

THE PENNSYLVANIA STATE UNIVERSITY  
SCHREYER HONORS COLLEGE

STUCKEMAN SCHOOL OF ARCHITECTURE AND LANDSCAPE ARCHITECTURE

EXPLICATING FAILURE:  
EXPO 2000

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A thesis  
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of the requirements  
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in Architecture  
with honors in Architecture

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## ABSTRACT

Why do we keep making the same mistakes?

Olympics, World Expositions, and other mega events cost billions of dollars, yet their life spans are drastically short. Ranging from 14 days to 6 months, these massively expensive and publicized events find themselves the center of the world's attention, yet what happens when the crowds leave and the cameras are turned off? A startling high percentage of these event sites lay in waste within a year of their use. After a decade many are completely abandoned and have had no long term impact on the communities they were intended to rejuvenate. In spite of these results, mega events continue to be held, in even higher numbers than in the past.

This thesis examines the remains of a specific site, the Expo 2000, in Hannover, Germany. The project works to understand the specific failures that occurred here and its deterioration over the last 10 years. The project addresses the specific issue of the waste that remains at the expo as well as the need to alter future behavior. The program is a recycling facilitation center that will work to deconstruct the remaining pavilions, but to do so in a way that will eliminate waste and salvage as much material as possible. The education aspect of the project comes through its transformation into a 'cemetery.' As a park, the designed remnants of the pavilions will act as memorials of the expo as well as a reminder to future generations of the need to learn from these mistakes and the many failures of these events. The driving guides of the project are derived from William McDonough's Hannover Principles, the intended, but unused, design guidelines for the Expo 2000.

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## 1.0 Thesis Statement

My recycling and research center in Hannover, Germany, for the public of Hannover, addresses the wasted remains of the Expo 2000 as well as the continuing failure of mega event sites, past and future. This process happens through the dismantling of the existing pavilions and subsequent creation of a cemetery memorial park.

Mega events are large scale international events that capture the interest of the world for some small amount of time. These events include World Expositions, Olympics, and other large scale sporting events. This portion of research will focus mostly on expositions and Olympics due to their correlation with large scale building projects.

