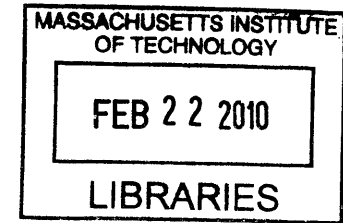


LIGHTS, CAMERA, EMERGENCY:
preemptive planning for disaster relief

by Erica A. Weiss
Bachelor of Arts in Architecture
University of Pennsylvania



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

MASTER OF ARCHITECTURE
at the MASSACHUSETTS INSTITUTE OF TECHNOLOGY

ARCHIVES

February 2010

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ABSTRACT

With increasing frequency and accuracy, the prediction of natural disasters and their effects are being charted. Their impendence is a certainty and yet we ignore the warnings, the lessons of the past, and the prominence of the future and do nothing to prepare for them. We respond with hurriedness, seeking to fulfill a need only once it has become a crisis. With each disaster time erases our memories and we stand unprepared for the future. Simultaneously, we sensationalize the trauma with imitations of it. Movies, books, newspapers all seek to retell the story of disaster in a more emotional manner. We remain captivated by the stories of triumph and loss. This thesis seeks to find an architectural solution to disaster preparedness, one that is in place long before the crisis, one that exists as an entity in its own right. What is it that a city needs both before and after disaster? Is it a place of refuge? Or organization? Urban environments cannot simply reserve space for disaster, instead this infrastructure should be in place and act as an asset to the land. The film industry has been growing rapidly in Louisiana, using its temperate climate and unique landscape to its benefit. This thesis proposes a new movie studio, with its technology, open spaces, and variable image transforming into the epicenter of disaster recovery: place of serenity and organization in the midst of great loss and sensationalism.

Thesis Supervisor: Adèle Naudé Santos
Title: Dean of the School of Architecture and Planning





ACKNOWLEDGEMENTS

To Adele, for being incredibly gracious with your time, knowledge and advice. Thank you so much.

To Mark, for signing on, and seeing me through to the otherside.

To Nader for “showing up for me” and asking the questions no one else did.

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To Chai, Anne, Mishayla, Haruka, Janna, Wayne and Travis, for being exactly the right kind of help at exactly the right time.

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To Eric, who’s absence made me ever more present.

To Isabel, for reminding me that life is constantly getting better.

To Mom, Mark, and Sitah, for listening even when I had nothing good to say and for loving me more with each complaint.





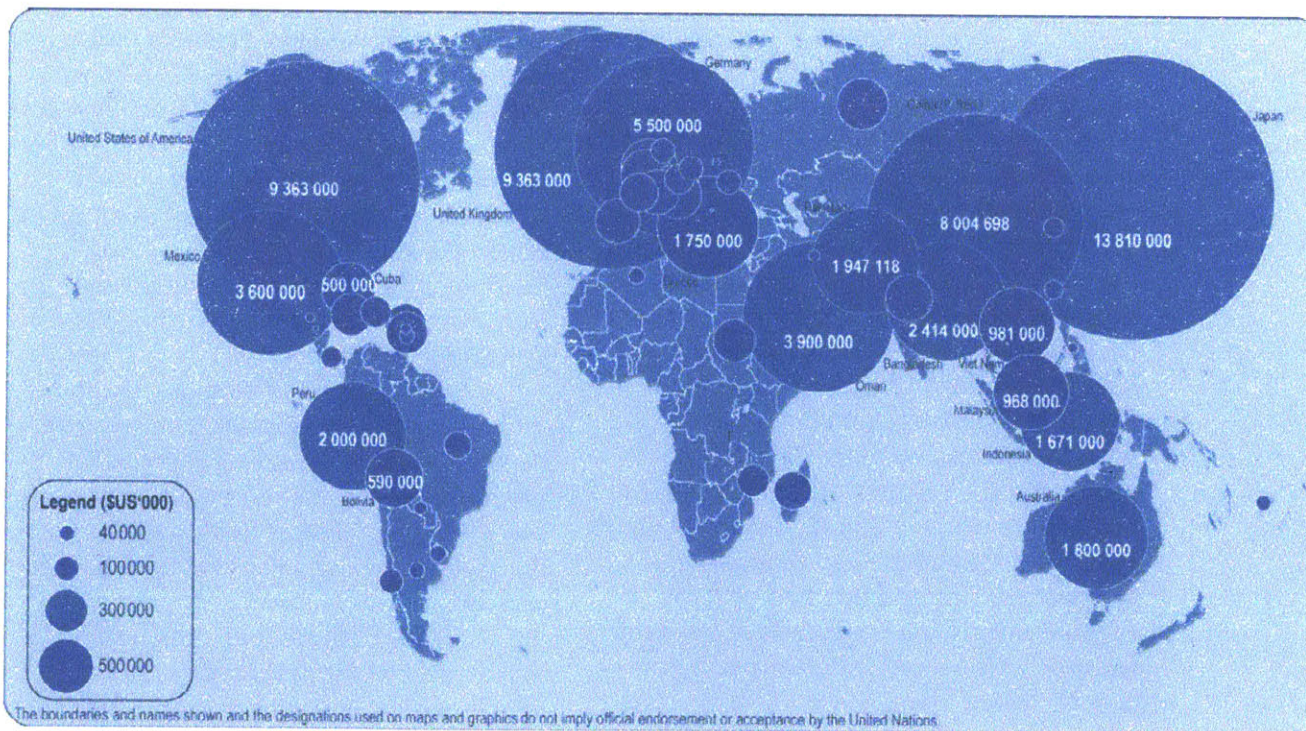
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PREMISE

“Lessons observed-- actions repeated, is the story of our nation’s collective failure to learn from previous disasters.”
Eric Holdeman, Disaster Expert

Natural Disaster Reported Damages in 2007



Natural disasters are a global phenomenon. No where in the world is safe from environmental disaster. In the United State's role as a world leader, it is distressing to have watched our own citizens flail their arms in need and have their calls gone unanswered during recent crises. Therefore, this project is sited domestically. We must learn to solve the problems of our own nation before we can reasonably aid others.

In 2005, Hurricanes Katrina and Rita reeked havoc on the Gulf Coast. The damage from this storm reached from Houston on to Tallahassee and spread north along the Mississippi River. In the four years since the hurricanes, \$81.2 billion in damages have been assessed making it the costliest hurricane in the history of the United States—more than double its runner up. According to the Federal Emergency Management Agency (FEMA) the Orleans Parish of Louisiana, containing the city of New Orleans, has more than 15,000 projects in the system and has funded over \$2.3 billion worth of grants—many of which have yet to be completed. New Orleans is an area still attempting to recover from its first tragedy, but constantly at risk and waiting for the next. If the infrastructure is put in place, now, before the next crisis, perhaps its consequences can be softened.

In Louisiana, disaster has always been imminent. With proximity to two major sources of water the response to

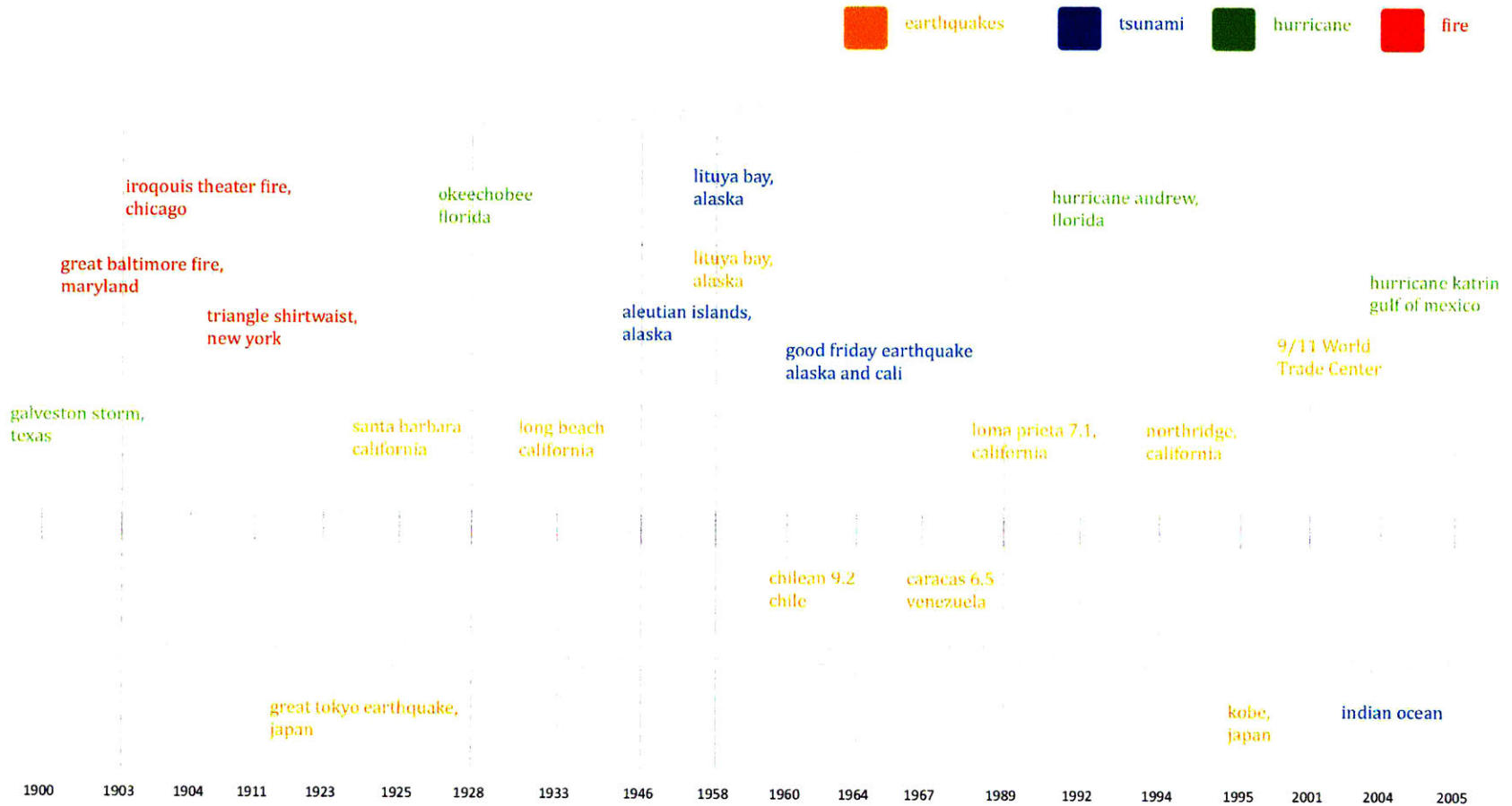
hurricanes and flooding has become dulled, a natural part of the cycle of each year. As people become numb to the effects of crisis, their responses also wane prompting the need for innate action and local facilities.

The project is sited in Baton Rouge, 83 miles from downtown New Orleans, free from the storm surges of Lake Pontchartrain and posed on high ground, but still bordered by levees along the Mississippi River. As the capital of Louisiana, Baton Rouge is the second largest city in the state and also a major industrial and petrochemical hub. The port of Baton Rouge is a major economic player and the 9th largest, in terms of volume, in the United States. Just north of downtown, across the lake from the state capital building is an open plot of land bordering a growing residential neighborhood and a struggling industrial area.

Organization of a response can be broken down into a careful timeline. What happens within 24 hours, 48 hours, 72 hours, one week, one month and even one year? Which problems float to the top of the urgent care list: infrastructure, health care, education, shelter?

Many of these "emergencies" require architectural solutions, rather than formulaic or financial ones. But what if the solution wasn't a direct result of the emergency? The emergency can act as a catalyst for the transformation of an

α history of disasters



existing building.

Cities have a history of destruction and rebirth. It is often said that with great disaster comes great revolution. It is naïve to think that many of the cities we already know will not suffer great losses in the future. It is even more naïve to think that we cannot plan for that loss now. Within the United States alone, San Francisco, Los Angeles, New York, and even St. Louis are waiting for the next great natural disaster to hit and follow in the footsteps of New Orleans—a city whose fate was widely predicted and still unplanned for.

Natural disasters have been prompting architectural reform for over a century. Some of the major disasters with influence on the construction and building industry are listed above displaying some trends of the changing natural disasters over time. Problems are highlighted in the United States because of the most changes are being made there-- and yet they still have the most problems.

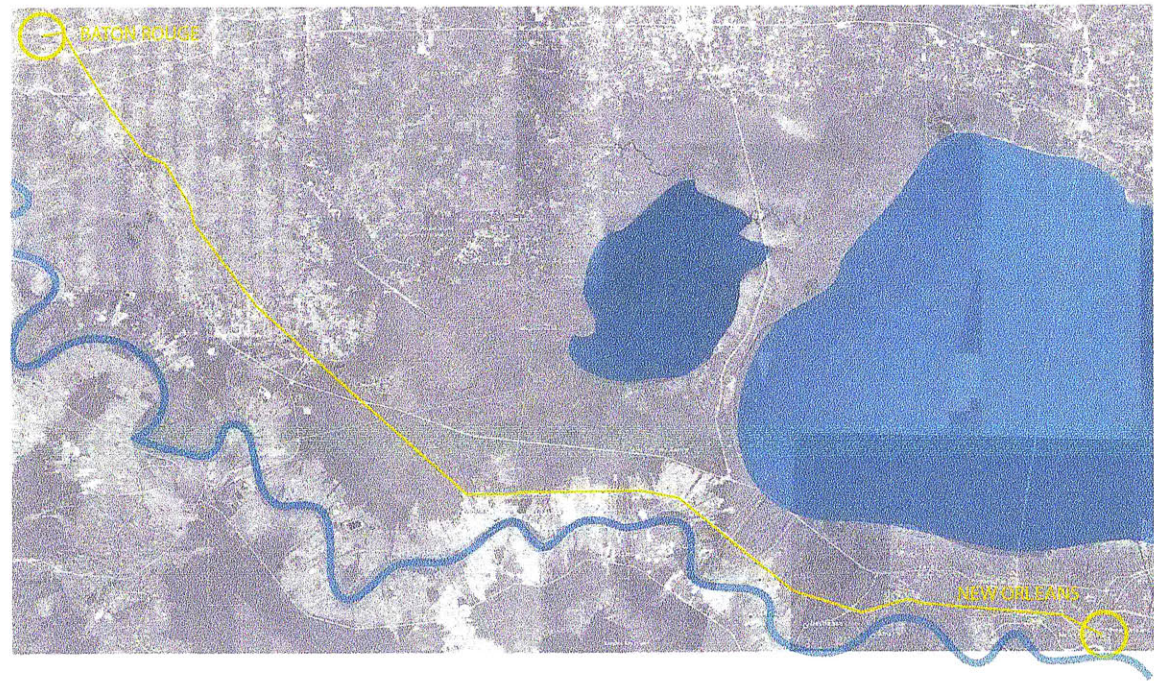
The project is developed to prosper in three distinct phases. First, its present day life: the film studio is set to be a foundation of its neighborhood, at least economically. Louisiana has grown to be 3rd in film and television production, just behind New York and California. The tax incentive program that began in 2002 has contributed to a 400 percent increase in skilled crew members. In 2008, more than \$800 million in production budgets went

through Louisiana setting a new record. This is a field growing rapidly and steadily in the state, one that can use nurturing to continue its growth in a state where population has been decreasing steadily.

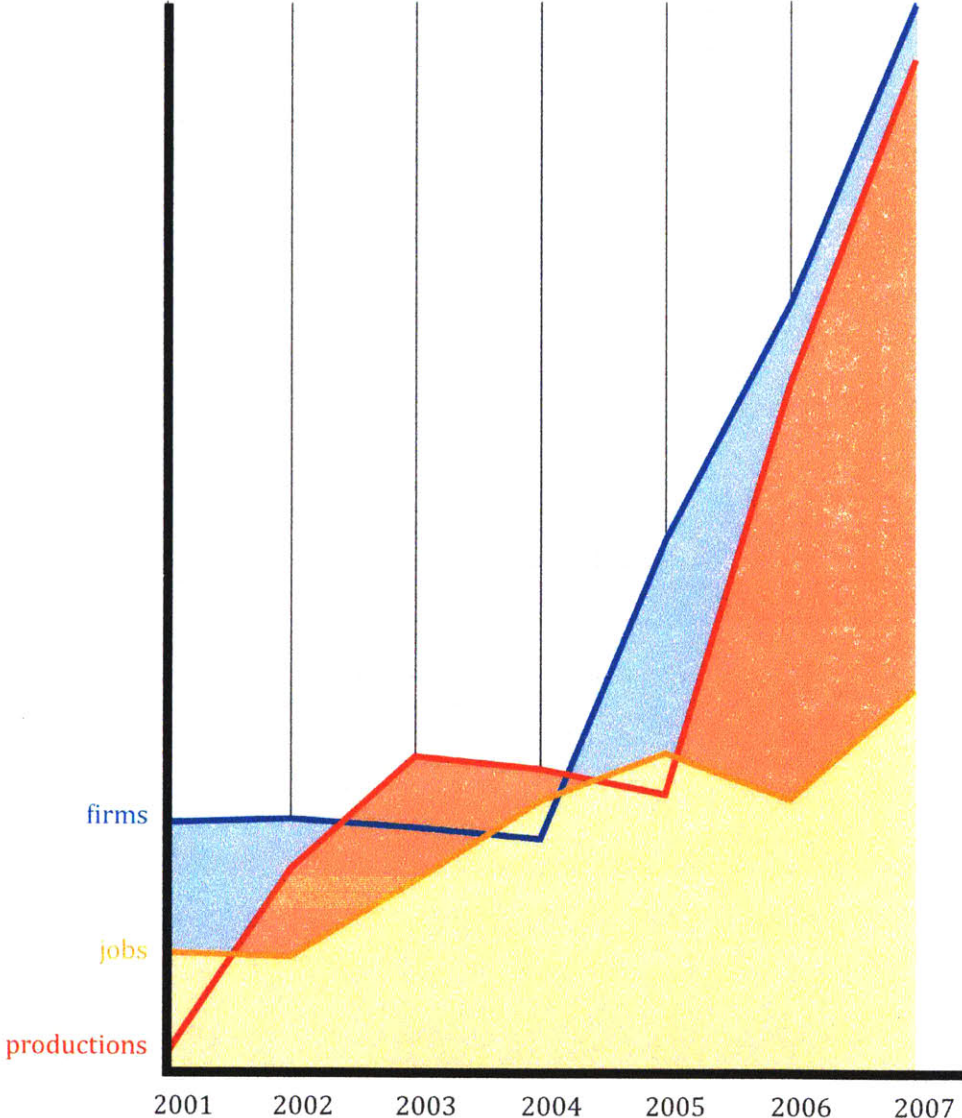
Second, its future role in emergency, as a place of refuge during disaster: people should know that this is the place to go when things go wrong. It will quickly transition from its present day function to its role as a response center. With the open, flexible forms maintained in a film production studio, conversion is well planned and accessible. Storage is another component that can easily be built into the

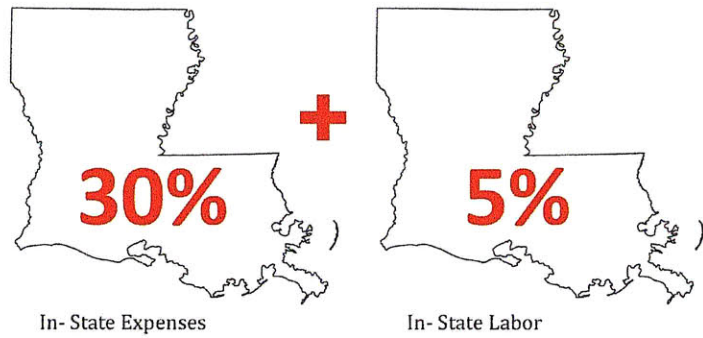
square footage required for this type of program.

