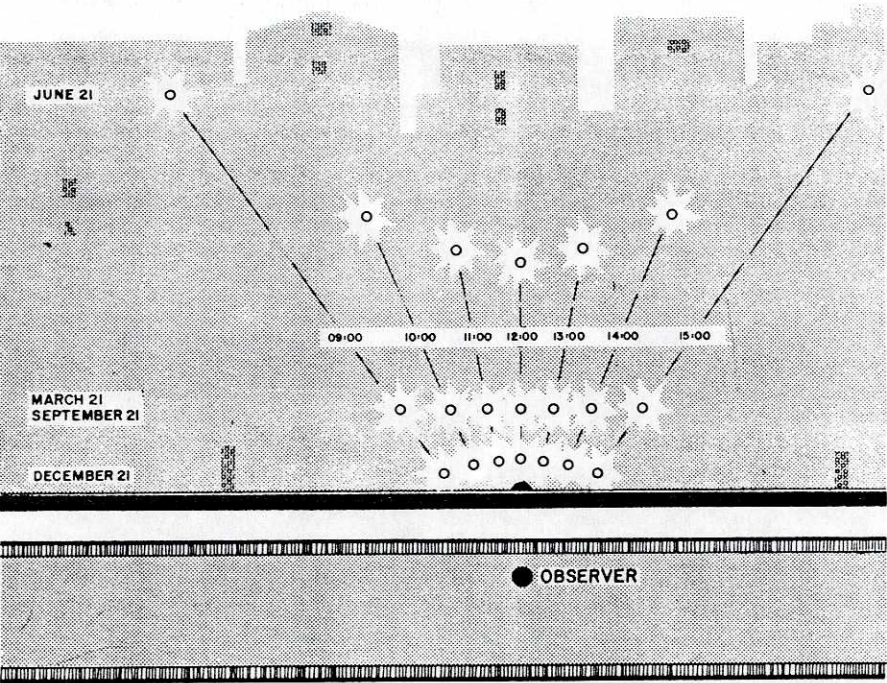


7-28. An annual pattern of reflected sun images.

## Types of Layouts

**Rows** These may be straight across entire theater, side banks may be canted, or entire rows may be curved. Advantages of each type are shown in Fig. 2. Min. radius for curved rows, due to seat construction, is 20 ft. Center for radii of rows and center of screen or stage need not coincide, although this is the ideal case. When rows are curved, a sloping auditorium floor should be a compound curve or amphitheater type to prevent tilted side seats.

**Aisles** These may be straight or curved, parallel or radial. Aisles should run at right angles to rows to eliminate "pockets."

Combinations of row and aisle types commonly used are shown in Fig. 2.

**Continental Seating,** most commonly used abroad, involves use of rows with unlimited number of seats. Local codes in this country often either prohibit its use or impose many restrictions. However, existing examples have proved safe and comfortable due to increased back-to-back seat spacing (up to 42 in.) which is essential to scheme. Larger than usual side aisles or foyers and many side exits are required.

**Code Requirements** These govern (1) maximum number of seats in a bank, (2) aisle width, (3) crossovers (not uniform). Usual requirements are: (1) no seat more than seven seats from an aisle; (2) min. aisle width of 3 ft, increasing by varying factors in relation to length of aisles. (3) Requirements for crossovers, not uniformly subject to codes, vary. Consult local authorities.
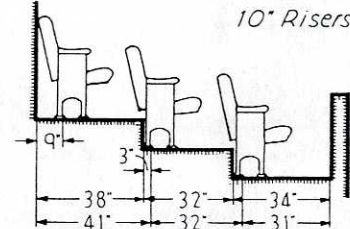


**LEVEL FLOOR**  Dimensions to chair-size line  31" 31" 31"
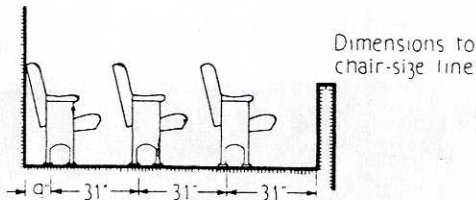
**INCLINED FLOOR**  Pitch 1½" perf ft.  32" 32" 31"
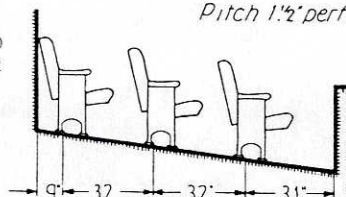
**STEPPED FLOOR**  10" Risers  38" 32" 34" / 41" 32" 31"
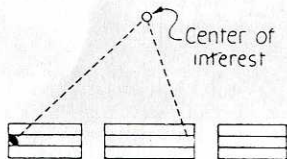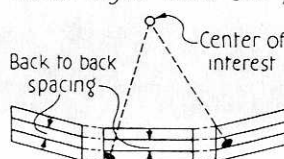
### MINIMUM SPACINGS FOR VARYING FLOOR CONDITIONS
*Based on stock sizes with 5¼" pitch back*