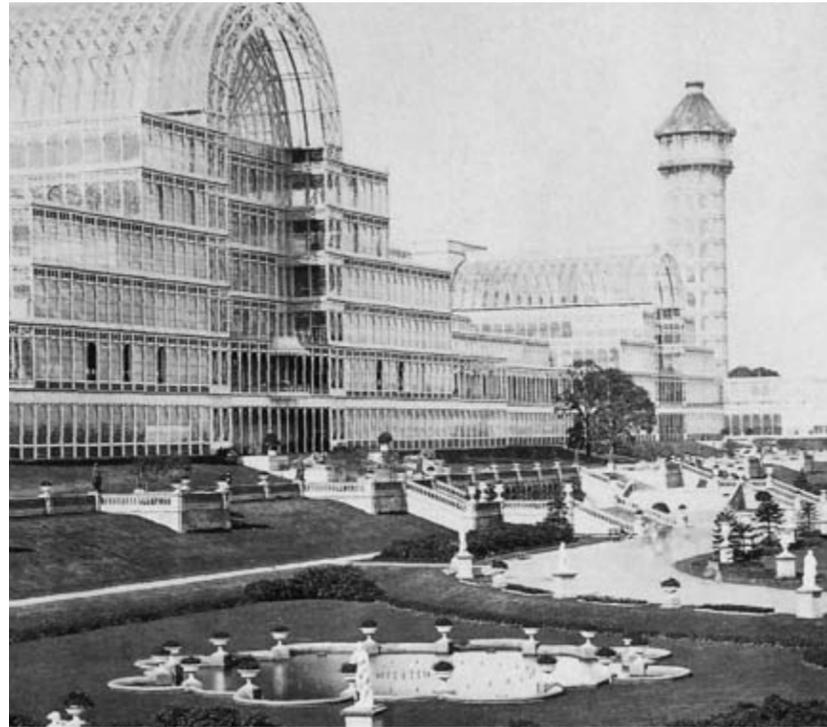
History of Expositions

INDUSTRIAL	<ul style="list-style-type: none"> <li>-1851 London (United Kingdom)</li> <li>-1855 Paris (France)</li> <li>-1862 London (United Kingdom)</li> <li>-1867 Paris (France)</li> <li>-1873 Vienna (Austria)</li> <li>-1876 Philadelphia (United States)</li> <li>-1878 Paris (France)</li> <li>-1879 Sydney (British Australia)</li> <li>-1880 Melbourne (British Australia)</li> <li>-1884 New Orleans (United States)</li> <li>-1888 Barcelona (Spain)</li> <li>-1889 Paris (France)</li> <li>-1893 Chicago (United States)</li> <li>-1897 Brussels (Belgium)</li> <li>-1900 Paris (France)</li> </ul>	<ul style="list-style-type: none"> <li>-1935 Brussels (Belgium)</li> <li>-1937 Paris (France)</li> <li>-1939 New York City (United States)</li> <li>-1939–1940 San Francisco (United States)</li> <li>-1958 Brussels (Belgium)</li> <li>-1962 Seattle (United States)</li> <li>-1964/65 New York (United States)</li> <li>-1967 Montreal (Canada)</li> <li>-1968 San Antonio (United States)</li> <li>-1970 Osaka (Japan)</li> <li>-1974 Spokane (United States)</li> <li>-1982 Knoxville (United States)</li> <li>-1984 New Orleans (United States)</li> <li>-1985 Tsukuba (Japan)</li> <li>-1986 Vancouver (Canada)</li> <li>-1988 Brisbane (Australia)</li> </ul>
CULTURAL	<ul style="list-style-type: none"> <li>-1901 Buffalo (United States)</li> <li>-1904 St. Louis (United States)</li> <li>-1905 Liège (Belgium)</li> <li>-1906 Milan (Italy)</li> <li>-1907 Dublin (United Kingdom)</li> <li>-1907 Norfolk (United States)</li> <li>-1909 Seattle (United States)</li> <li>-1910 Brussels (Belgium)</li> <li>-1911 Turin (Italy)</li> <li>-1913 Ghent (Belgium)</li> <li>-1915 San Francisco (United States)</li> <li>-1915 San Diego (United States)</li> <li>-1929 Seville (Spain)</li> <li>-1929 Barcelona (Spain)</li> <li>-1933 Chicago (United States)</li> </ul>	<ul style="list-style-type: none"> <li>-1992 Seville (Spain)</li> <li>-1992 Genoa (Italy)</li> <li>-1993 Daejeon (South Korea)</li> <li>-1998 Lisbon (Portugal)</li> <li>-2000 Hannover (Germany)</li> <li>-2005 Aichi (Japan)</li> <li>-2008 Zaragoza (Spain)</li> <li>-2010 Shanghai (China)</li> <li>-2012 Yeosu (South Korea)</li> <li>-2015 Milan (Italy)</li> <li>-Expo 2017 or 2018 yet to be designated <sup>1</sup></li> </ul>
THEME PARK		

## Official World Expos

- 1937 Paris, 6 Million Visitors
- 1939 New York City, 45 Million Visitors
- 1958 Brussels, 41 Million Visitors
- 1962 Seattle, 10 Million Visitors
- 1967 Montreal, 51 Million Visitors
- 1970 Osaka, 64 Million Visitors
- 1992 Seville, 41 Million Visitors
- 2000 Hannover, 18 Million Visitors
- 2010 Shanghai, 73 Million Visitors <sup>2</sup>

The expo has been in existence for 160 years. The purpose of the expo has over time changed from being a technological showcase to a cultural learning experience into the modern theme park. The highest class of expo, the World Expo, have become massive events drawing millions of people to their respective countries. It is within this category the 2000 Hannover Expo, the focus of this thesis falls. The following case studies examine various successes and failures from these past 160 years.