Third, its post apocalyptic program: the building stands as a beacon of the neighborhood—capable in times of respite and times of need. While the economy restores itself slowly, the remainder of the site continues to provide aid, participating in the recovery process by housing up to 2,200 people.



Film Industry Growth, Louisiana

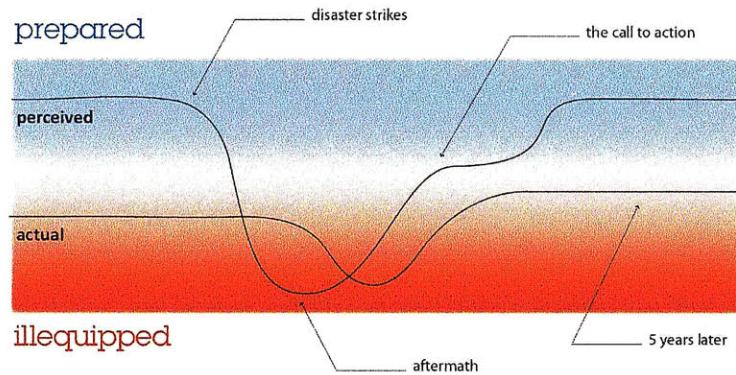




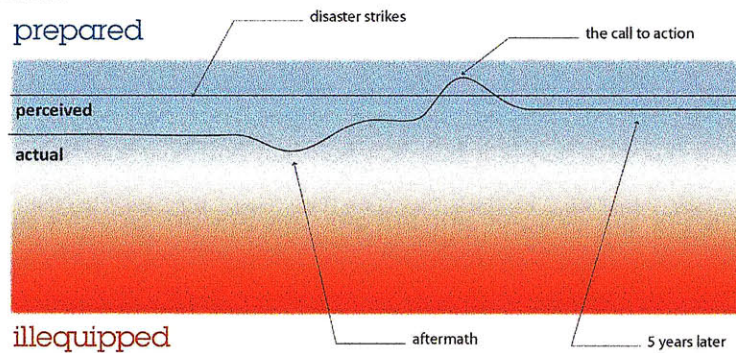
Any feature-length film, video, television series or commercial spending at least \$300,000 in Louisiana can receive a 30% investor tax credit on their total in-state expenditures. PLUS, an additional 5% labor tax credit can be given for the hiring of Louisiana residents. These tax credits are fully-transferable, and there is no cap on the amount that can be received.

Louisiana also offers a refundable tax credit of 25% on music and sound recording, as well as up to 25% tax credit against in-state expenditures for digital media.

history

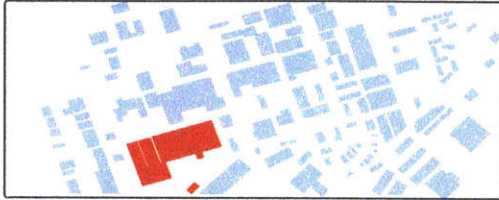


desired future



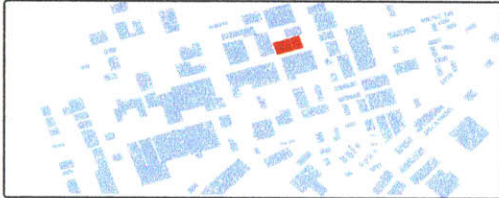
SITE AND PROGRAM

Nims Center, New Orleans, LA



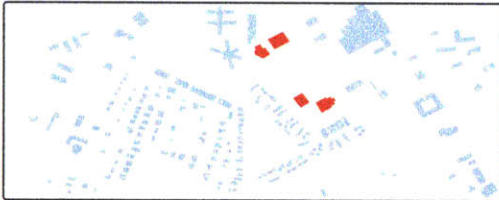
Total Square Footage	100,000
Ceiling Height	23'-31'
Number of Buildings	2
Office Space	6,000
Stage Space	
square footage	36,700
quantity	3

Louisiana Film Studios, New Orleans, LA



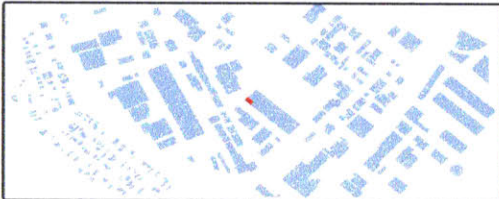
Total Square Footage	500,000
Ceiling Height	unknown
Number of Buildings	1
Office Space	100,000
Stage Space	
square footage	150,000
quantity	6

Celtic Media Center, Baton Rouge, LA



Total Square Footage	112,000
Ceiling Height	19'-70'
Number of Buildings	5
Office Space	45,000
Stage Space	
square footage	68,000
quantity	4

Beven Street Stuios, LLC, Harahan, LA



Total Square Footage	107,000
Ceiling Height	30'
Number of Buildings	1
Office Space	6,000
Stage Space	
square footage	101,000
quantity	4













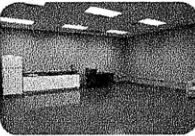

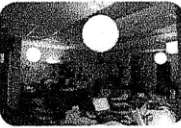


Sony Picture Studios, Culver City, CA



Total Square Footage	700,000+
Ceiling Height	28'- 80'
Number of Buildings	50+
Office Space	6,000
Stage Space	
square footage	340,000
quantity	17

At left are the building densities in four of the production studios in the state of Louisiana. The final map is the figure ground of Sony Pictures Studios in Culver City, California, just outside of Los Angeles. All diagrams are at the same scale. While Louisiana's movies studios are growing, they have yet to take on the scale of their west coast counterparts. Additionally, the Louisiana studios can meet neither the total square footage nor the excess of amenities offered at even a single Los Angeles studio.

film studio typology

	Sound Stage	Costume and Dressing Rooms	Construction Workshop	Kitchen/ Catering	Post-Production Sound Stage	Screening Room	Production Offices	Hair and Make-Up	Green Screen Stage
Square Footage	4,500-45,000	1,000-10,000	5,000-20,000	2,000-10,000	200- 500	500-5,000	5,000 - 25,000	200-2,000	1,000+
Capacity	Very High	Medium	High	High	Low	Medium	Low	Low	Medium
Duration of Use	Temporary	Moderate	Continuous	Temporary	Moderate	Temporary	Extended	Extended	Temporary
Special Requirements	Sound proofing Electrical Truck access	None	Open span Electrical Access	Full kitchen Open seating	Ultra sound proofing Special flooring	Max seating Special lighting	None	None	Height
Photos									
									

Americans have been basking in the entertainment of disaster since before the 1970's. For as long as we have been able to represent the story, we have been drawn to the theaters to watch in awe as fires raged, cities fell, and disasters we could only dream of invaded our planet. The

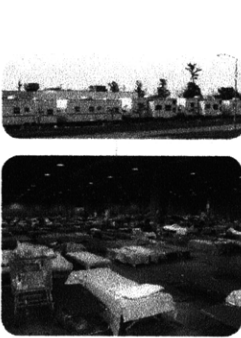








film industry is inexplicably linked to our greatest fears and our heroes. Isn't it finally time they gave something back?

The hybrid building type proposed in this project enables the industry itself to become a part of the story, rather than its backdrop. The open spaces and cyclic

nature of the film production studio allows for alternative program to be instituted in its place.

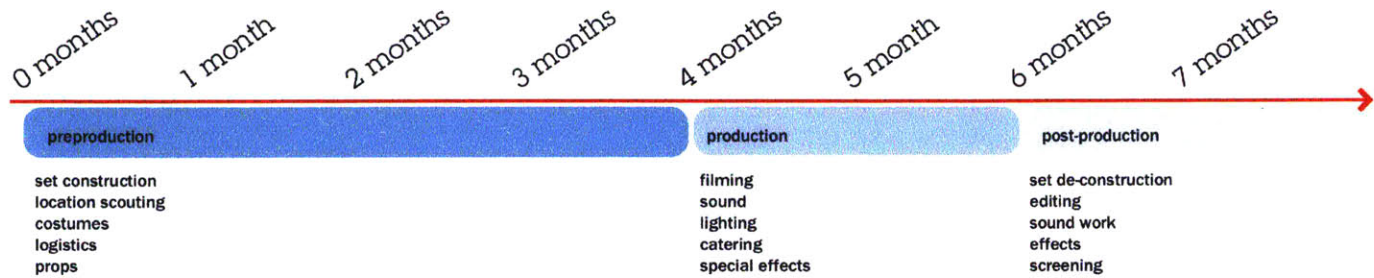
The technical requirements within the sound stages and the varied scale of programming in a studio require systems within those buildings which can be

disaster relief typology

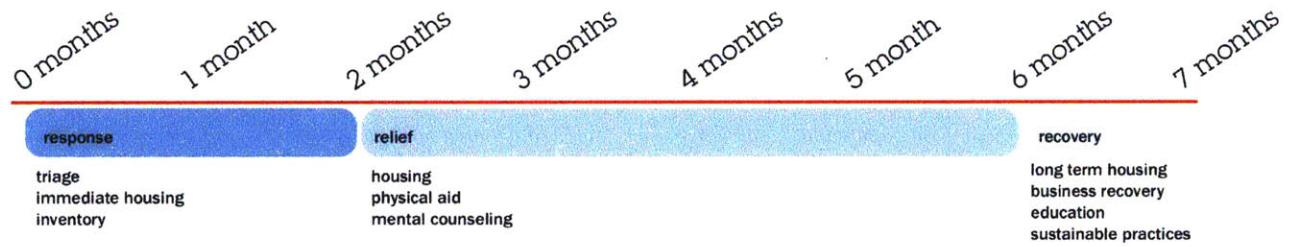
	Housing	Cafeteria	Offices	Recreation	Volunteer Coordination	Health and Aid	Counseling Services	Child Care Facility	Storage
Square Footage	4,500-45,000	2,000-10,000	25,000-70,000	5,000	500-2,000	5,000	500-2,500	2,000-6,000	1,000-8,000
Capacity	Very High	High	High	Medium	High	High	Low	Low	High
Duration of Use	Extra-Extended	Temporary	Extended	Temporary	Moderate	Temporary	Extended	Extended	Permanent
Special Requirements	Privacy Security	Kitchen amenities	None	None	Flexible use space	Electrical	Privacy	Safety Security	Underground Weatherproof
Photos									

exploited by other industries. While the scale and duration of habitation is quite different for a disaster response center, large scale infrastructure could prepare the site for the possibility of transition.