**STRAIGHT ROWS**
Uncomfortable for spectators at side, unequal stress on seats and backs

**STRAIGHT, CANTED SIDE-BANKS**
Same defects as straight rows though to less degree. Note that rows do not line up. Steps if required in aisles will be unsafe
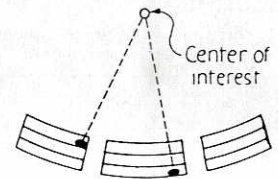
**CURVED ROWS**
Recommended for comfort, ease of vision and safety

### TYPES OF ROWS
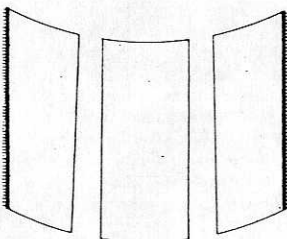


**STRAIGHT**
(poorest type)
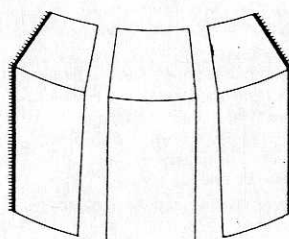
**COMPOUND**
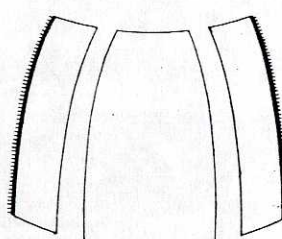
**CURVED**
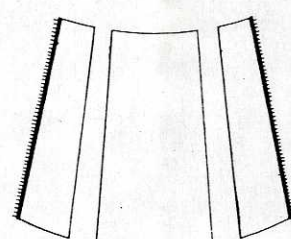
**FAN**
(ideally best)

### COMMON THREE-BANK LAYOUTS
*see also "Continental Seating" in text*



PLAN — Row line

INCORRECT SECTION — Point 'b' being higher than 'a' and 'c' causes chair to slope
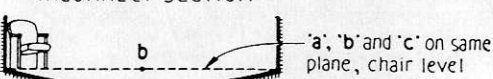
'a', 'b' and 'c' on same plane, chair level

Aisles cutting diagonally across rows — Pockets

Curved or straight radial

Fig. 15 The vertical angle above which ability to recognize familiar shapes falls off very rapidly is 30°.

like a theatre with all seats in the center section. A center aisle wastes the most desirable seating area in the theater and inevitably causes the objectionable condition of seats near the aisle being directly in front of each other. (See Fig. 17.)

### Depth of House

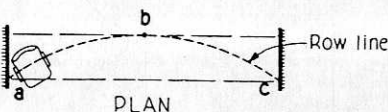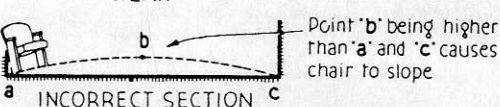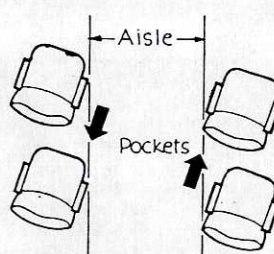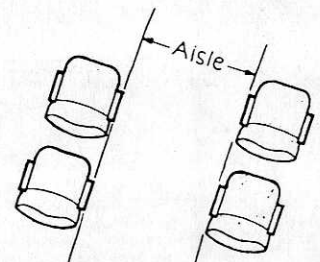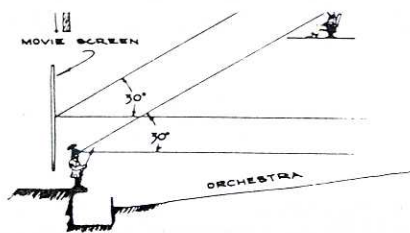There are many formulas used to determine the depth of the house, or more accurately, to determine the relationship between depth of house, width of house, and width of screen or proscenium. They vary considerably and are all empirically derived on the basis of existing theaters, with too little reference to whether such theaters are good or not. Typical are the following: Optimum depth equals 4 times screen width. Maximum depth equals 6 times screen width. Depth equals 1.25 to 2.35 times



(a)

(b)

Fig. 16 (a) A scene of direct conflict loses its visual significance to spectators outside the angles $D_1$-$D$-$D_1$, etc. One performer covers the other for spectators inside the angles $D_1$-$D$-$D_2$. (b) Scenes of direct conflict staged anywhere between B and C on an extended stage retain visual significance for all spectators between lines $BB_1$ and $CC_1$.

perceive a minimum dimension or separation equal to 1 minute of visual arc. Translated into space measurement this means that at 10 ft a normal eye can perceive a dimension of 0.035 in., at 50 ft, 0.175 in., and at 100 ft, 0.35 in. Details of actors' make-up and facial expression are not plainly recognizable at distances of more than 50 ft from the stage.