1851 London

- The expo is held within the Crystal Palace. Over 6 million visitors, while only several hundred thousand were expected.
- The palace is dismantled afterward.
- 3 years later the structure is rebuilt by the Queen.
- Built in Sydenham, it is used as a winter garden, public park, and museum for the middle class.
- This historic structure burns down in 1936 <sup>ibid., 201</sup>



1900 Paris

- 50 million visitors come to the expo, though 60 million were expected.
- Unlike the 1889 expo, no great monument equivalent to the Eiffel Tower is built.
- There are initiatives to save buildings, but it becomes too expensive and none are saved.
- The land is sold and profits are used to demolish the built structures.
- Though gone, the architectural style of the expo influences design trends throughout Paris.
- Henard becomes famous for his urban planning of the reconstruction of Paris.
- Up until WWII expositions act as birthplaces for modern urban planning. <sup>ibid., 429</sup>



1939 New York City

- 26 million visitors actually came, although 60 million are expected.
- The entrance fee is considered expensive and the fair remains open for a second season to make profit.
- The fair is considered to have 'lost dignity' and becomes more of a carnival.
- Held during WWII, invaded countries like Poland and France still held pavilions at the expo.
- \$18.7 million is lost on the expo.
- The parent company, Fair Corp. nearly goes bankrupt and most pavilions are slowly demolished over time. The grounds. The same grounds, Flushing Meadows Park, was reused for the unofficial 1964 Expo. <sup>Ibid., 550</sup>



1970 Osaka

- 64 million people attended the Osaka expo. This was the highest attendance ever until the 2010 Shanghai Olympics.
- One of the few Expos to produce real profits, 19.5 billion yen or approximately \$24 million.
- The planned demolition of the expo and pavilions was carried out in 1970-71.
- The land was completely rebuilt, but organized along same layout as the expo.
- New public parks, sports facilities, and a museum were built.
- The expo successfully expanded an area of Japan outside of Tokyo. The expo established self confidence in national identity. <sup>Ibid., 638</sup>



Expo '92 cost: \$10 billion  
Seville, Spain use: abandoned

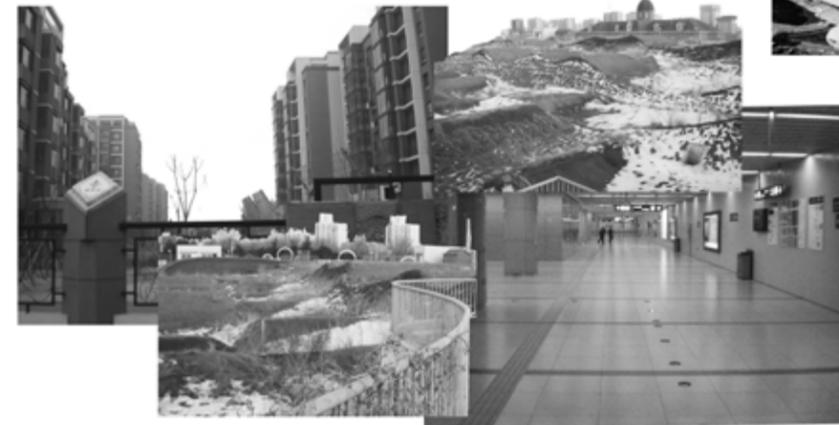
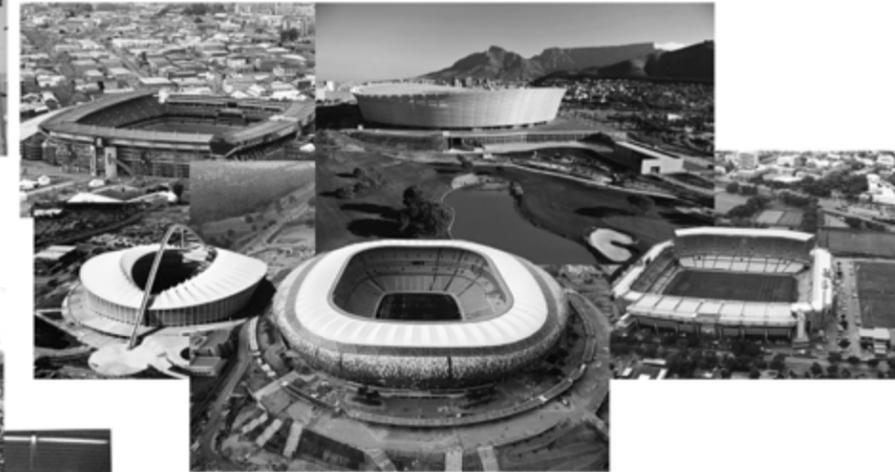
Expo 2000 cost: \$4 billion  
Hannover, Germany use: partially abandoned