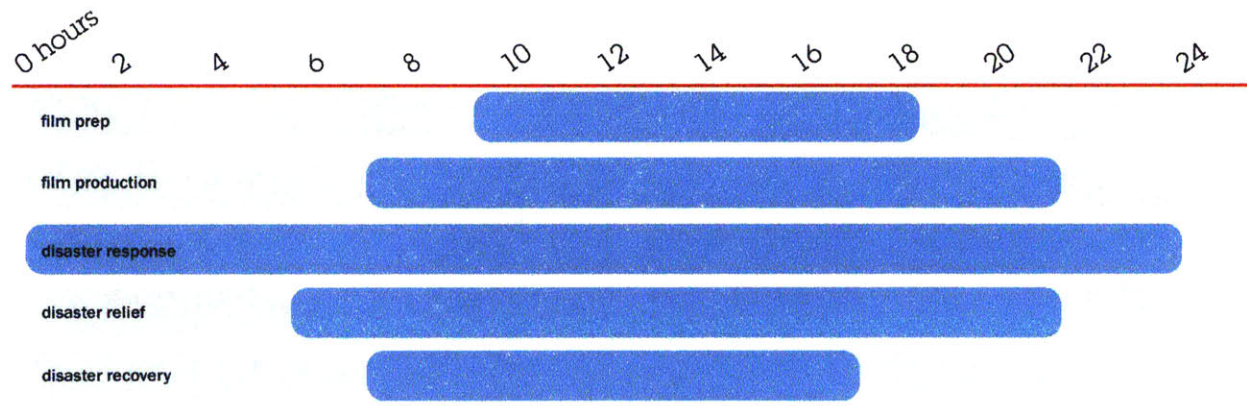
film
timeline



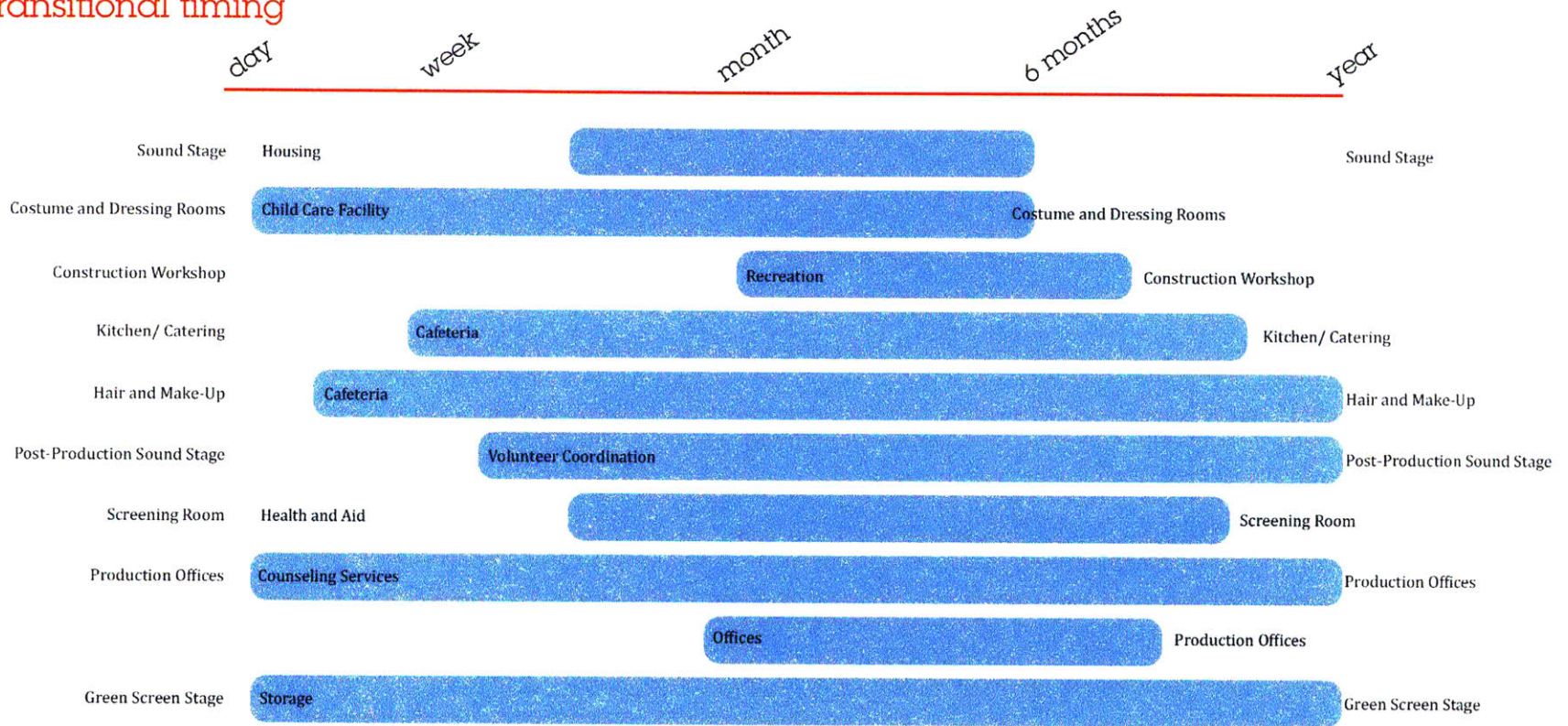
disaster
timeline



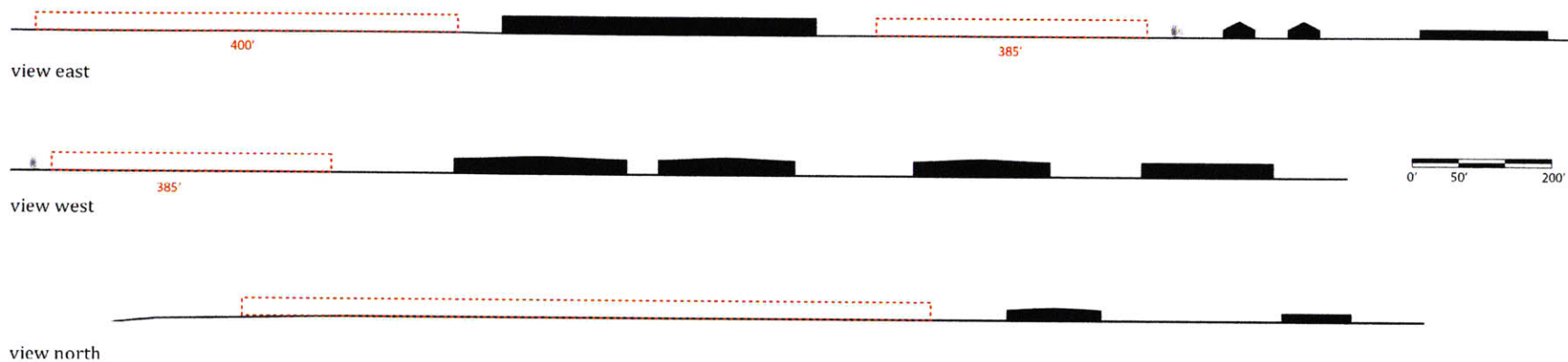
daily use



transitional timing







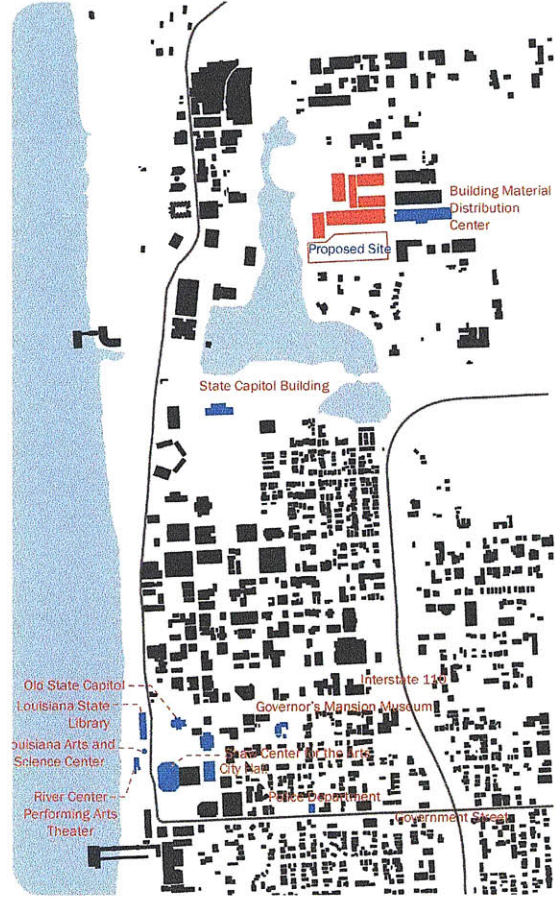
Sandwiched between a series of large, low industrial buildings and a growing residential neighborhood, the site covers over 400,000 square feet of flat barren land adjacent to Capital Lake. Given the the opportunity, the buildings to the north of the site cheaply constructed and not worth saving. The exaggerated scale of these buildings, especially when juxtaposed to a series of ranch style houses, makes this a sensible location for a series of mixed use and mixed scale buildings. The access to a waterfront and main roads also makes this an ideal place for the community to meet- reinforcing the “hub-like” atmosphere a disaster relief center needs to take on.

Dealing with disasters spans a significant amount of time. Breaking the time down creates three specific categories: response, relief, and recovery. Each phases lasts a different amount of time and has a specific set of standards. The response phase lasts no more than four days and deals with the largest influx of people. The standards are low, as people are mostly looking for shelter and informations. Expectations are raised in the relief phase which follows for a few months. Access to daylight, air, and privacy all become more of an issue. Finally, in the recovery phases, only those truly in need of shelter remain and the site begins to return to its daily activities.

The local population of Baton Rouge is about 220,000. This relief center accommodates approximately 5% of that population at the peak of disaster response.. An individual needs about 38 sqft for their sleeping area, circulation, and belongings with families and people with special needs increasing the space and raising the total square footage required to accommodate people.

city context

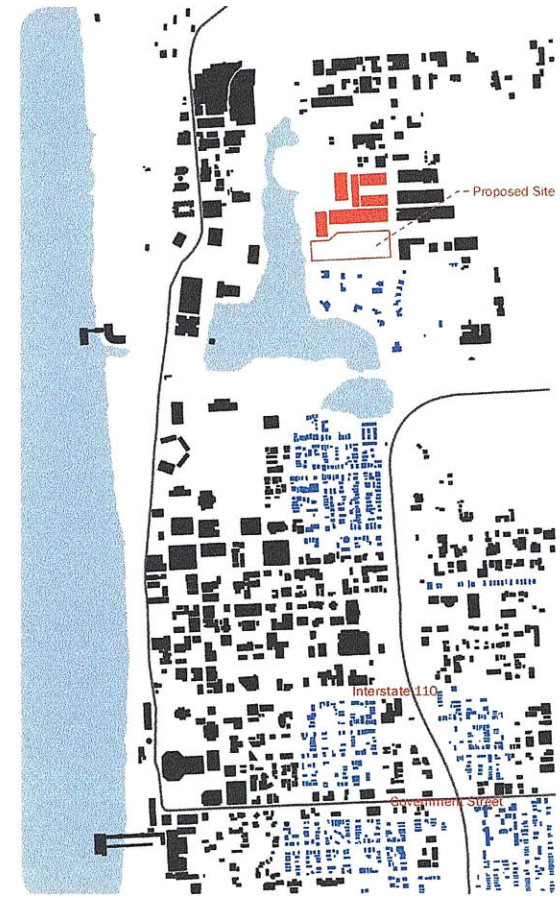
Baton Rouge Highlights



Proximities and Distances

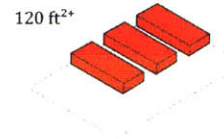
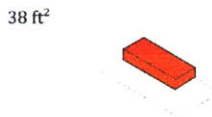
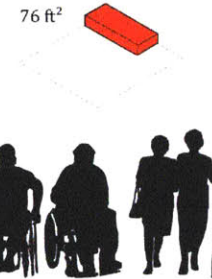
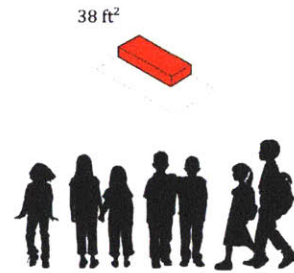


Housing Neighbors

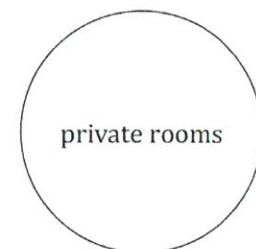
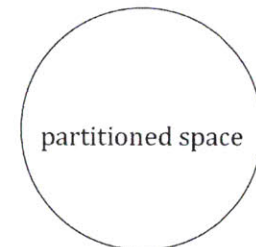
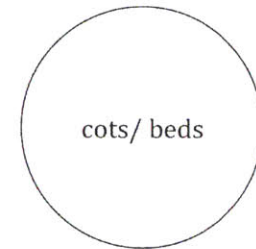


housing the masses

phases



types



assessing spatial needs

75" x 26" x 5"
= 5.64 ft³

x 8,800 = 37,239 ft³
people in need of immediate beds

x 11,000 = 3,190 ft³
people

.29 ft³ per person per week

min. 10 gallons per person per day
= 1.34 ft³

x 11,000 = 14,740 ft³
people

= 55,000
storage space based on essential needs

toilets for 10,000

x 10 1,450 sqft

14.5 sqft

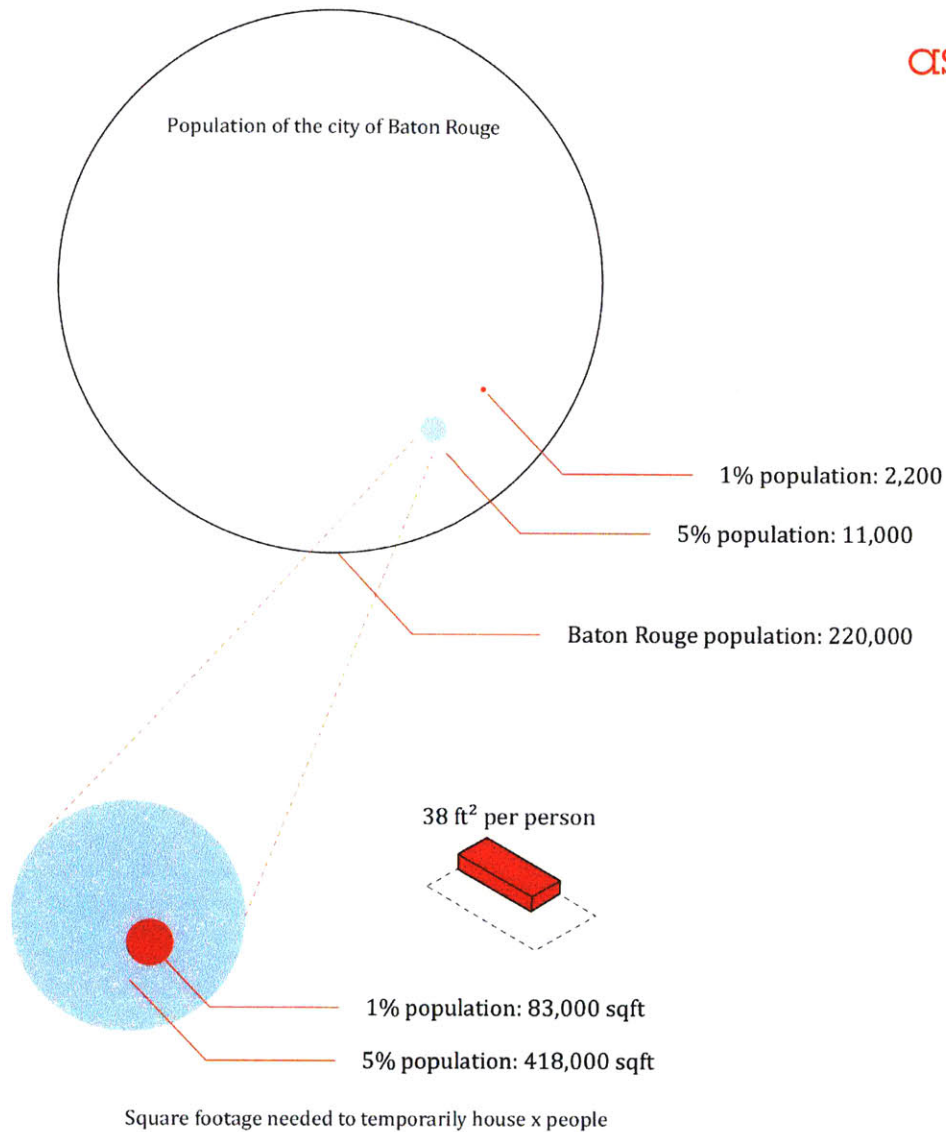
x 10 2,050 sqft

205 sqft
7 toilets and 2 urinals

x 100 <1,000 sqft



assessing the masses

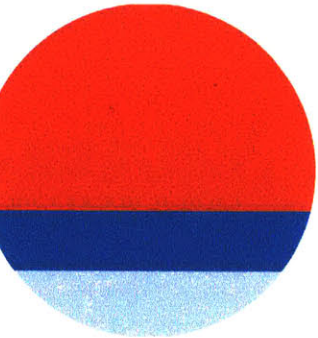


People to Accommodate

6,600 cots

2,200 partitioned
2,200 private

response



11,000

2,200 partitioned
2,200 private

relief

4,400



2,200 private






















recovery

2,200




present throughout the life of the project

program square footages

		Less 20%			
	Sound Stage	100,000	20,000	80,000	
	Housing	80,000		80,000	Housing 
	Costume and Dressing Rooms	5,000		5,000	Child Care Facility 
	Construction Workshop	12,000	6,000 (50%)	6,000	Recreation 
	Kitchen/ Catering	2,000		2,500	Cafeteria 
	Hair and Make-Up	500			
	Post-Production Sound Stage	1,000	200	800	Volunteer Coordination 
	Screening Room	1,600		1,600	Health and Aid 
	Production Offices	30,000	6,000	14,000	Counseling Services 
				10,000	Offices 
	Green Screen Stage	1,000		1,000	Storage 
	Storage	40,000		40,000	Storage 
	Total	275,000	32,000	243,000	Total

accomodating 11,000 people

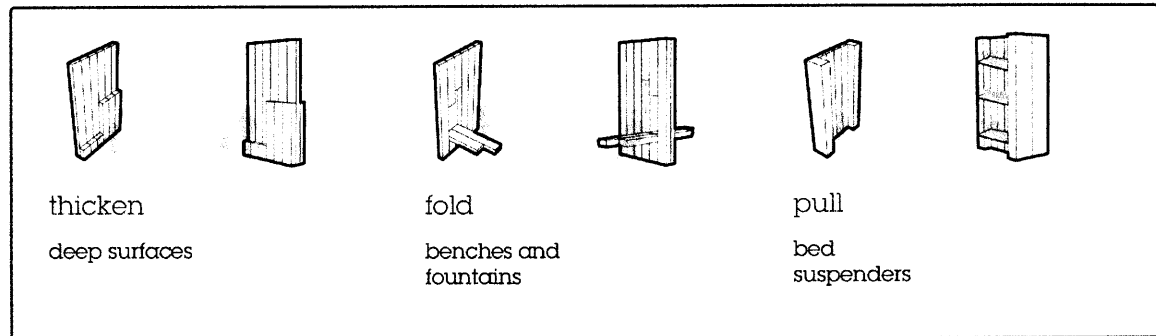
 = 30 people

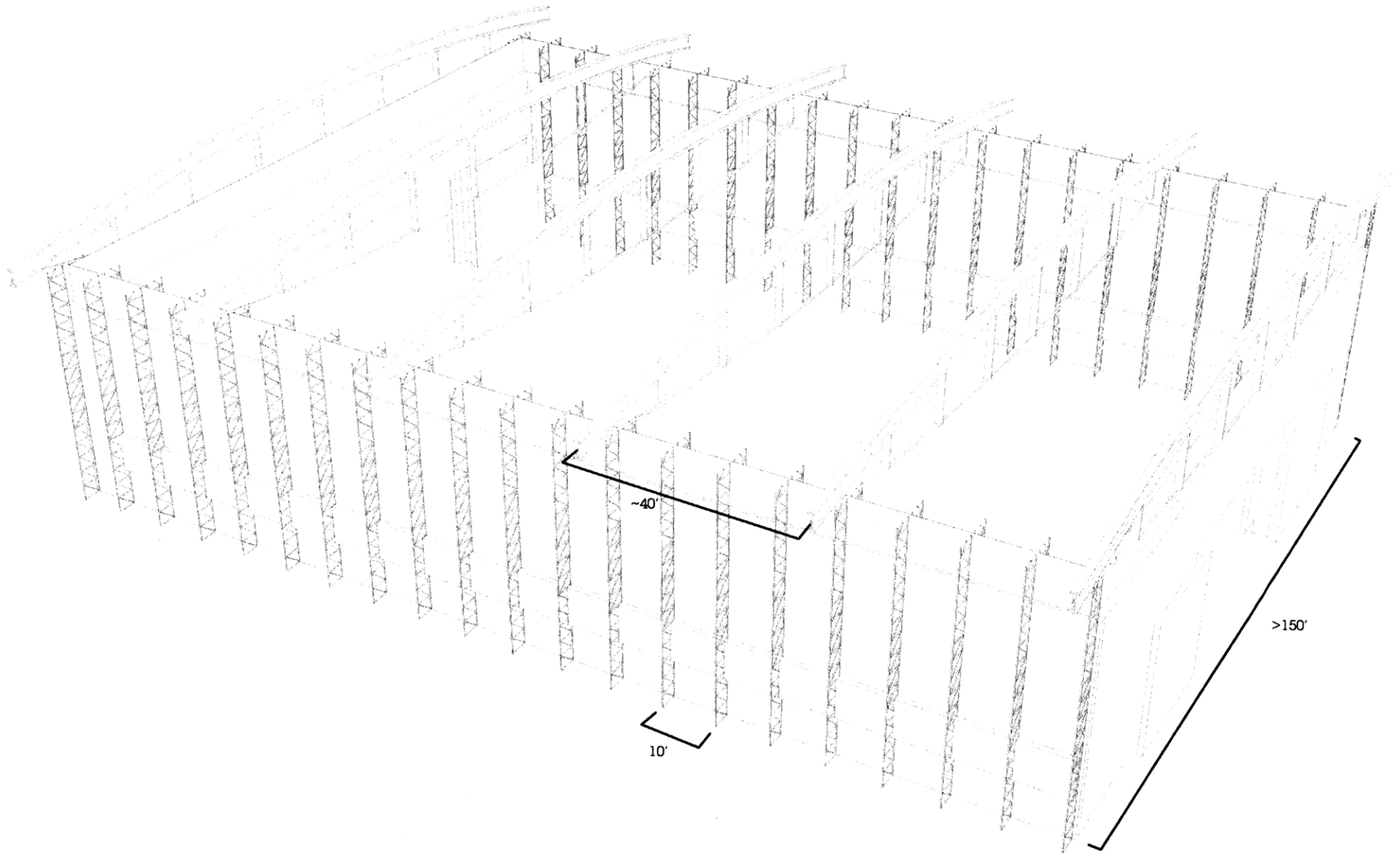
FINAL DESIGN

THICK WALLS: as adaptors

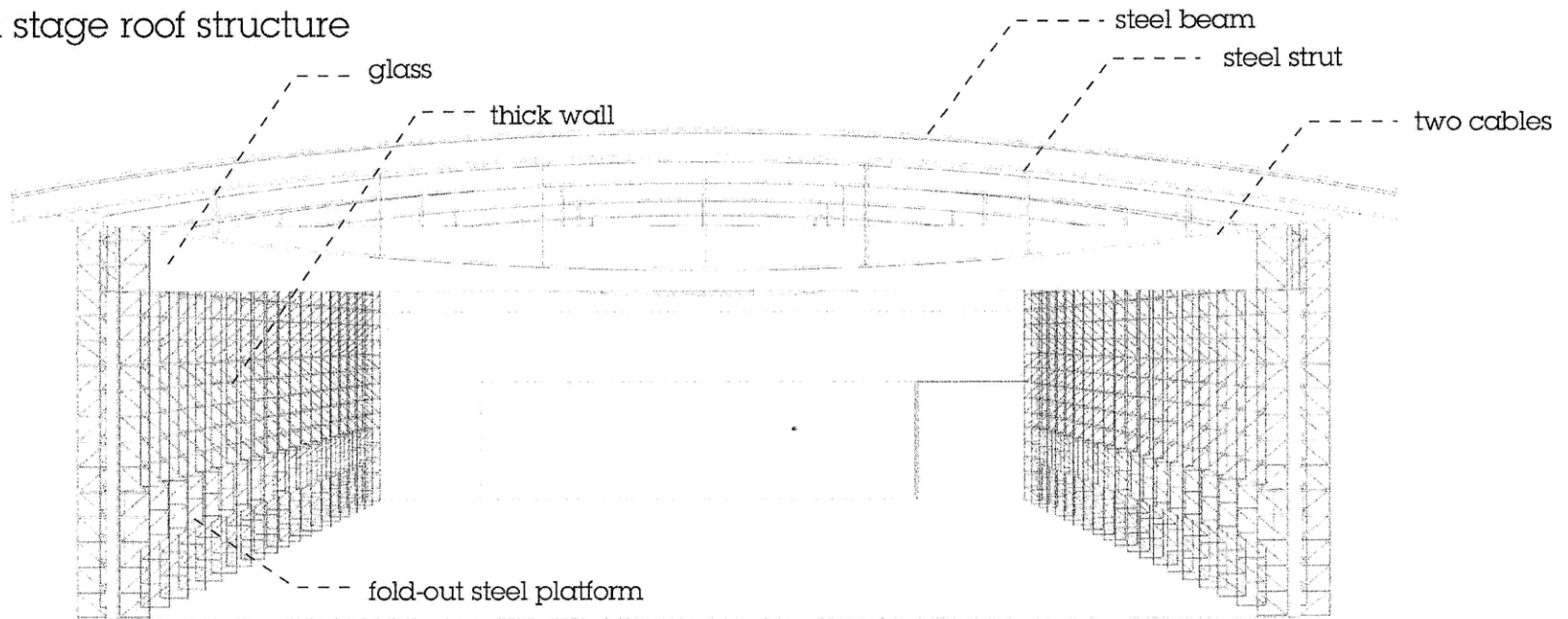
Sound stages are traditionally represented as closed, big boxes. This makes for large energy intensive buildings which are used under these conditions for only 15% of the time. The other 85% of the time sound stages have the potential to be used in more energy efficient ways. By allowing light and air into the building, the comfort levels of the space are able to accommodate not only typical day-to-day activities but also allow it to be used as post-disaster housing.