2. Capacity. The larger the house, the lower can be the price per seat or the greater the gross. If the box office is not to be considered, capacity may be limited by optimum seeing requirements, and the last rows kept within 50 ft of the stage. As various requirements
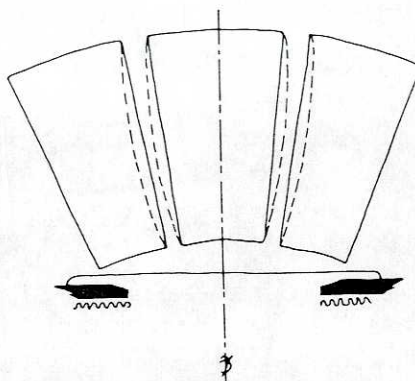


Fig. 17 Straight radial aisles are better than aisles which curve or bend.

operate to increase capacity, the distance of the rear seats from the stage must be increased and seeing conditions impaired in proportion. The theater operator may compensate the occupants of these seats by charging less for them. For shows involving live human actors, 75 ft is generally accepted on grounds of visibility as maximum house depth. (See Fig. 18.)

In theatrical entertainment which has as its chief visual component human actors (live shows), the degree to which these performers must be seen to satisfy the audience and put the show across varies.

A. Details of facial expression and small gesture are important in legitimate drama, vaudeville and burlesque, intimate revue and cabaret.

B. Broad gesture by single individuals is important in grand opera presentation, musical comedy, and the dance.

C. Gesture by individuals is unimportant and movement of individuals from place to place is the smallest significant movement in pageant.

It follows then that theaters planned for the types of entertainment listed under A must be limited in depth of auditorium so that visibility from the remotest seat still allows the occupant to perceive facial expressions (not over 75 ft).

Theaters planned for the types listed under B may have greater distance from the stage to the remotest seat, but this distance is set at a maximum beyond which the individual actor is diminished to insignificance (approximately 125 ft).

Spectators in the last rows at the Radio City Music Hall in New York, looking through a distance ranging from 160 to over 200 ft, depending on the location of the performers onstage, see a ballet reduced to the size of midgets, and an individual performer, even with the dramatic enhancement of a follow spot, is a very insignificant figure indeed.
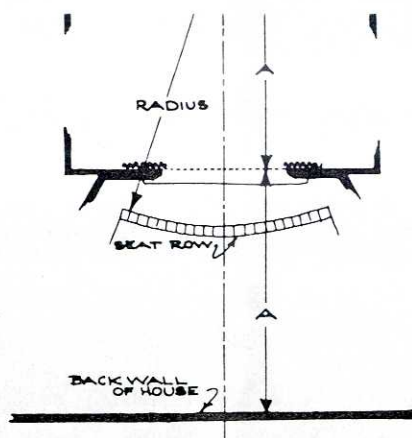


Fig. 18 Location of center of curvature for rows of seats.

### Summary

Given the proscenium opening and capacity, laying out the orchestra and balcony or balconies in plan becomes a simple and straightforward process. Sight lines determine proscenium splay and house width. Visibility limits and capacity determine depth. Minimum distance from stage or screen to first row is determined in the section.

As can be realized from the foregoing requirements for seeing, any scheme which attempts to provide flexible audience-performance relationships sacrifices something, usually in every form attempted. The multiform theater cannot be justified except as a laboratory, where certain limitations are an acceptable price for flexibility and the box office does not need to support the enterprise.

### SECTION

The vertical angle of 30° at the spectator's position establishes the distance from the closest seat to the screen or to the highest significant object on the stage. The lowest seat in the orchestra must be located where the patron can just see the stage floor (except in the case of theaters built for motion pictures only). The highest seat in the balcony must be on a line which is not more than 30° to the horizontal at the front curtain at the stage floor if it is not to be above the limit of reasonable distortion. The standing patron at the back of the orchestra must be able to see the top of the screen, which is usually as high as any significant portion of a stage setting. Each spectator must see the whole stage or screen over the heads of those in front of him. Within these limits the floor slope of orchestra and balcony can be laid out: the first step in determining auditorium section. (See Fig. 19.)