2004 Olympics cost: \$15 billion  
Athens, Greece use: abandoned



2010 World cup cost: \$4 billion  
South Africa use: TBD



2008 Olympics cost: \$40 billion  
Beijing, China use: partially abandoned

Why do we keep making the same mistakes?

The historical examples as well as the more recent precedents reveal a startling trend in mega events. Though during the fanfare they are very popular, the question of what to do with them afterward is not easy to answer. Osaka, perhaps the most popular expo found the solution of demolishing the expo buildings. Many other events come to this conclusion, but it is often years after the main event has taken place. In that time a state of abandonment occurs. All of these events make promises of long term economic sustenance and vitality to their host cities. Often times these promises go unfulfilled as these venues sit empty for years. This waste becomes far more disturbing in recent years as these event sites become ever more expensive, costing billions of dollars. Any government investing such large amounts of capital should expect to see some long term return, but they are often left with huge sums of debt instead. Expositions typically last 5 months, while Olympics last a mere 2 weeks. This time frame does not equal the high cost and permanence of the physical presence created by these mega events. Though not a failure in every sense, there are definite economic, social, and environmental failures as a result. What can be done to prevent the same mistakes from being made again and again? What can be done with these already abandoned sites? This thesis works towards answering the first question by starting with the second.



The apostasy concerning the Expo 2000 can be traced back to 1988. Birgit Breuel was the main component behind obtaining the expo for Hannover. The main impetus behind the bid was the hope for this event to benefit all of North Germany, particularly the infrastructure of Lower Saxony and Hannover.<sup>3</sup> Paired with a possible German Olympic Games, there was hope this event would be successful in re-branding the newly unified Germany.<sup>4</sup> The original expectations for the Expo 2000 were highly accurate at a predicted 18 million visitors. This number was, however, far below typical World Exposition attendance. Since WWII, every World Exposition Class expo had garnered at least 40 million guests. With the bid not yet awarded, the estimate and subsequent expectation was altered through some ‘bad math’ to 40 million. A fervent campaign on the theme of “Humankind-Nature-Technology” was also begun. The pitch was that this expo would become a forum in which to address the major issues of the world as a community. With these changes and strong theme, Hannover was awarded the Expo in 1990.

From the outset of planning for the Expo, there were several warning signs that the plans of the few did not coincide with the majority. Though officially awarded the expo, only 51% of the population of Hannover was in support of the event. The ten person planning organization reflected this with only one member representing the interest of the city of Hannover.<sup>5</sup> The next 10 years and billions of dollars were devoted to the planning and building of the expo. In the end it became the largest physically built area to hold an expo as well as the most expensive. Of the estimated total 3.5 billion DM, 2.5 billion were spent on infrastructure. The expansion of the autobahn A2 and A7 to six lanes was one major project to prepare for the increase in vehicular traffic. There was also a line extension of the light rail system added to the Expo area as well as a modernizing of Hannover’s public transport system. A third major project was the addition of a third terminal to Hannover’s International airport.