Exaggerating the acoustical needs of the sound stages thickens the walls to over two feet. Additional vertical structural elements placed every ten feet serve two purposes. First, they create a permanent structure upon which to orient lights and provide attachment points for building sets. Second, they house the folding platforms which create an upper level of bedding in disaster, increasing the capacity of each building with a thick wall by almost 30%. The thick walls contain extra structure on both the interior and exterior creating an upper sleeping tier both indoors and out.

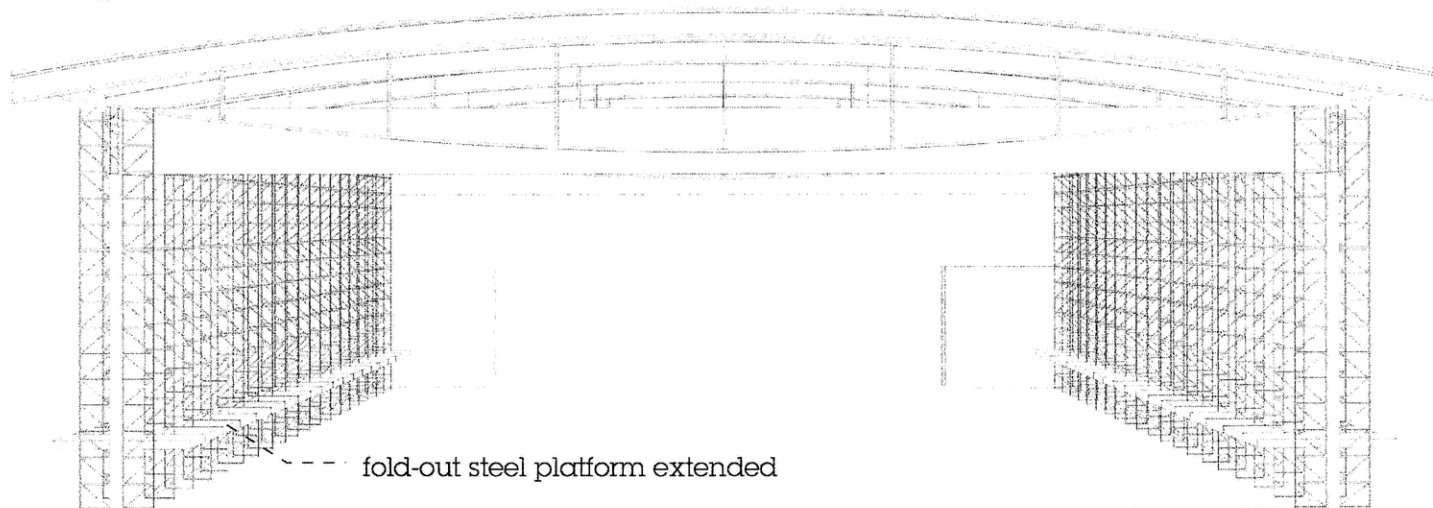




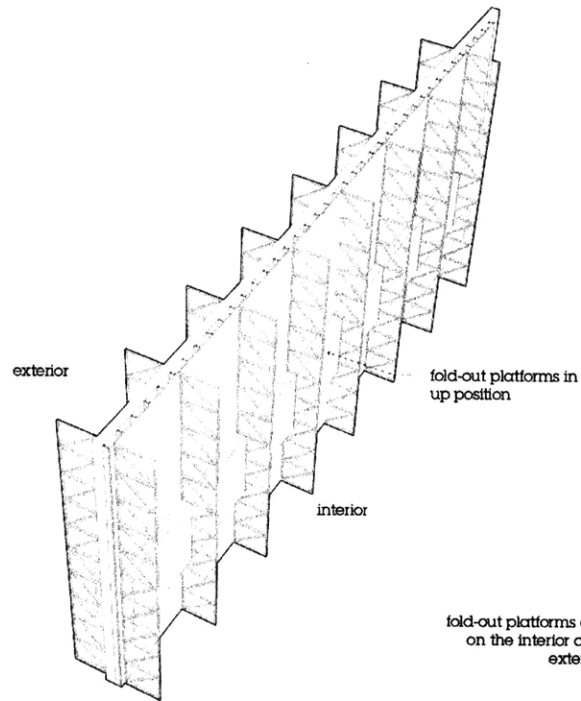
sound stage roof structure



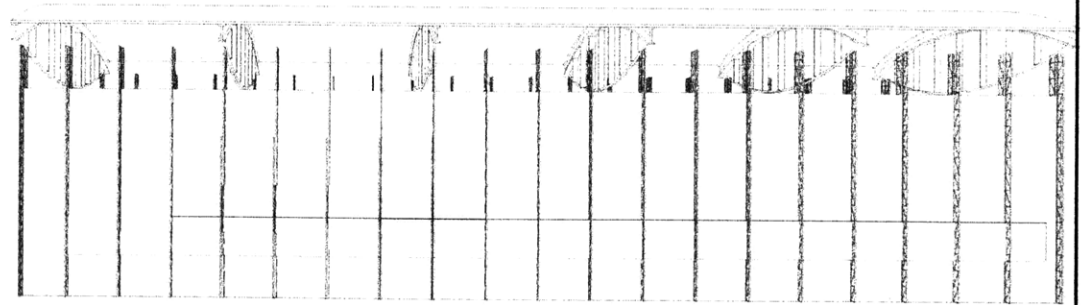
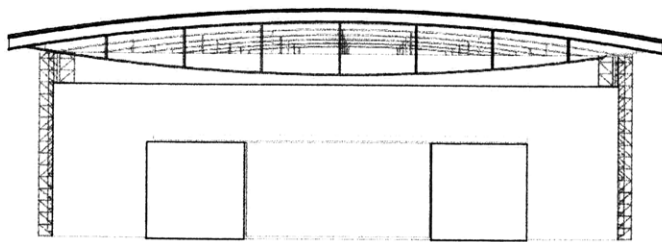
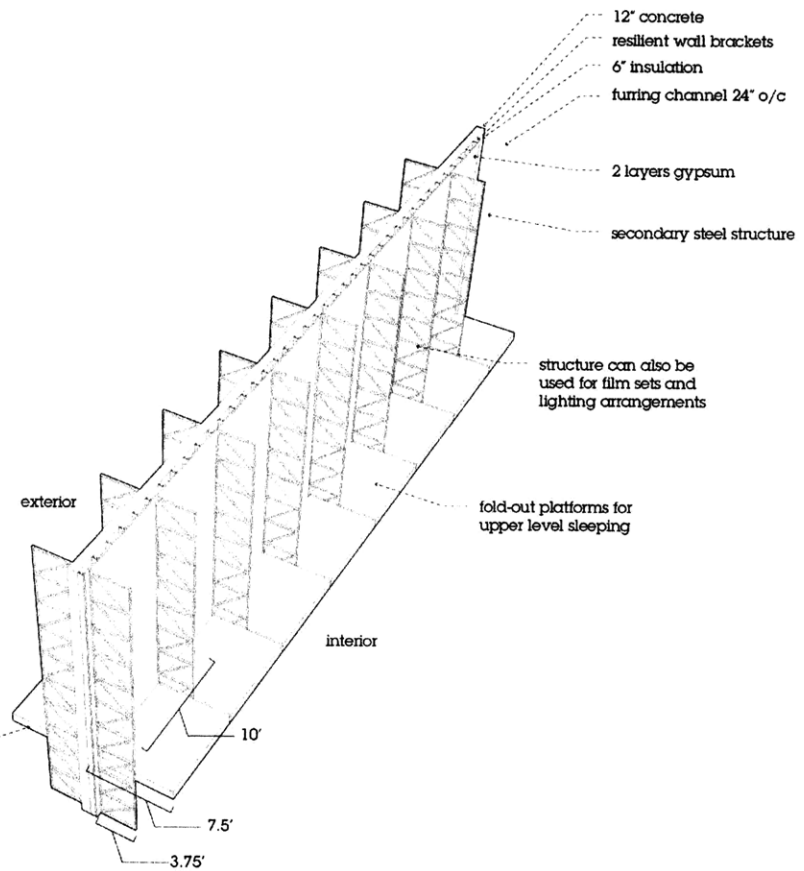
with bedding walls extended



thick wall details

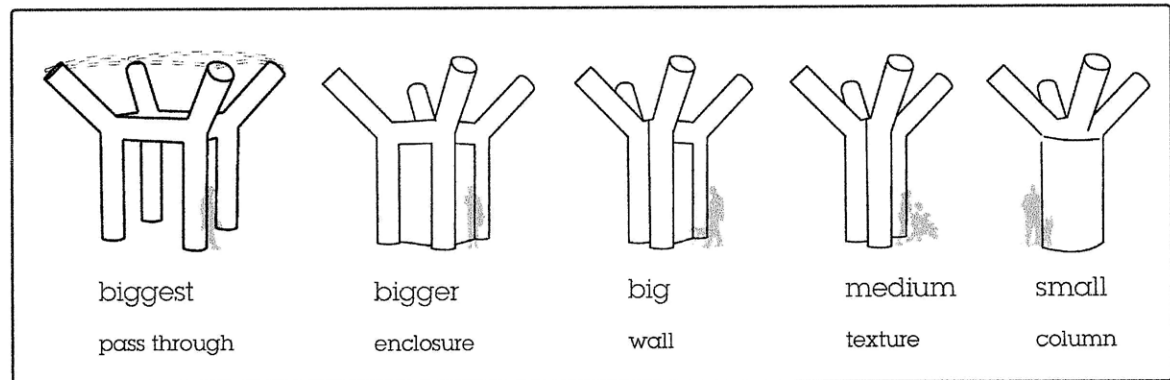


fold-out platforms are on the interior and exterior

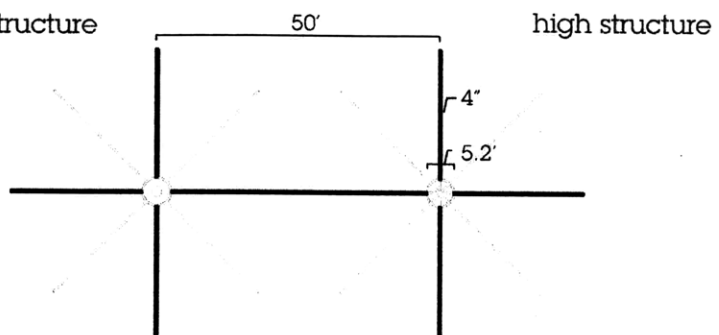


COLUMNS: as active structure

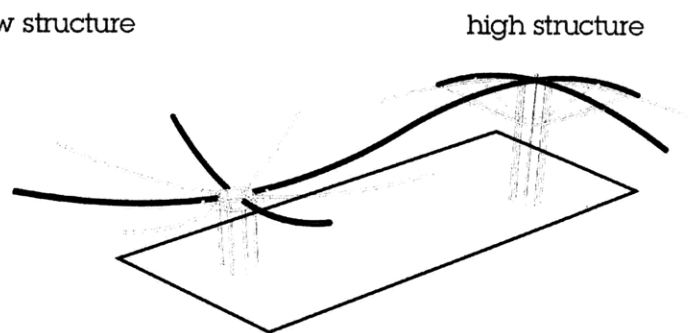
The columns and roof framing are a permanent intervention in the site. They serve to mediate the scale of the site down to a more human level-- the large sound stage buildings and the 1400'+ length of the site would otherwise be overwhelming to an individual entering the space. Each "column" is composed of eight individual columns radiating in a 5'4" circle. The insides of these columns contain either liquid or media facilities. The liquid poles, limited to the lower columns (which serve as drainage when the entire roof is closed), contain sources of water such as drinking fountains and outdoor showers. The media poles, located at some of the taller poles, act as a place of information: internet, television, announcements, and a bulletin board. Sinusoidal curves occur in two directions across the column grid. The pattern formed by this arrangement is enclosed, in three ways. First, some areas are covered permanently. In these cases, the roofing cannot be removed. Second, some areas are frequently covered for events and outdoor gatherings. These panels have a snap-in system which can be attached and removed frequently. Finally, the tarp systems covers the remainder of the structure to form a full outdoor roof.