Several methods have been offered heretofore for developing the floor slope. Doubtless others will be offered in the future. The authors present the following method as one which assures unobstructed vision from all seats. It may be noted that this system produces a floor slope considerably steeper than that in many existing theaters. It also produces better seeing conditions.

To determine floor slope, establish eye position of spectator in first row on center line by approximately 30° vertical angle above. For live shows, stage floor will be approximately 2
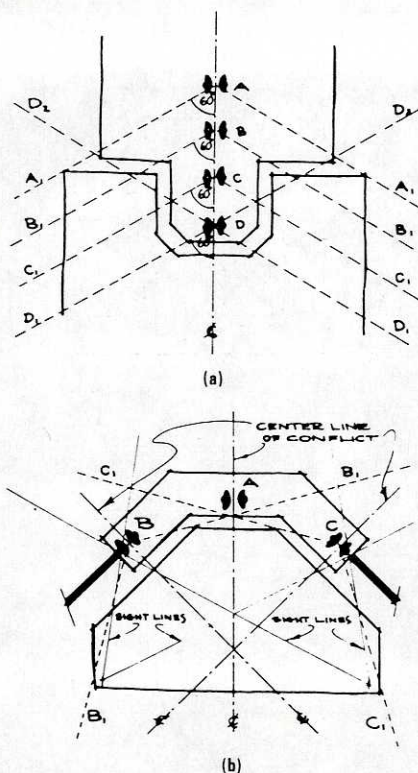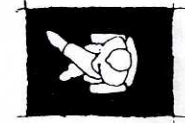
teria, the major organizing principles of Drama uses, define the distribution of people in the House while hearing criteria, the major organizing principles of Music uses, define the distribution of boundary surfaces. Second, varying the size of a Drama audience mainly influences the linear and planar geometry of the House, while varying the Music audience mainly influences volumetric geometry.

In this section, Drama (vision) and Music (hearing) considerations will be applied to the audience portion of a Room, in terms of the primary attributes of size, shape and arrangement. A Frontal arrangement is assumed, either legitimate drama or orchestra on stage.
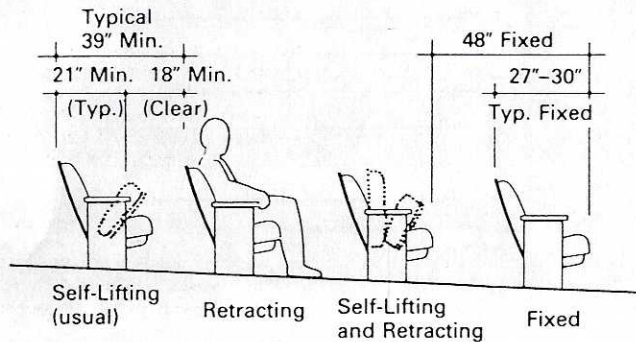
ment of seats defines the net floor area of the House (an aspect of size). Reckoning of area includes allowance for aisles and varies from 6 to 10 square feet per seat. Generally, a figure of 8 s.f. is good for first estimates although a higher number is usually needed for smaller capacities. This variation is caused less by differing seat dimensions than by conditions of arrangement. Sharp radius curves and ragged aisles introduce triangular residual areas. If seating is moveable, additional allowance must be made for imprecision and maneuvering clearances (13–15 s.f. is commonly used).

spacing must be greater for continental seating, which is practically unlimited in row length. Continental requires wider end aisles with closely spaced exit doors. Continental gives more legroom seated, but more interference from latecomers. It also heightens the sense of vastness in a large Room. On balance, floor area per seat is the same for both methods.



**7 to 12 SF/Person**

**Continental Row Spacing**



Self-Lifting (usual)   Retracting   Self-Lifting and Retracting   Fixed

**Area Comparison**
(incl. 20% aisles)



Conv. 6–8 SF
Cont. 8–10 SF

Extra Area Needed

**Conventional Row Spacing**



Self-Lifting
Fixed

**Typical Seating Dimensions**



Widths
18" Avoid
22" Avg.

Fig. 1  Seating area units.