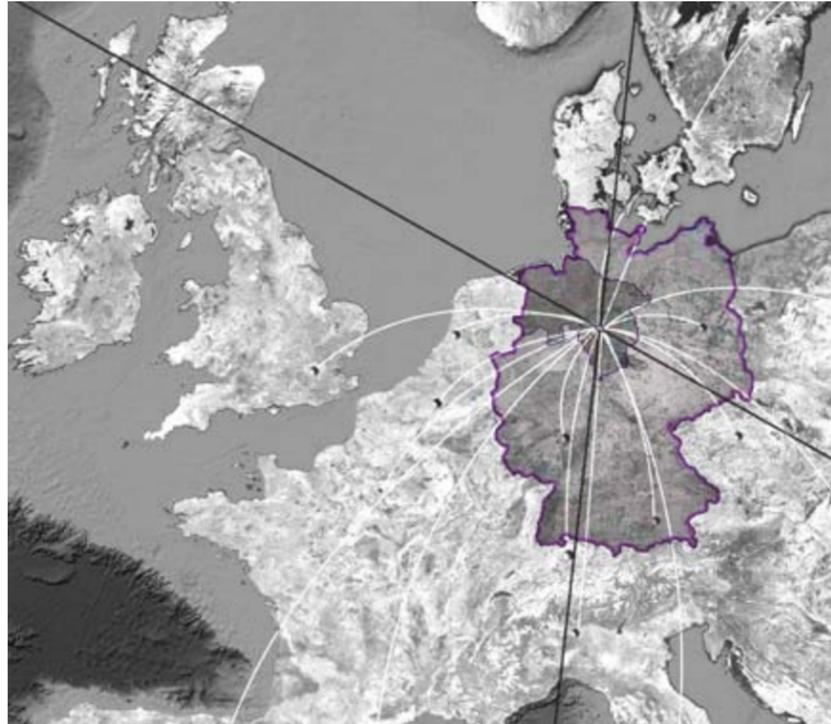
Many of these renovations were done to also handle the future needs for Hannover in 2010. Though these costs added to the overall deficit of the expo, they were at least focused on the future, beyond the 153 day event. Ultimately, the Expo 2000 is considered to be one of the greatest failures in the history of World Expositions. The original estimate of 18 million visitors was incredibly accurate as the actual came to 18.1 million. However, because the Expo had been planned around 40 million guests, estimates were far off mark. The expected revenue from tickets was 1.6 billion DM, where as the actual amount was only 575 million. The hoped for sponsorship was 1.6 billion DM, but only 538 DM million came through. Total money spent on the expo was beyond the predicted amount. 2.89 billion DM was the planned amount, but in actuality over 3.3 billion was spent. The original hope was for the majority of the Expo to be funded through private investment, but the local, state, and federal government paid for 80% of it. Ultimately, it was the public who were forced to pay for the expo only a few really wanted. In this process the entire country was hijacked by the Expo 2000. The will of the few took precedent over the majority. Instead of questioning this process, Architecture became a willing participant. Consideration for life past the expo was not taken. There was a disregard for the temporary nature of the event or life afterwards. The Expo 2000 grounds now remain in a state of semi use/semi ruin. Massive permanent structures remain slowly rotting away, unused. This is unfortunately not the first time, nor nearly the first time this has happened. Expositions and Olympic events alike nearly always fall into the same state of disrepair or ruin afterwards. With a few exceptions, most remain dormant unused areas, or are completely demolished over time. This failure becomes all the more embarrassing as a major theme of the expo was devoted to sustainability. A few of the pavilions have found reuse or were taken down and recycled, but the site remains largely abandoned. There have been attempts after the Expo 2000 to re-use the site. The main focus has been on establishing an Information Communications Technology, or ICT cluster. Similarly to the expo though, this plan was based more on ideal than existing conditions.