low structure



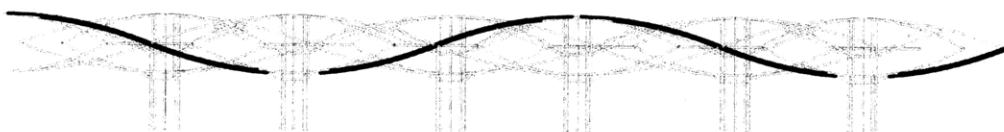
low structure



structure profile



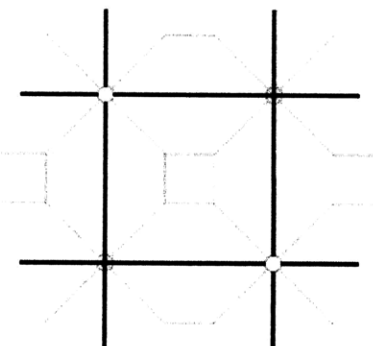
structure profile



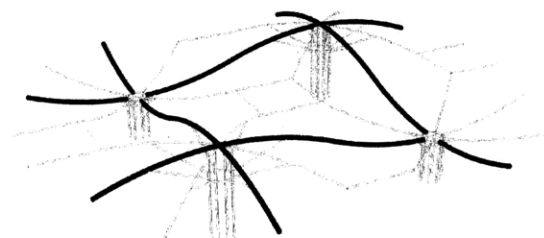
structure profile adorned



main elements



emphasis of the sine curve

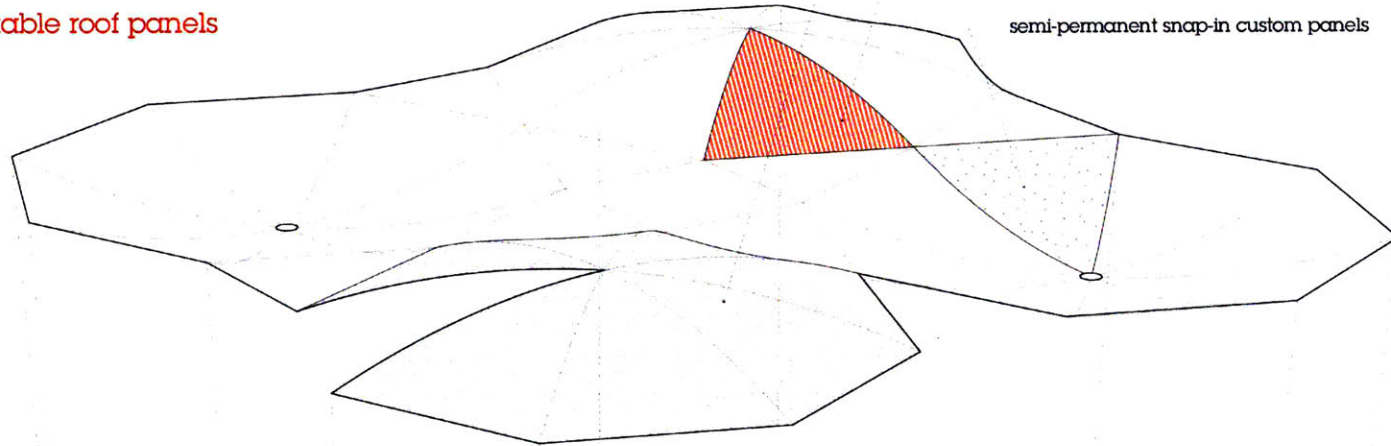


adjustable roof panels

temporary rollout-tie down canvas

permanent polycarbonate panel

semi-permanent snap-in custom panels



media pole

television

phone and internet

bulletin board

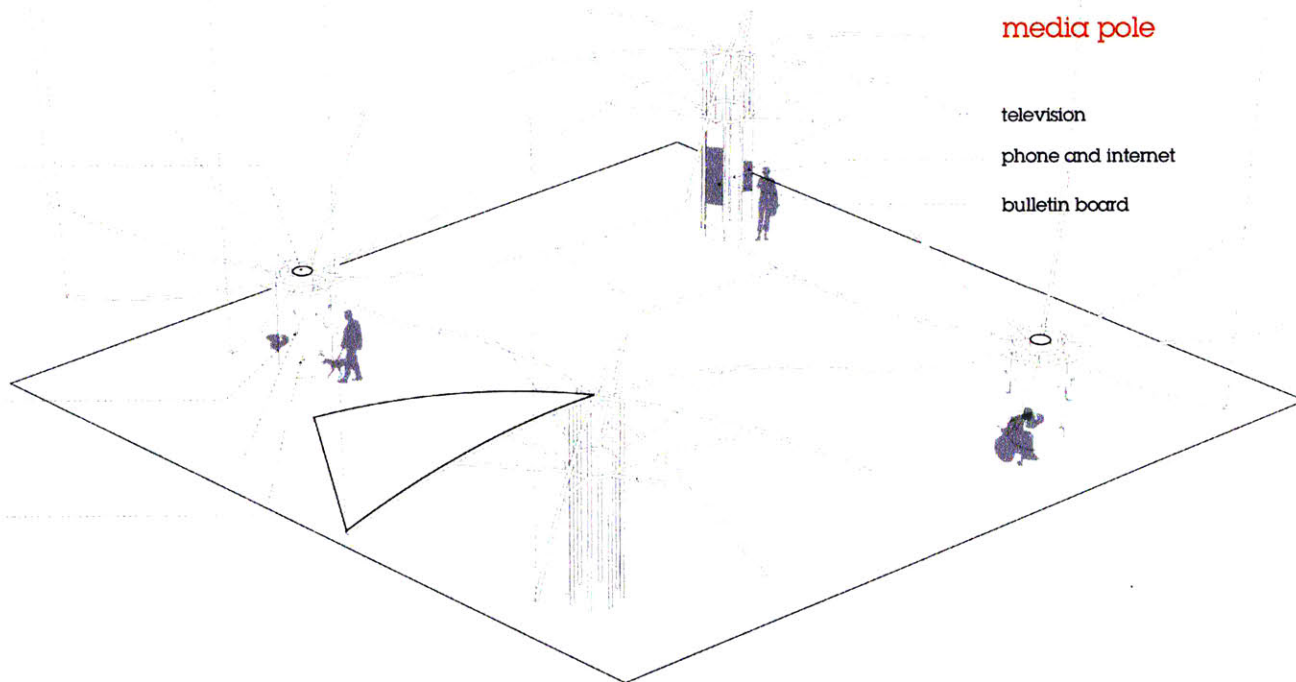
drainage

liquid pole

water fountain

shower faucet

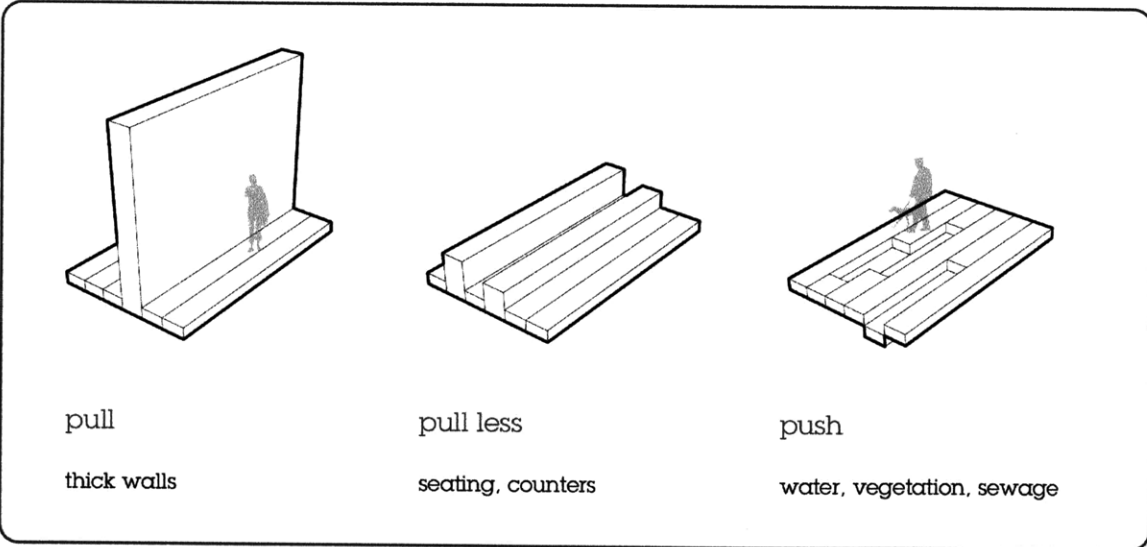
water spout



GROUND: pushed and pulled

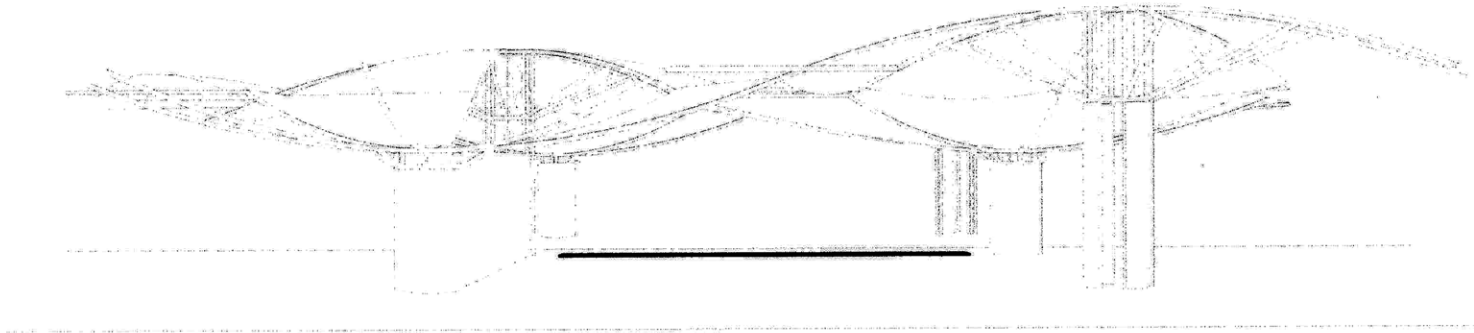
The project is made up of a series of layers reaching from the deep underground to heights of the tallest sound stage roofs. Beginning at the bottom, underground, we have a series of systems working out of sight. In addition to the fresh water tanks storing a supply of water able to keep 11,000 people hydrated for the weekend, there is also a system of sewage disposal and connections hidden just beneath the surface. This connections can be quickly tapped into to form groups of the 1,000 toilets needed to handle the waste of the 11,000 people seeking refuge on the site during disaster.

Food distribution is the other major concern with such a large group of people. A mix of permanent and temporary perforated walls signal a place to line up, but also conceal a series of places for trucks to park and plug into. Food can then be handed out in an orderly manner and distribution can be regulated.



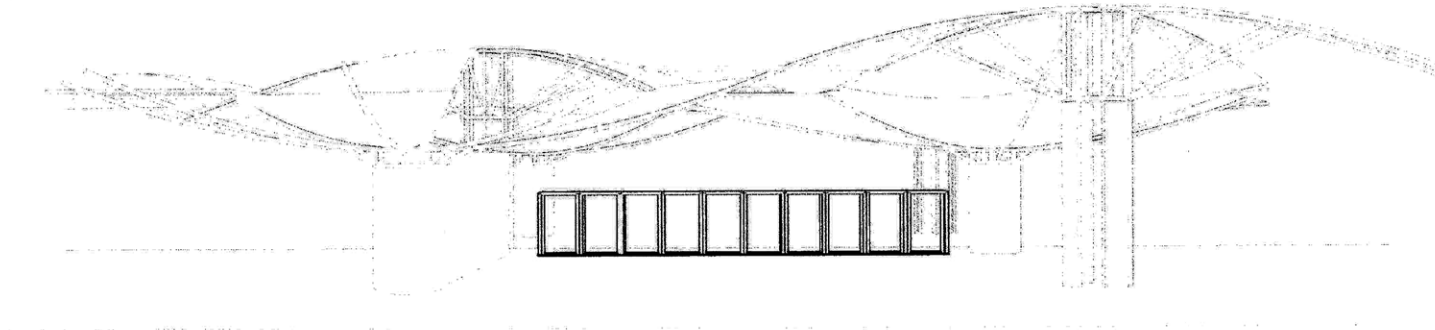
toilets and hidden drainage

daily condition



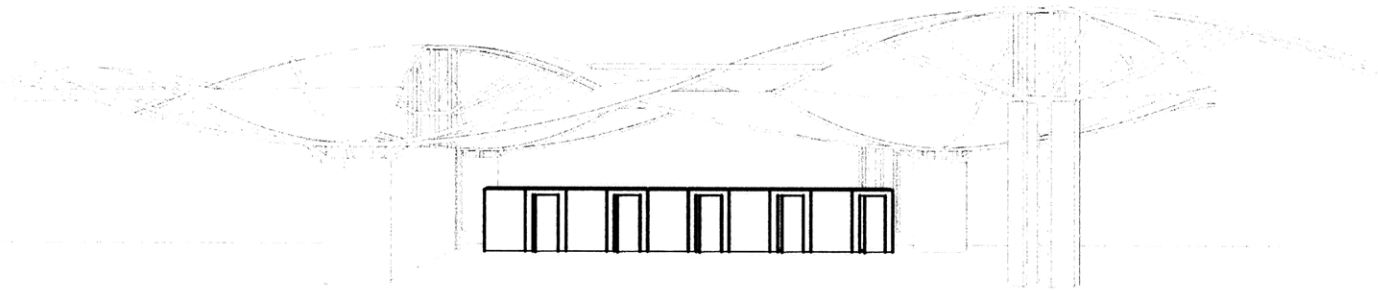
a ground impression covers sewage connections and is linked into the canopy drainage

framework

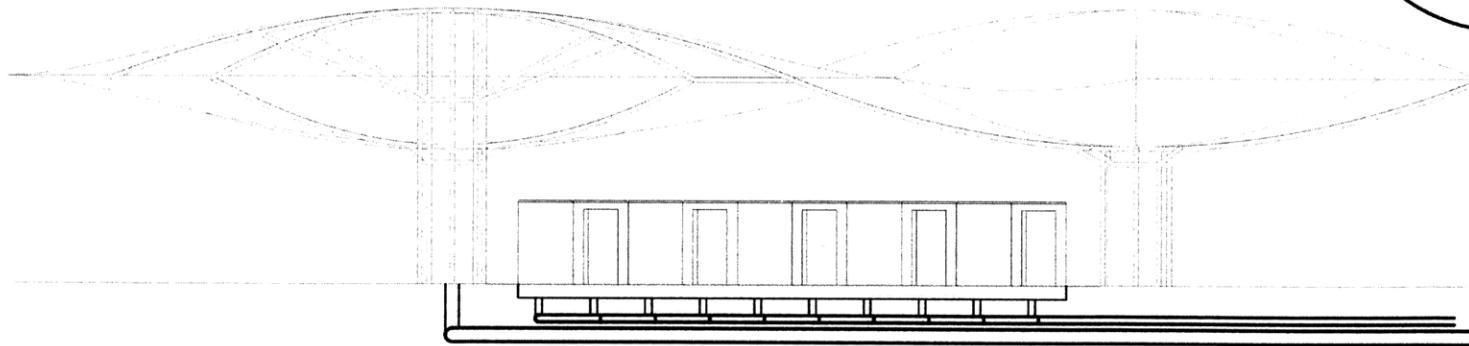
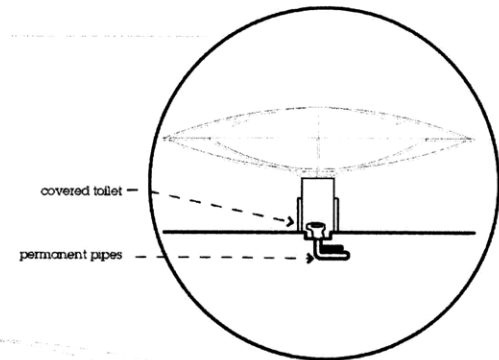


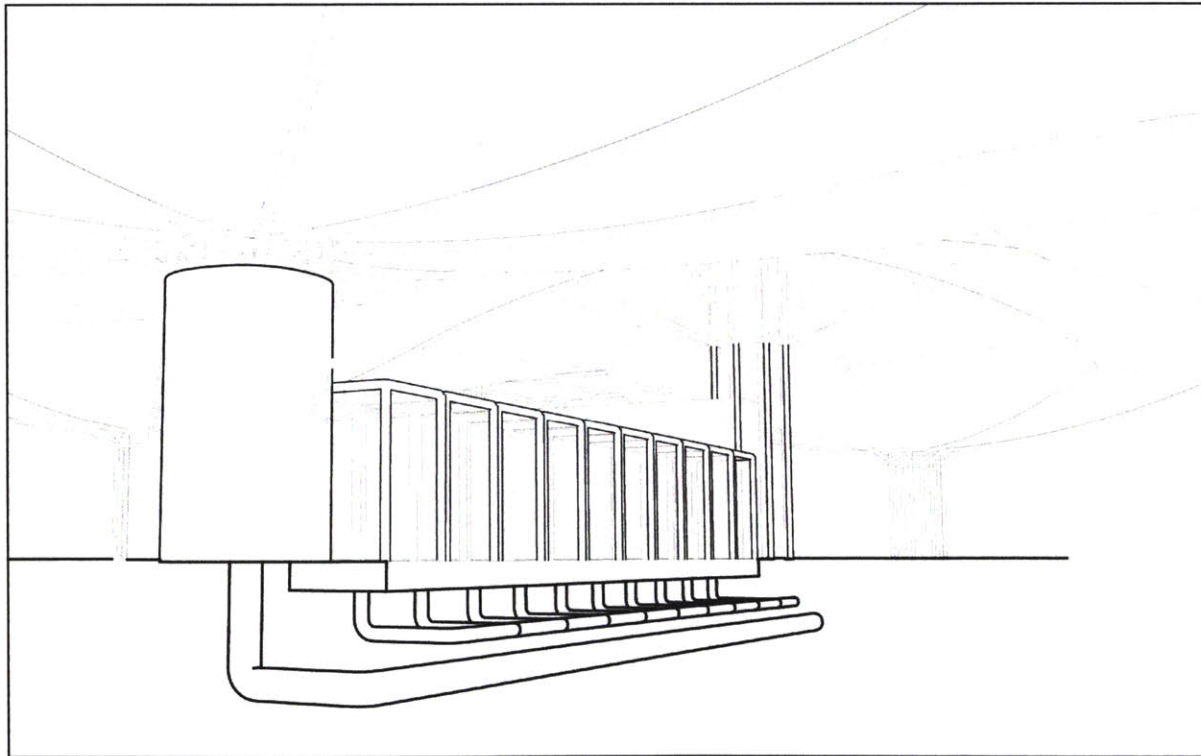
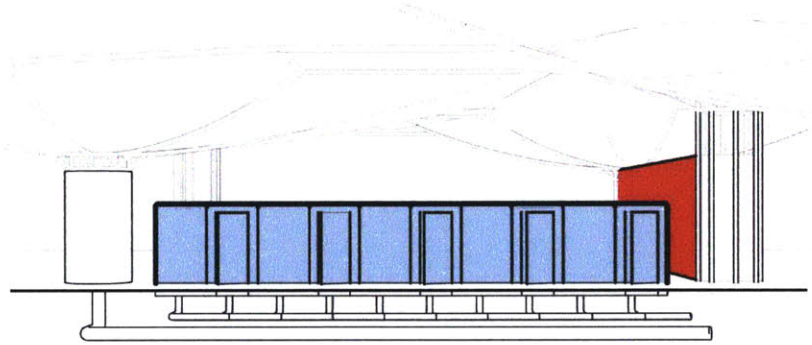
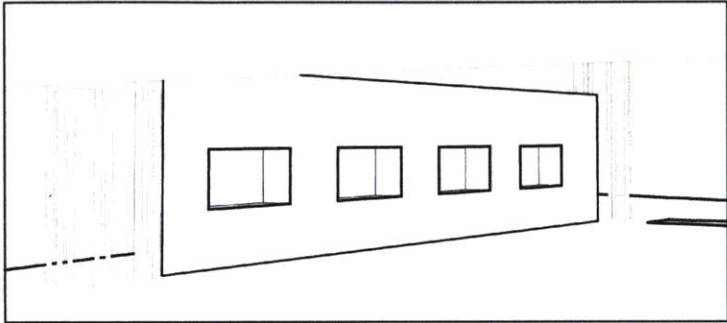
frames are taken out of storage and un folded into existing holes in the ground