**CONVENTIONAL**
(More Seats Centered)

30' x 30'

**196**

154 Seats

40 Ft.
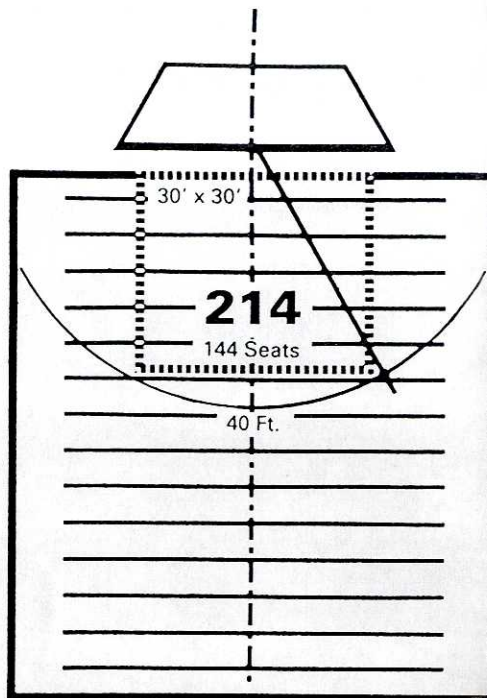
**CONTINENTAL**
(More Seats Near Stage)

30' x 30'

**214**

144 Seats

40 Ft.

Fig. 2 Conventional vs. continental seating.



110 Ft. - Discern Large Motions
65 Ft. - Discern Gestures

D*

79° Max. Turn
45° Comfortable Turn
40° Cone of Polychromatic Vision

18"

24"

5% of Acting Space

100°
40° Cone of Vision

65°

45° Head Turn

50° Limit of Vision
35° Color Discrimination

40° Color Discrimination

Normal

15° Sightline

Viewer's Choice

Undesirable

Uncomfortable

44"

18"

70° Limit of Vision

Equal

Equal

Optimum - 75 Ft.

Center of Seat Row Radius

D*

30°

Nearness Limitations

Tallest Significant Object

$or \ D = \dfrac{Proscenium \ Width}{3}$

Fig. 3 Plan definition of frontal seating.

teria, the major organizing principles of Drama uses, define the distribution of people in the House while hearing criteria, the major organizing principles of Music uses, define the distribution of boundary surfaces. Second, varying the size of a Drama audience mainly influences the linear and planar geometry of the House, while varying the Music audience mainly influences volumetric geometry.

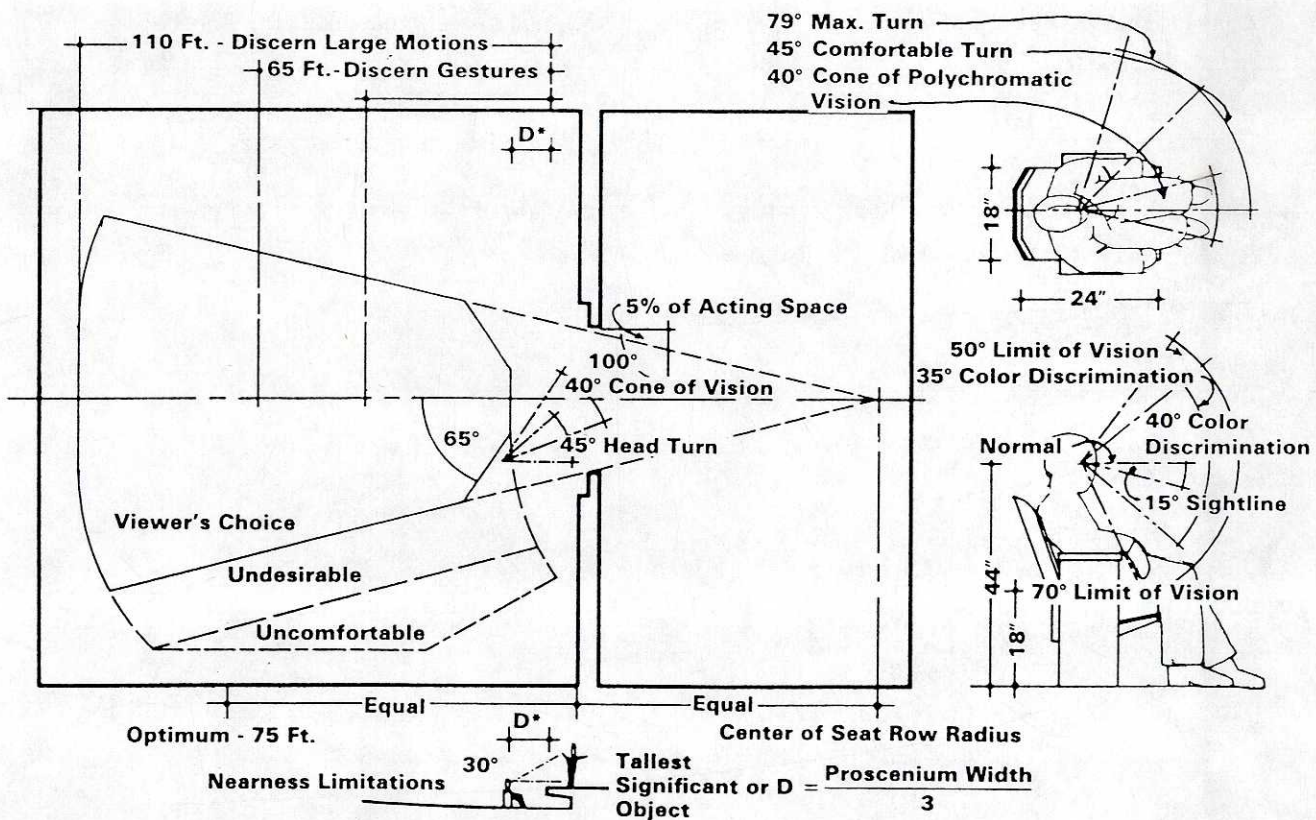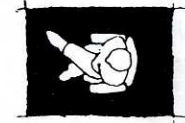In this section, Drama (vision) and Music (hearing) considerations will be applied to the audience portion of a Room, in terms of the primary attributes of size, shape and arrangement. A Frontal arrangement is assumed, either legitimate drama or orchestra on stage.
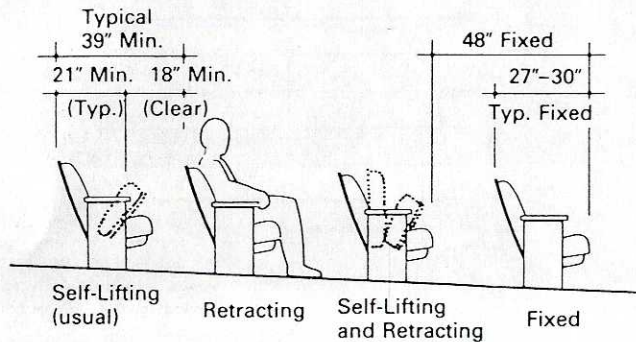
ment of seats defines the net floor area of the House (an aspect of size). Reckoning of area includes allowance for aisles and varies from 6 to 10 square feet per seat. Generally, a figure of 8 s.f. is good for first estimates although a higher number is usually needed for smaller capacities. This variation is caused less by differing seat dimensions than by conditions of arrangement. Sharp radius curves and ragged aisles introduce triangular residual areas. If seating is moveable, additional allowance must be made for imprecision and maneuvering clearances (13–15 s.f. is commonly used).