In a study of Germany, Hannover was ranked well below cities like Berlin and Munich to successfully grow an ICT cluster.<sup>6</sup> Various initiatives have brought different businesses and start up companies onto the expo grounds, but the overall initiative lacks cohesion and an organizing goal. Ten years later there has been no large research center or Multinational Corporation to move into the area as hoped for. The likelihood of a cluster forming is now much less likely, as the zoning has been changed to allow for retail on the site.

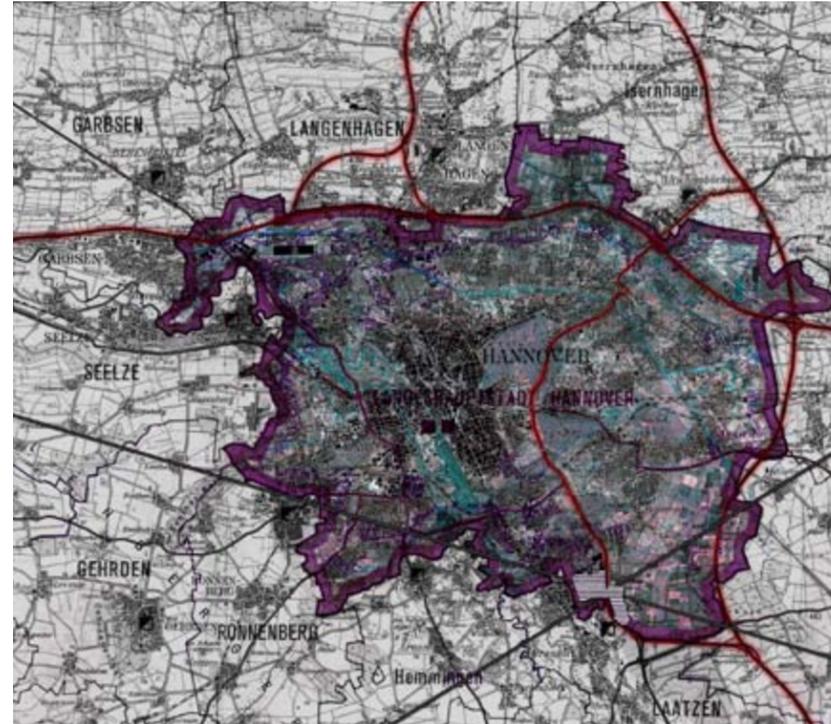
The future of the expo grounds remain uncertain and could continue to remain abandoned and unused. One of the main issues in finding organizations to relocate to the expo grounds has been its distance from the center city of half an hour. The site is easily accessible though because of the infrastructure improvements that were made. The great failure of the architecture here is its unwillingness to move out of the expo milieu. It forcefully remains in the 5 months of the expo back in 2000, living in a theme park world that no longer exists. Parts have succeeded in transferring themselves to new uses, but as a whole the site and abandoned pavilions do not form a cohesive place that allows for new use or function.

### 3.0 Site and Context Information



Hannover is in north central Germany. It is the capital of Lower Saxony with the population of more than 500,000.

### 3.1 Aerial photos and/or maps of site



The expo grounds are on the edge of the city limits, 30 minutes south east of the city center.



The site is divided between the east and west halves. The east is where most of the country pavilions were located and where most of the abandonment is located.

2000



The site in its full plan during the expo.

2011



The remaining pavilions with the abandoned in red.

3.2 Site Documentation

Much of the site sits largely empty and is used as storage for the nearby IKEA.



Hall 10 is the most recent structure to be taken down. This fate awaits the remaining abandoned structures.



The grounds are used very much as a park. It is common to see people walking dogs, biking, flying kites, and spending time with their families.