draped



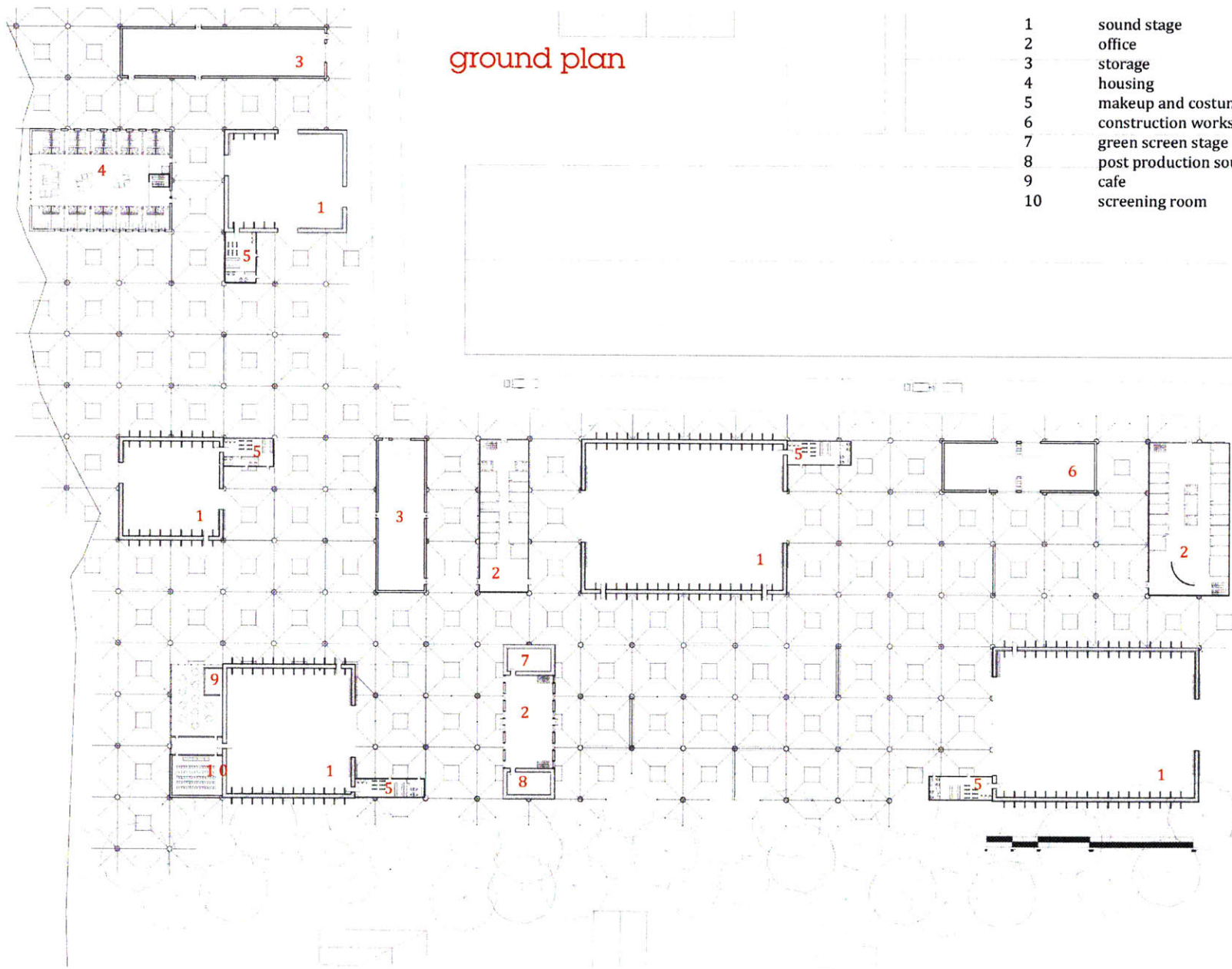
frames are draped in canvas to create privacy for each toilet



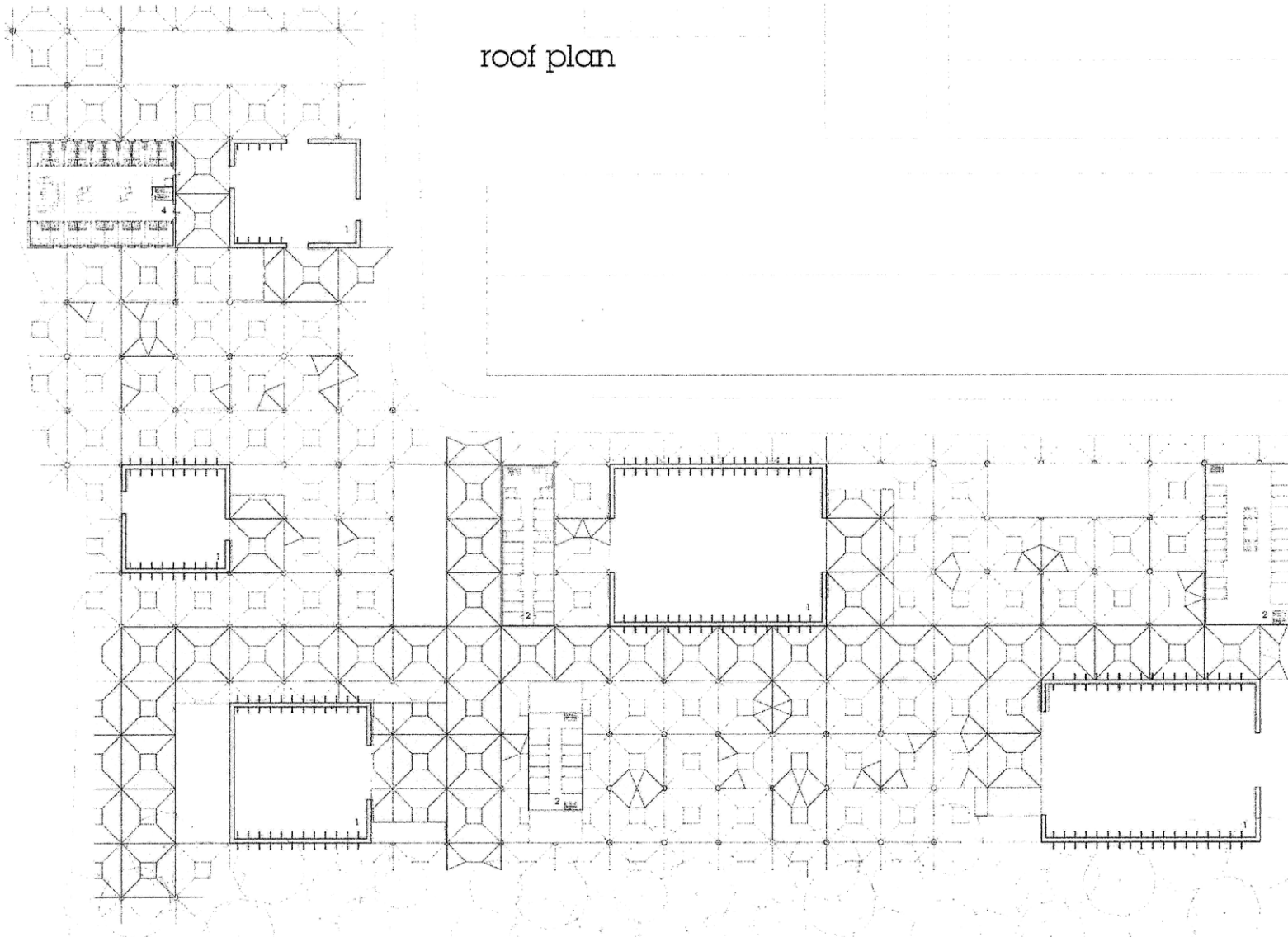


ground plan

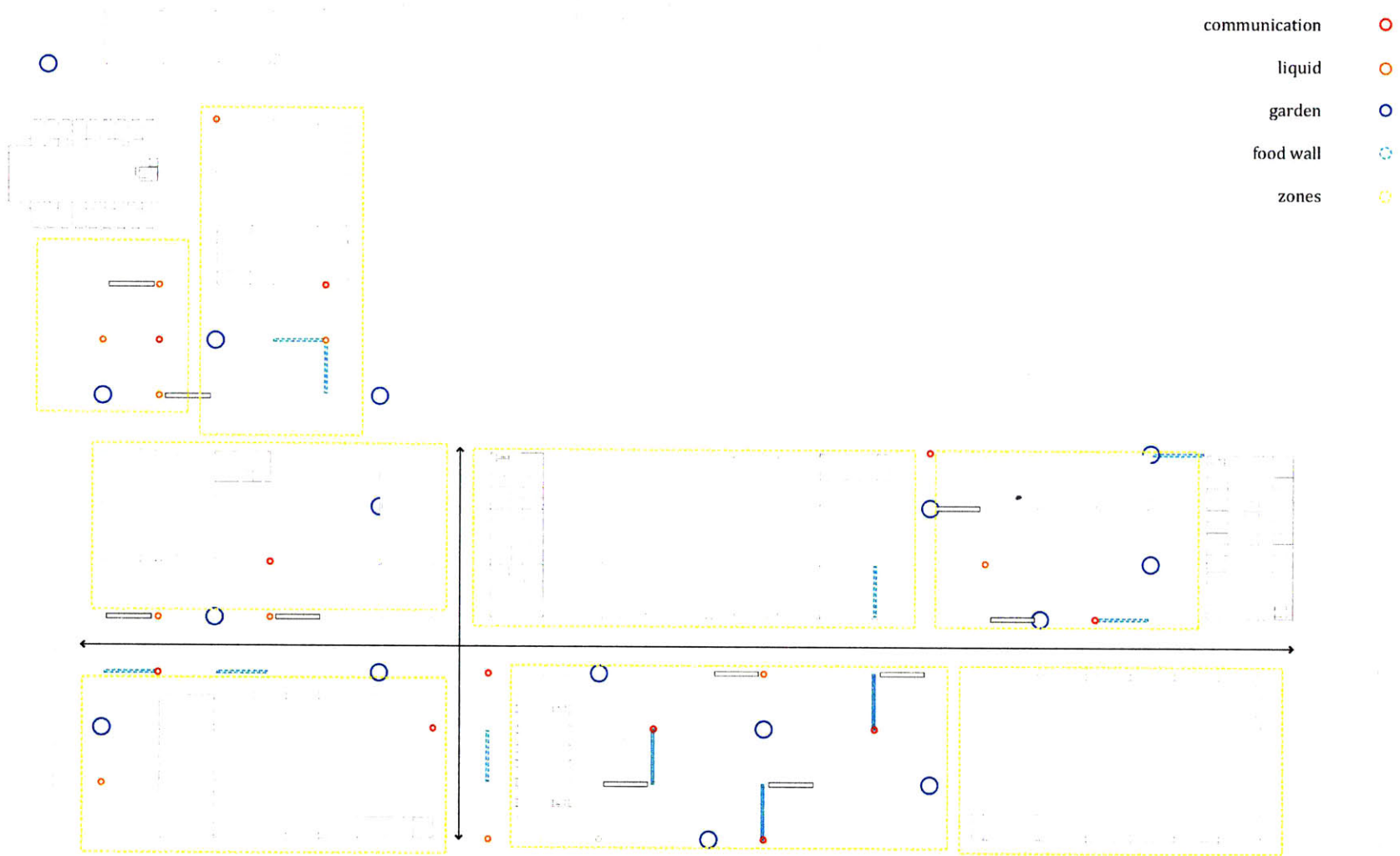
- 1 sound stage
- 2 office
- 3 storage
- 4 housing
- 5 makeup and costume
- 6 construction workshop
- 7 green screen stage
- 8 post production sound stage
- 9 cafe
- 10 screening room