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**7 to 12 SF/Person**

**Continental Row Spacing**



Typical
39" Min.

21" Min.   18" Min.
(Typ.)    (Clear)

48" Fixed

27"–30"
Typ. Fixed

Self-Lifting
(usual)    Retracting    Self-Lifting
and Retracting    Fixed

**Conventional Row Spacing**



33" Min.    36"–39"    39"–42" Fixed
            Preferred
21" Min.  12" Min.  15"–18"    27"–30"    12"
Typ.    Clear

Self-Lifting
Fixed

Fig. 1  Seating area units.

**Area Comparison**
(incl. 20% aisles)



Conv. 6–8 SF
Cont. 8–10 SF

Extra Area Needed

**Typical Seating Dimensions**



Widths
18" Avoid
22" Avg.

44
34
23
17

Actors
Preparation

Rehearsal Stage
Shipping/Receiving

Service/Receiving

Stage

BACKSTAGE SUPPORT

THE HOUSE
Seating

Lobby
Tickets
Concession

Office

FRONT OF HOUSE

**Functional Diagram of a Small
Performing Arts Facility**
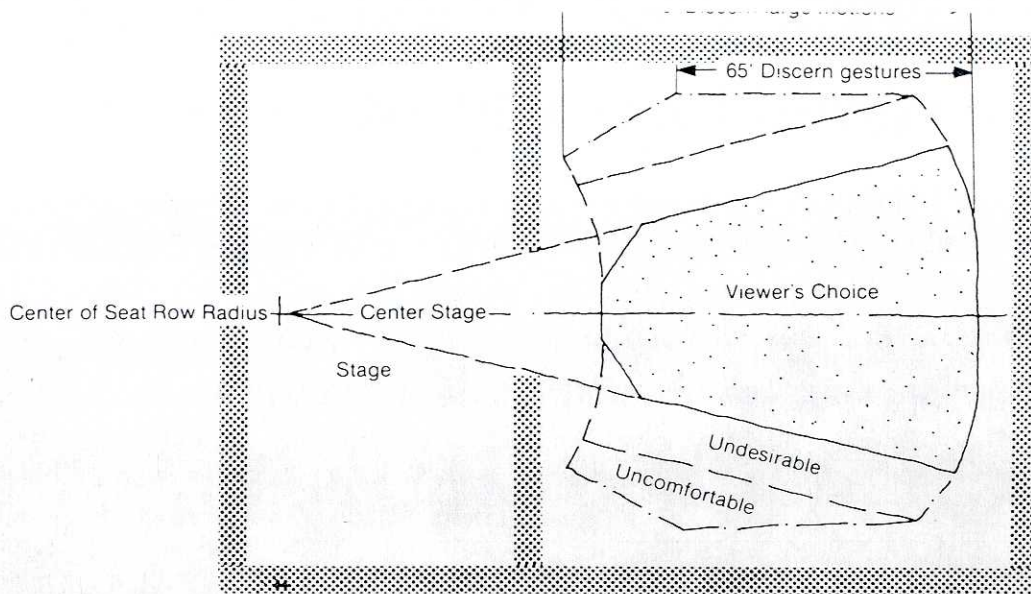
Horizontal Sightlines