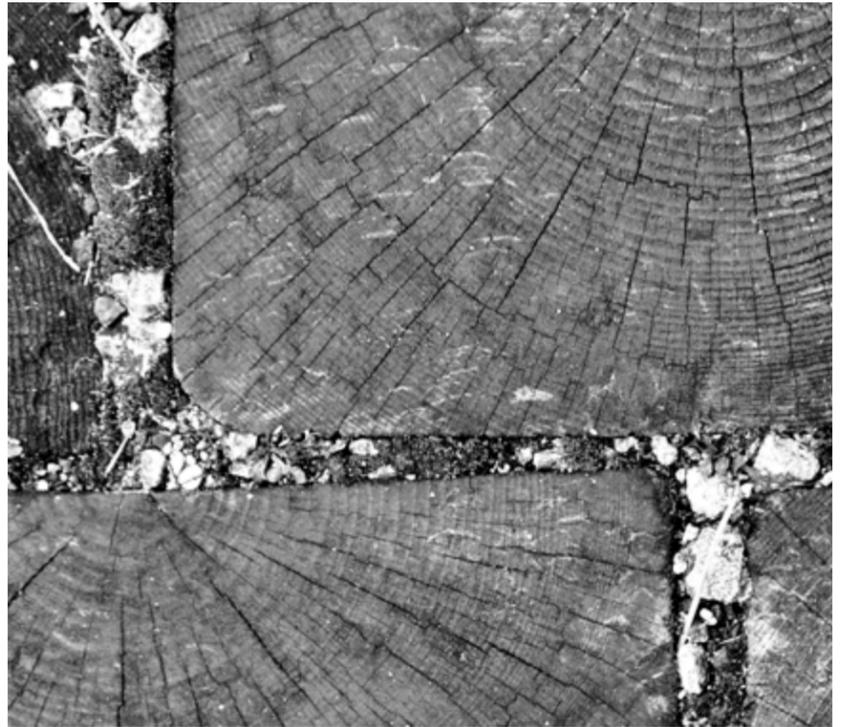


Material library



A sample of the palette of materials available throughout the expo grounds.