roof plan



systems plan





disaster response day

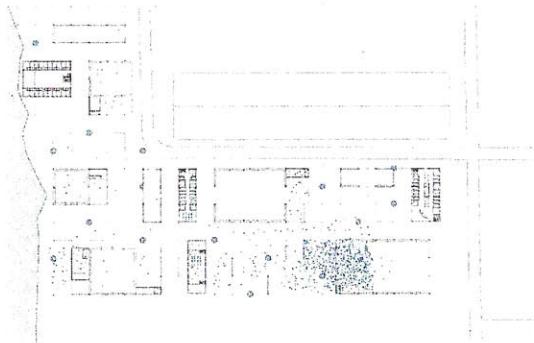


disaster response night



disaster relief

SWARM DIAGRAMS

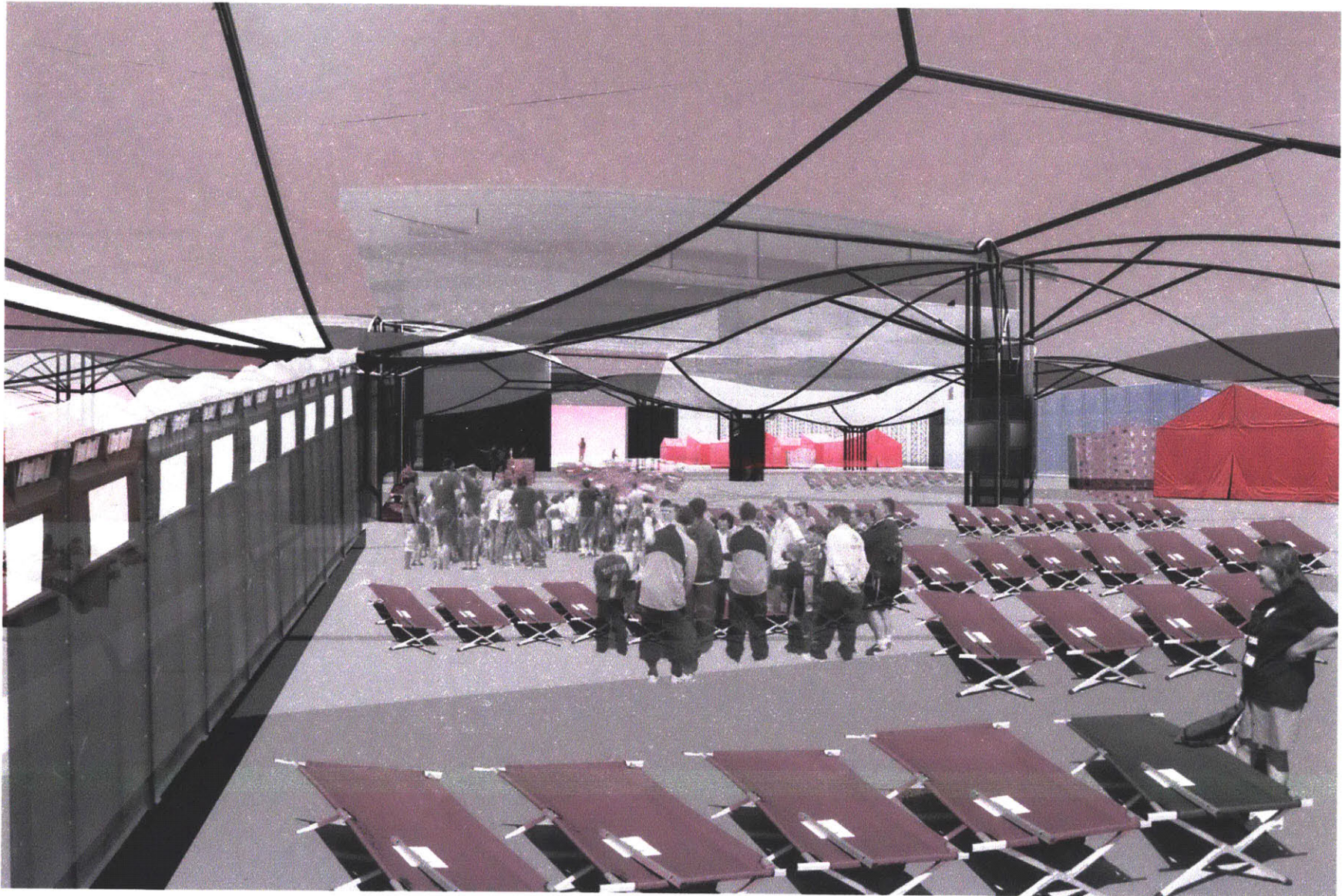


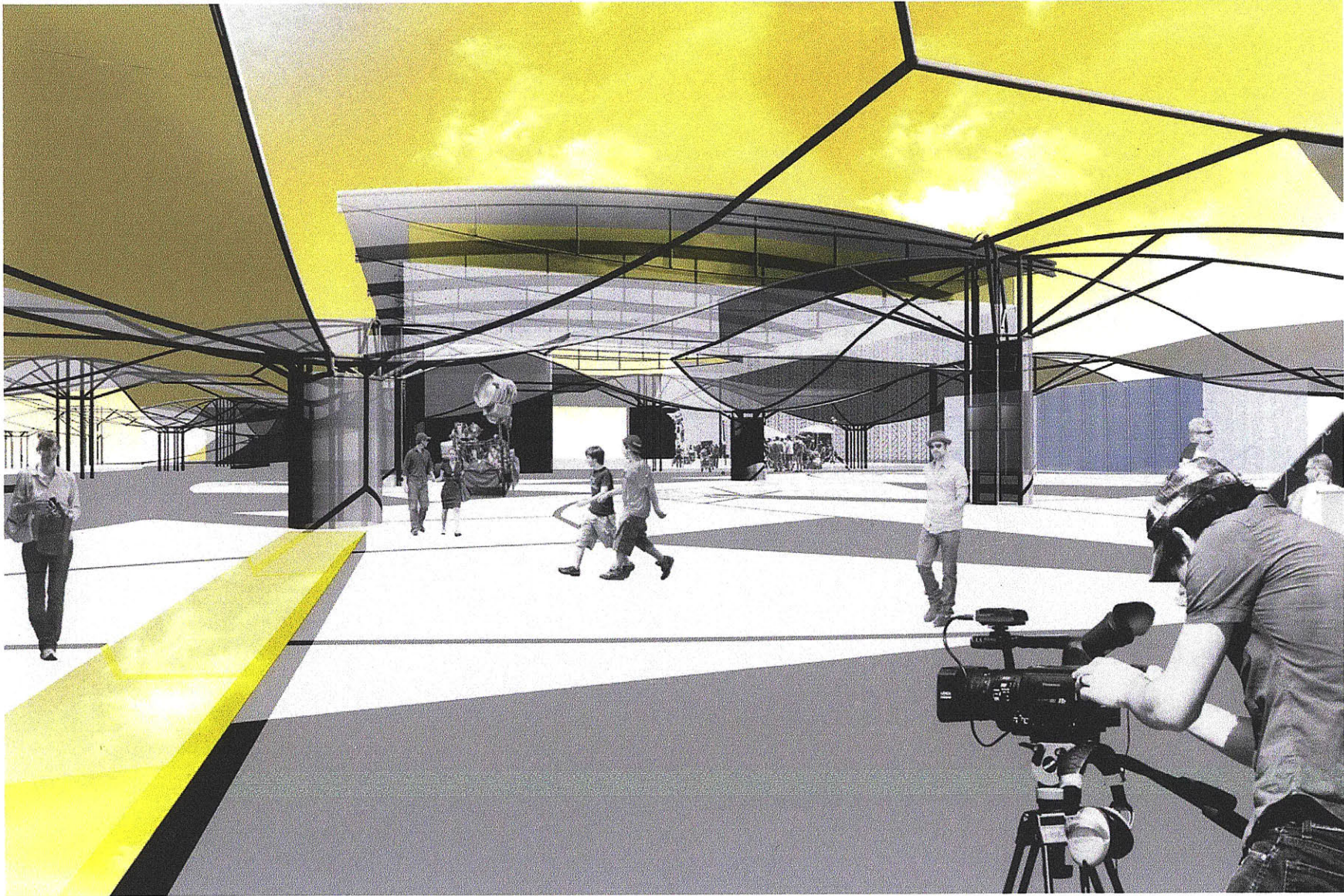
event occupation

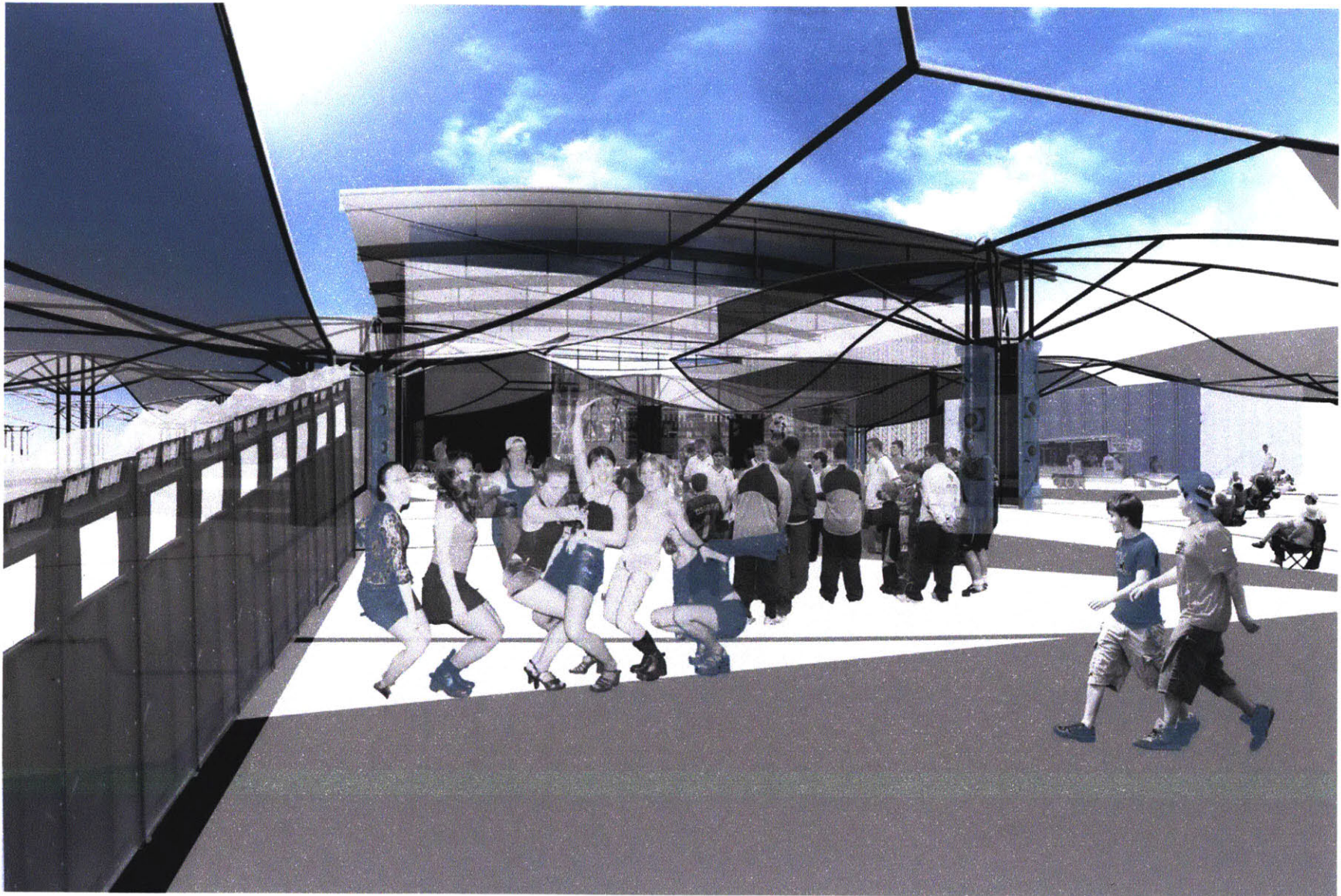


studio occupation

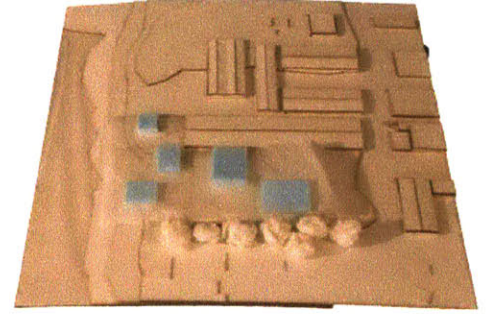
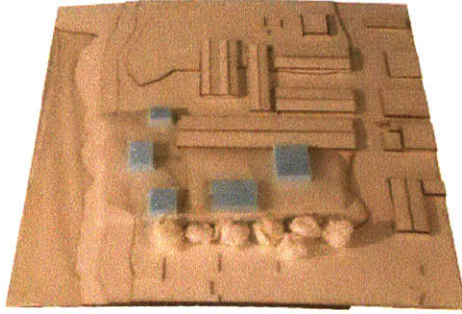
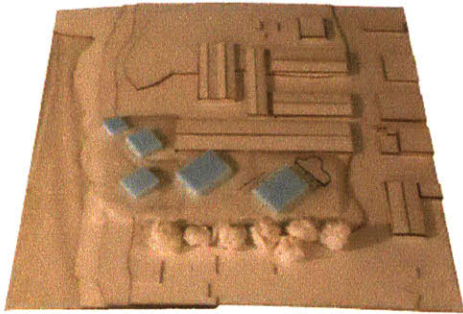
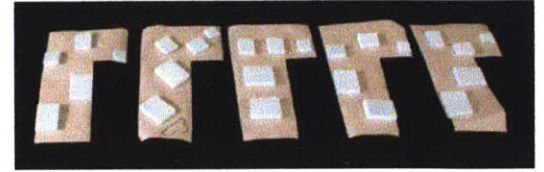
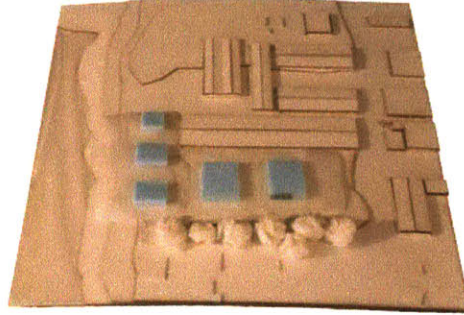
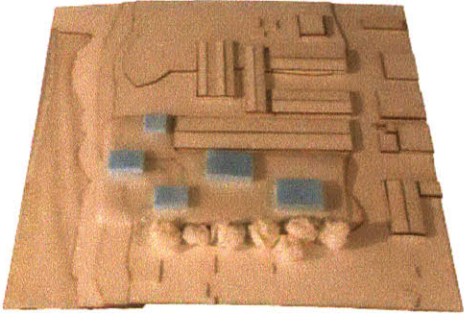
The diagrams at left represent three potential phases of the studio's occupation. In yellow is shown a typical afternoon on the studio campus. The site is seemingly sparsely populated, but a few movies are filming and the studios and offices are occupied. In blue is shown an event occurring in one of the studios on campus. The studio being used is currently unoccupied by a film and being rented out for an event. Finally, in pink is what happens when disaster strikes. During the response period, an influx of 11,000 people descend onto the campus in search of shelter. At night they fill every space available. Finally, as life begins to return to normal, disaster victims inhabit only the water front side of the campus, while the film industry moves back into the street side.