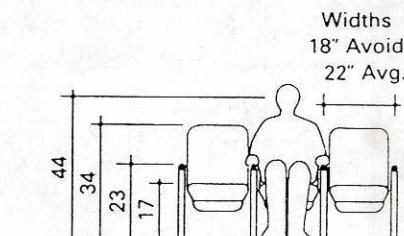Fig. 1   Operational clearances. [Note: For safe working conditions an allowance of 75 to 125 square feet per person is required (including machinery) in woodworking according to type of activity in progress.] Width/length ratio of work area: minimum 1/1, maximum 1/2. Minimum width of general work area: 30 feet. Minimum ceiling height: 12 feet.

## Process

## Activities

This branch of the program covers the use of materials and techniques to produce three-dimensional objects, figures, or construction in the round or half round. Processes in sculpture involve clay modeling, wood carving, stone cutting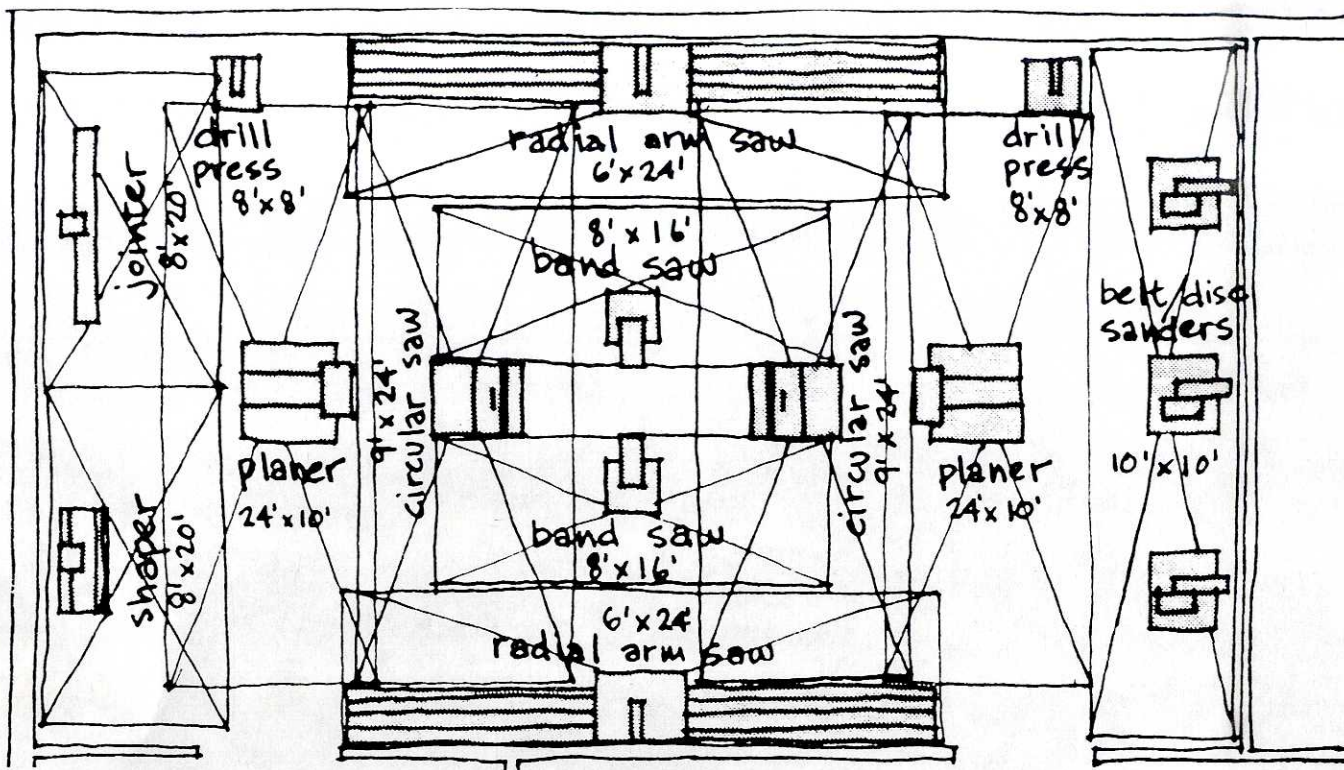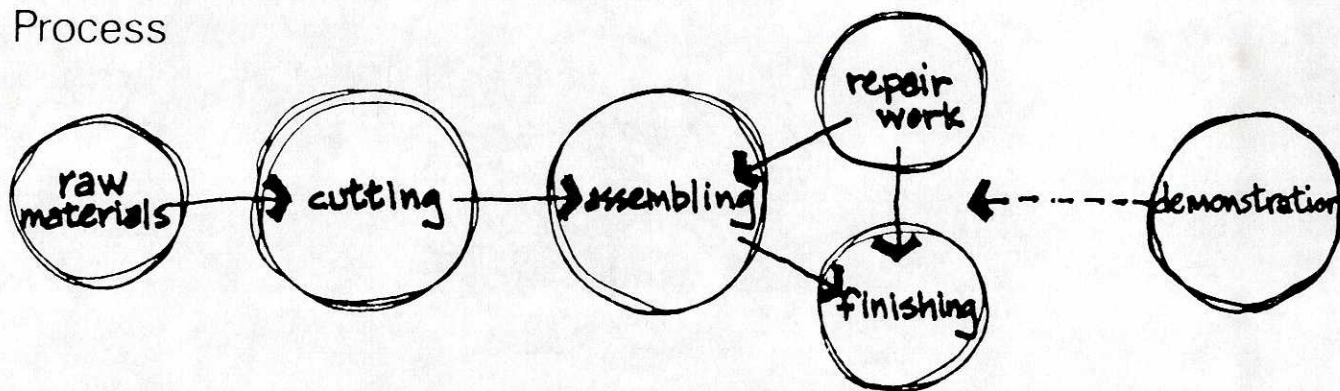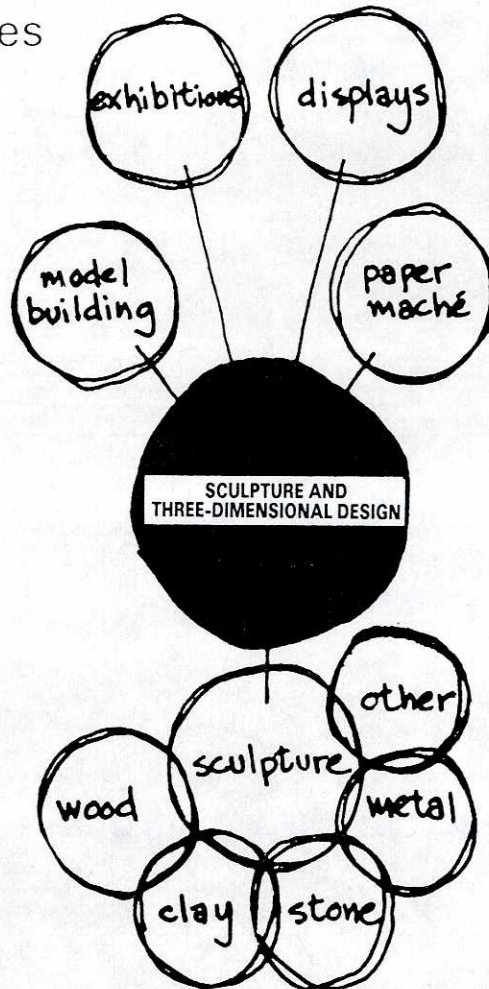, plastic work, metal casting and welding. Model building, paper mache work, displays and exhibition properties and interior decoration are additional activities within this category.

Many activities will take place in the general arts and crafts area without special modifications. Projects such as clay sculpture, welding, or wood-carving can utilize the same areas provided for pottery, art metal, woodwork, and outdoor projects. Large exhibition work requires unobstructed space.

Major items include floor and table sculpture stands, several sets of hand chisels, portable electric chisels, grinding and buffer arbor, welding equipment and a heavy anvil. Workbenches and stools already provided in the general arts and crafts area are adequate for most projects. Woodworking power tools, kilns and furnaces used in other activities can be shared.

# Activities



Diagram showing circles: exhibitions, displays, model building, paper maché connected to central node SCULPTURE AND THREE-DIMENSIONAL DESIGN, with sculpture, other, wood, metal, clay, stone below.

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