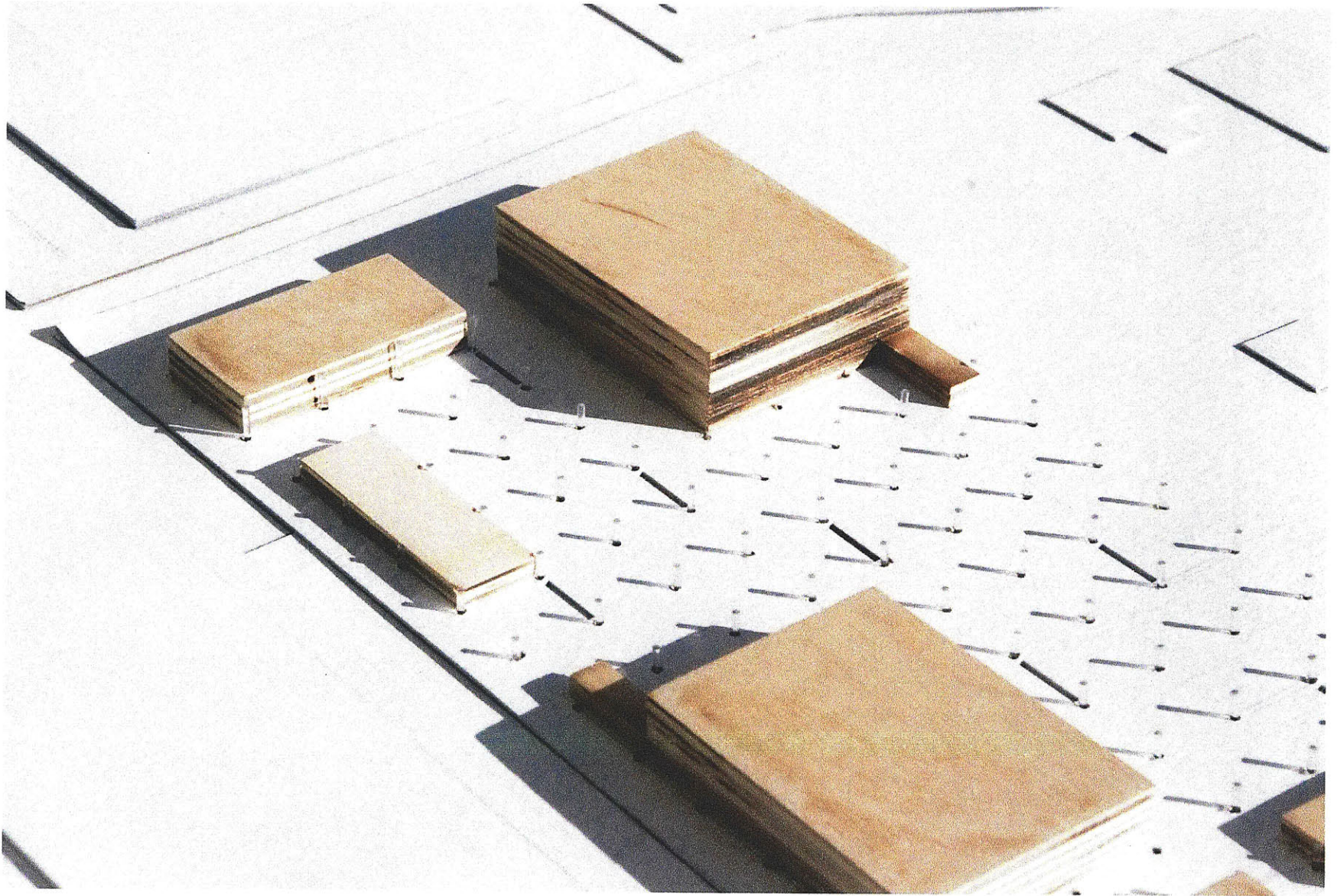


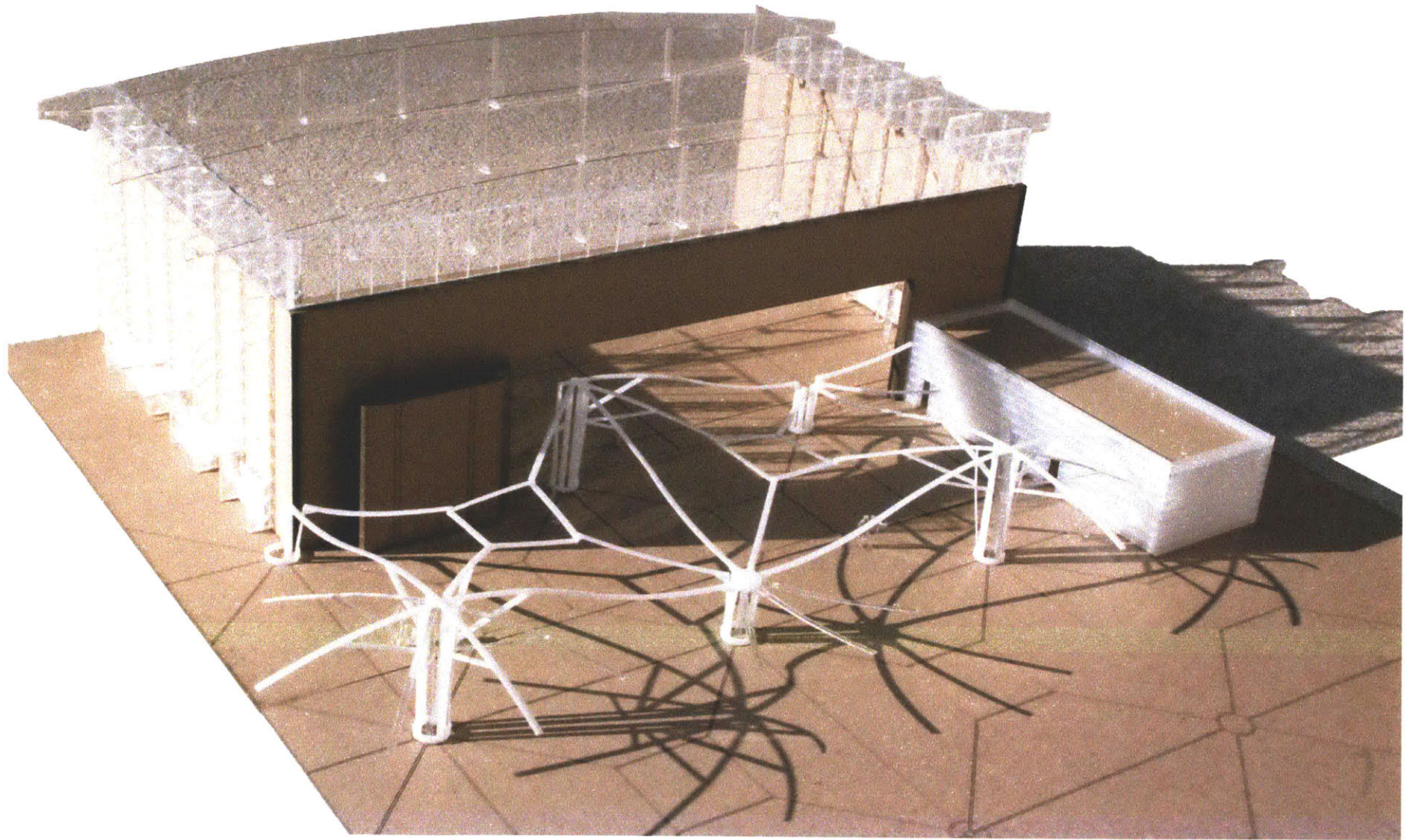


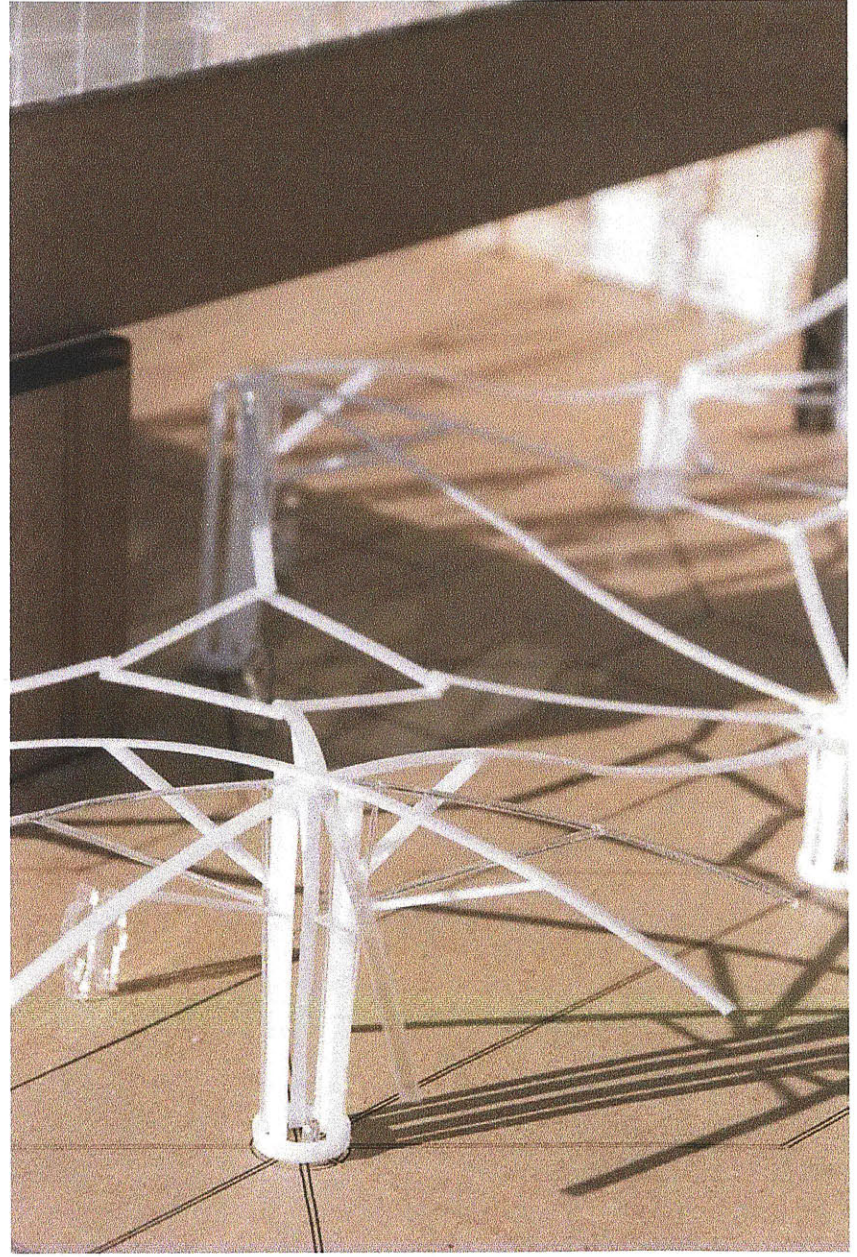
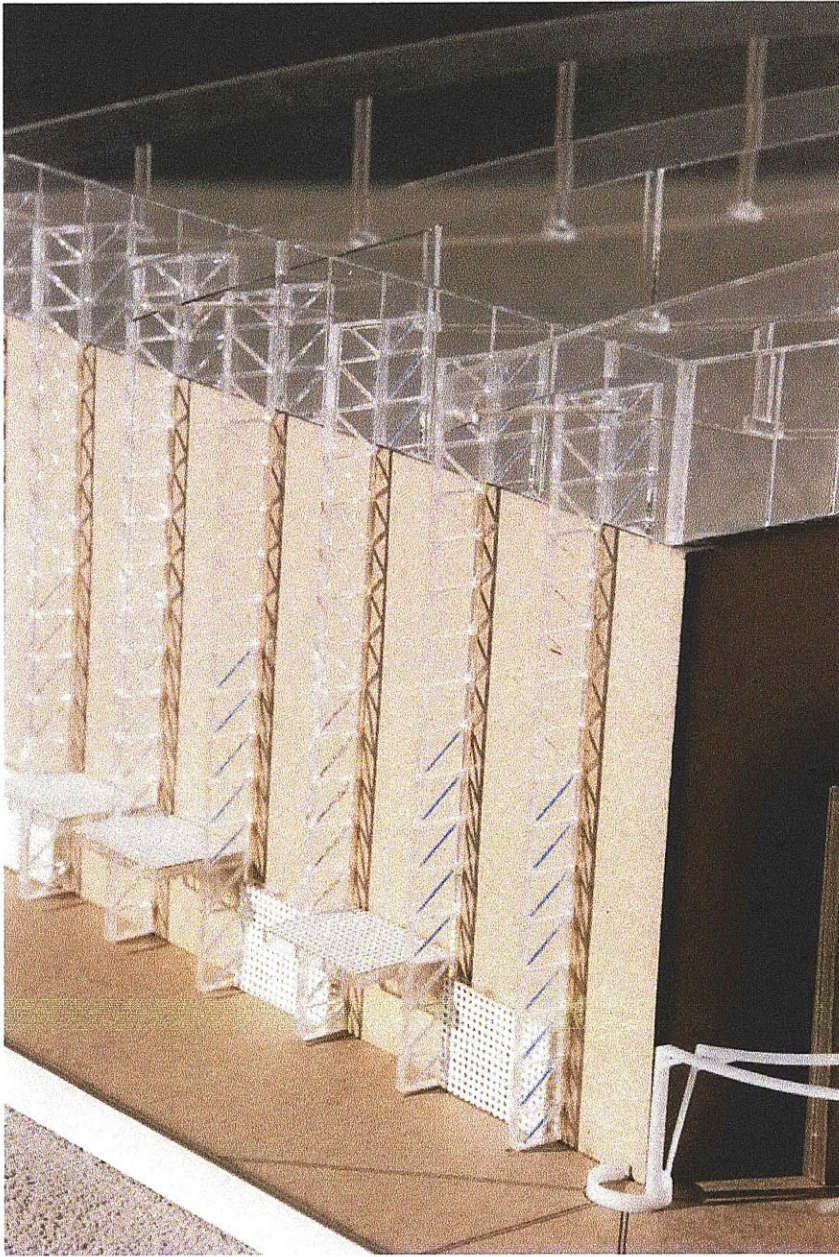
PRESENTATION MODELS

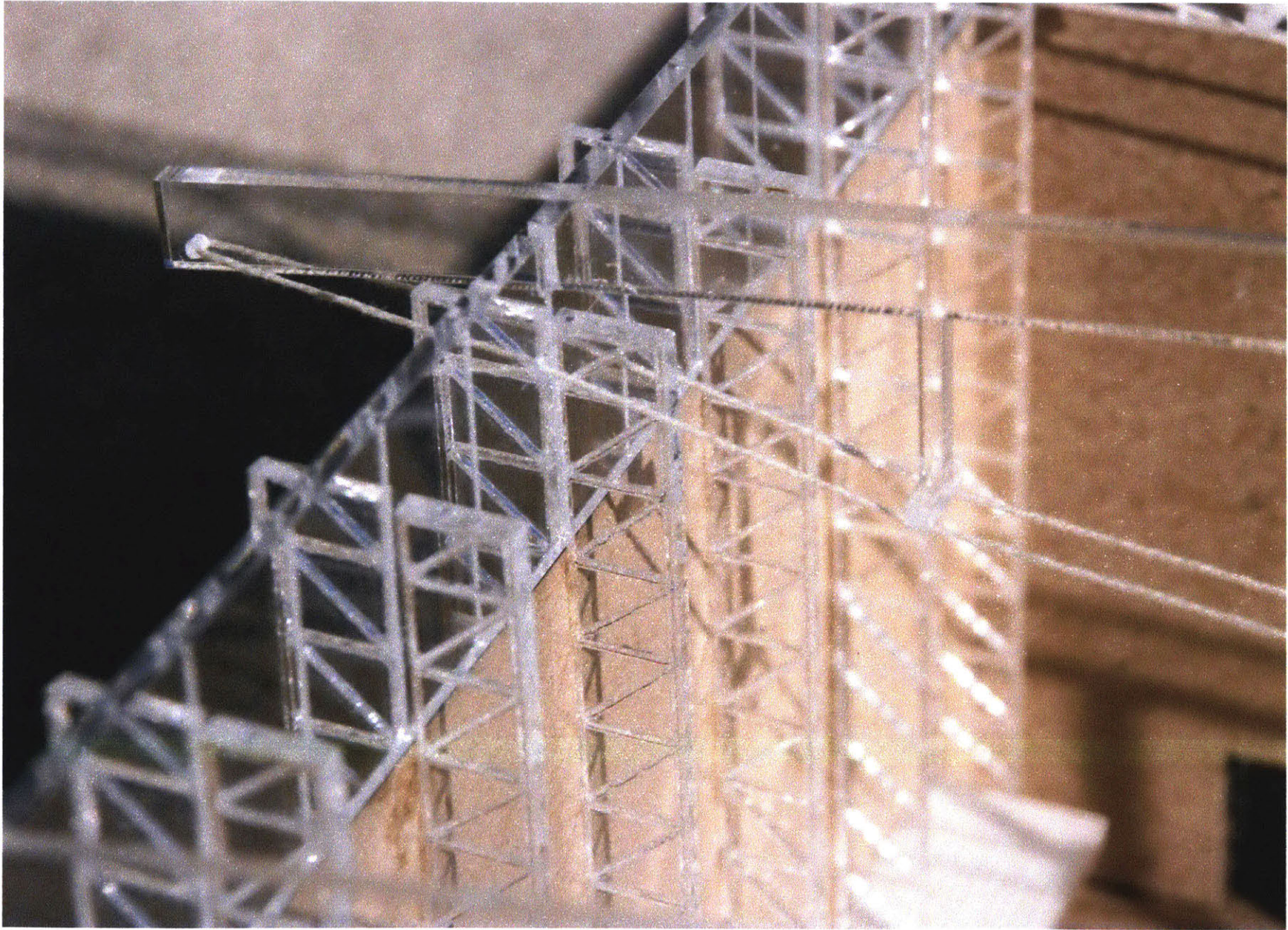




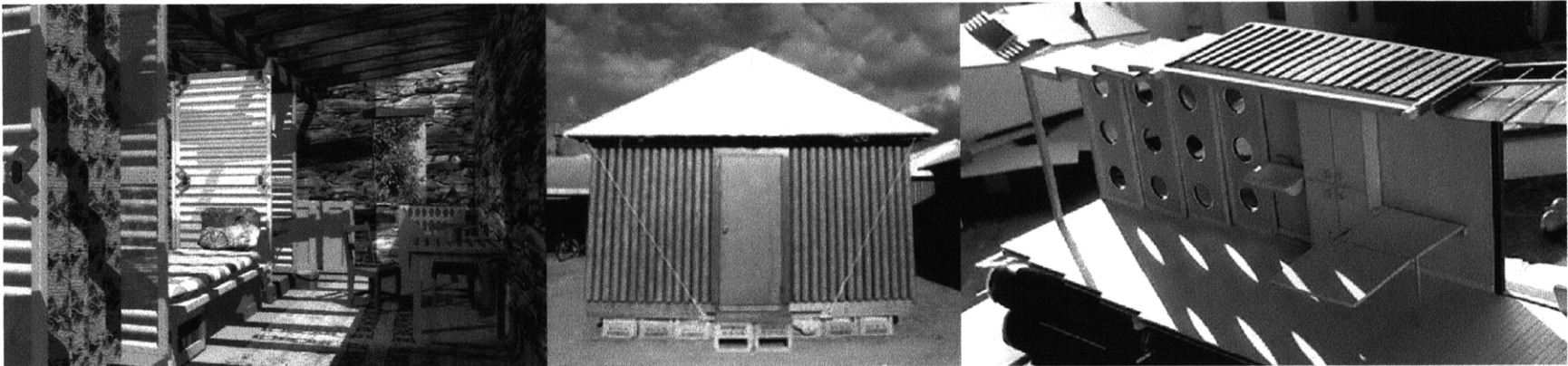








APPENDIX: PRECEDENT STUDIES



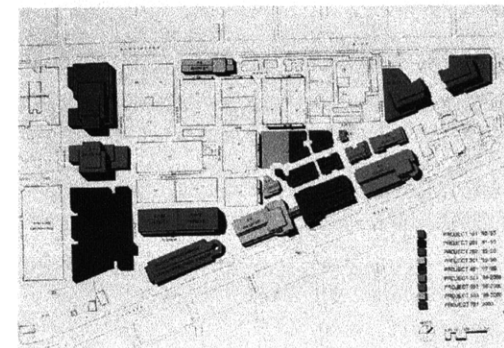
refugee housing

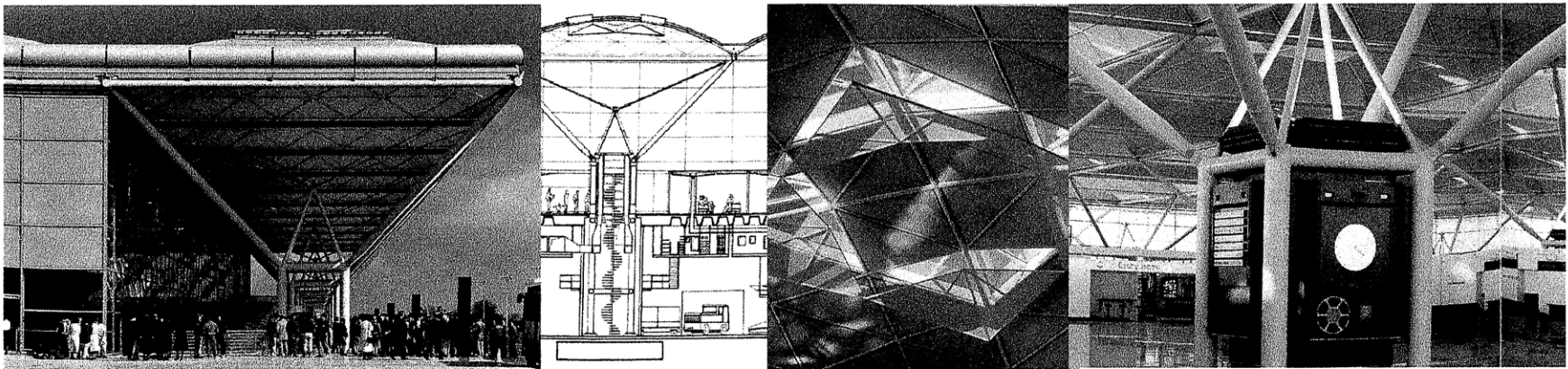
A competition for refugee housing in Kosovo and disaster housing in Japan yielded results taking into account quick, local solutions. Deborah Gans's approach to the problem of refugee housing is significant because of her wholistic view of the problem. Rather than simply looking housing for refugees she reserached refugee camps as a whole only to discover that that the problem related to securing the rights of the individual, rather than simply providing shelter. Her proposed solution directly targets single mothers within in refugee camps providing them with water and fuel-- the driving concerns for survival in a refugee camp-- allowing them to spend more secure time with their children. Shigeru Ban, with is Kobe earthquake housing response was looking to provide the fastest, lightest structure he could using local materials. His used of structural cardboard tube allows an engagemnt of the local economy. The use of beer crates as a foundation keeps the housing low impact and prevents a feeling of permance, while allowing a level of comfort not often allowed for during disaster response. His homes can be deconstructed and recycled as easily as they were collected and assembled.



motion picture production studios

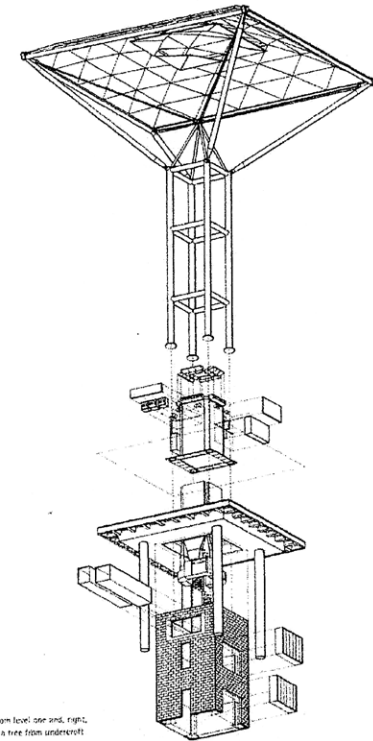
Ranging in size from just a few acres to to hundreds, production studios can vary almost as much as the content being filmed within them. In 1989, the Warner Bros. studio in Burbank California employed over 5000 people and contained an independent power plant that was capable of lighting a city of 36,000 people. While downtown Baton Rouge, with its population of around 230,000 residents, is in no way equipped to take on such a large expansion, the Warner Bros. studios is an example of the possibilities. Currently, in Plymouth, Massachusetts, Plymoth Rock Studios in under construction on 10 acres of land with 14 sound stages, production offices, post production facilities, a theater, offices and an amenity village. The intervention proposed in these thesis seeks to accomodate at least 15,000 people temporarily after disaster, with longer stays for up to 5,000 people.





stanstead airport

Norman Foster's airport in England reverses the traditional airport by moving all systems to the lower floors of the facility and allowing passenger circulation to occur on a single level. By moving the systems to the lower levels, openings on the roof and the opportunity for natural light becomes abundant, an amenity often reserved for vertical walls in airports. The use of skylights eliminates the need for supplemental lighting during daytime hours. The structural system used to support the roof also creates opportunities for the movement of services through the building within the columns. This method of distribution creates a network of active columns as hubs. Created through a system of layers and infills, these hubs house vital information for passengers and distract from their original purpose as structural elements.



4. "tree" as seen from level, see p. 102, right. The full height of a tree from underneath to roof.



disaster planning

Miki Disaster Management Park Beans Dome

The 16,168 square meter structure is in Miki City on the Hyogo Prefecture, about 30 kilometers west of Kobe, and was completed in 2007. It is actually a combination tennis court and disaster center, built in response to the big Kobe earthquake in 1995 by Japanese architect Shuhei Endo. In the event of an earthquake or typhoon, supply trucks can drive directly into the 174,000-square-foot building, thanks to movable glass panels at four locations around the perimeter. Additionally, the rounded, curved forms of the building, according to the architect, are more in tune with nature.

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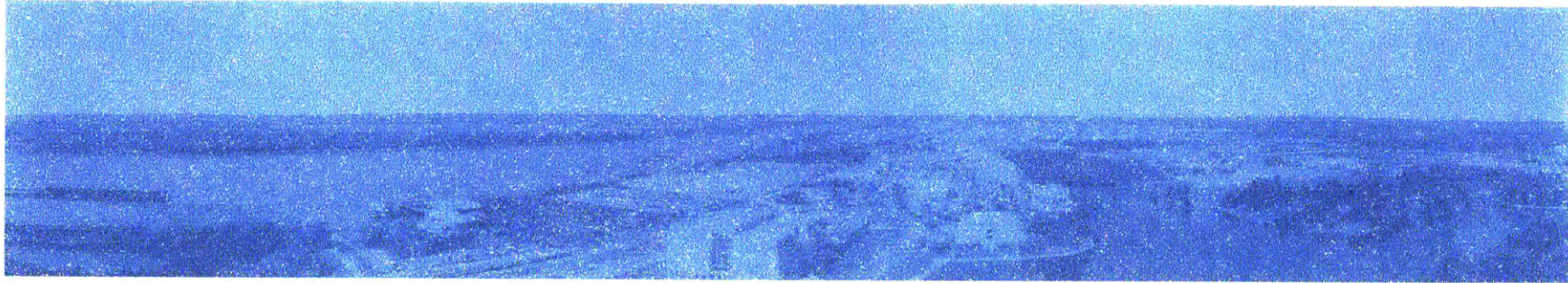


IMAGE CREDITS

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page 13	http://www.preventionweb.net/english/professional/maps/v.php?id=4167
page 15	chart based in information gathered in American Hazardscapes by Susan Cutter.
page 21	sony pictures image: source unknown
page 22	make-up and green screen images: source unknown
page 23	all images via web search
page 28	background images courtesy of Google Street View