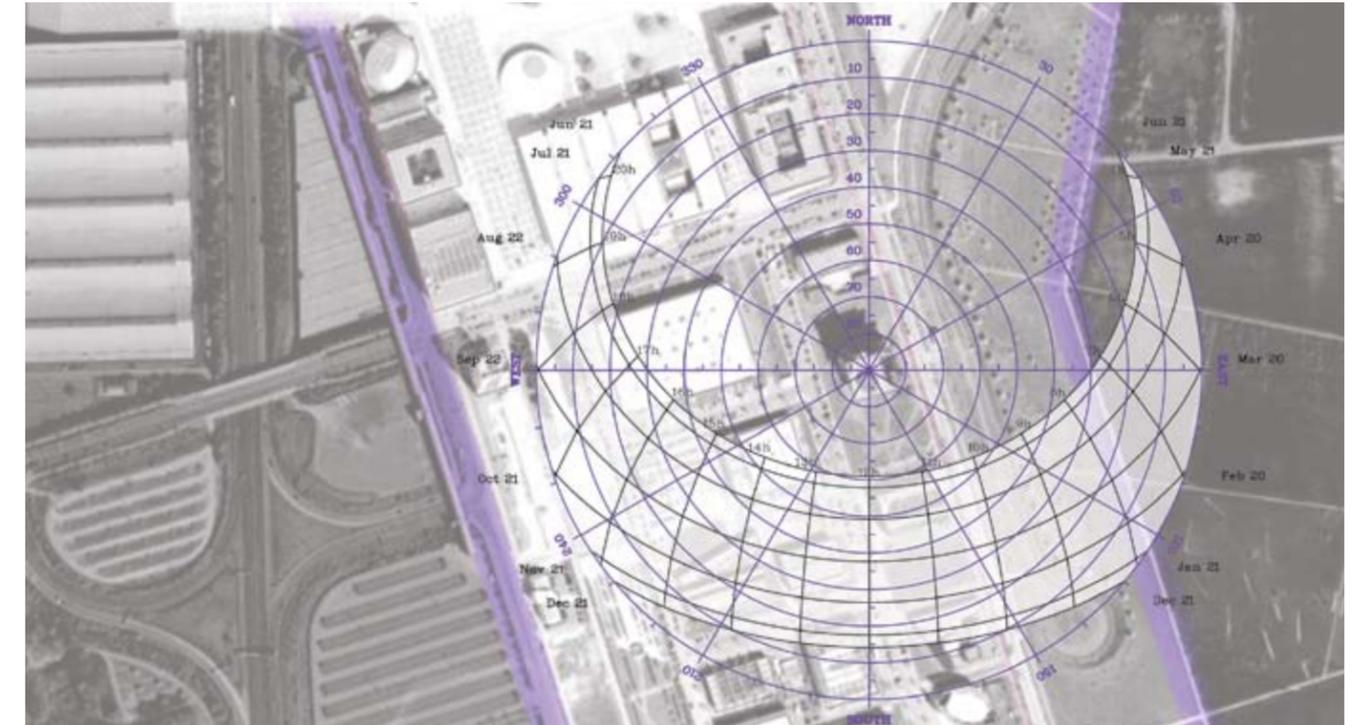




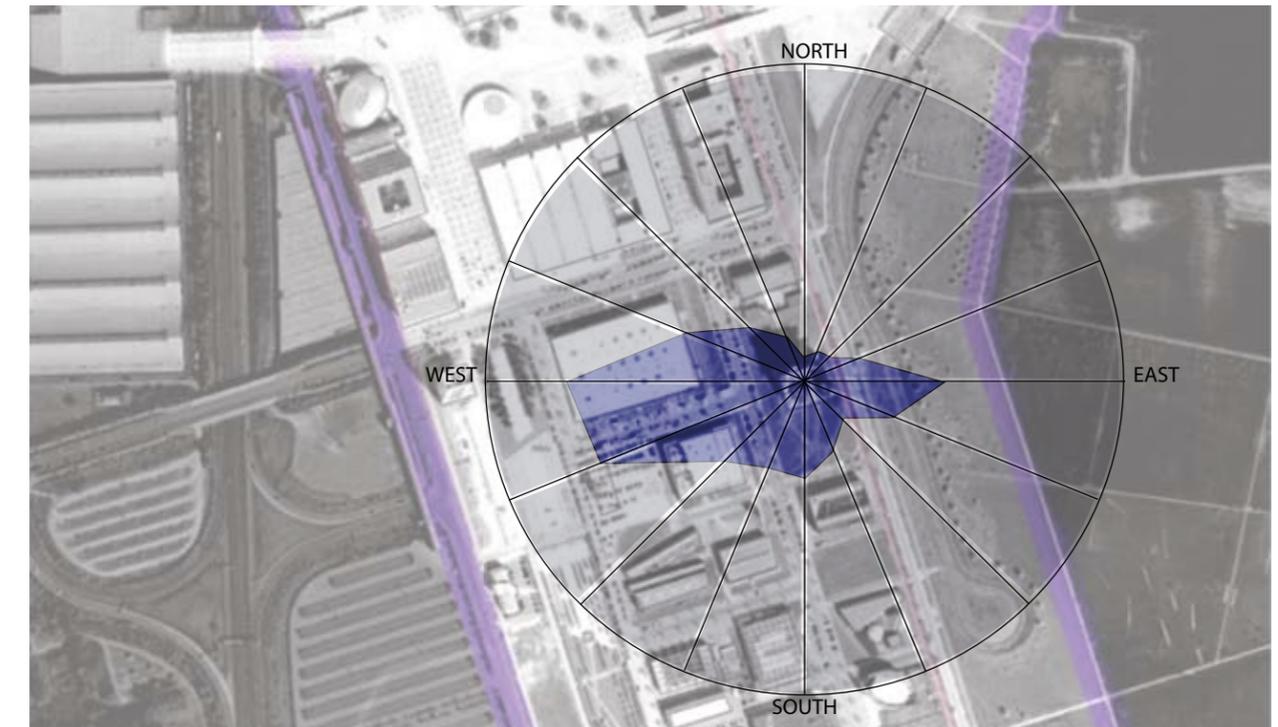


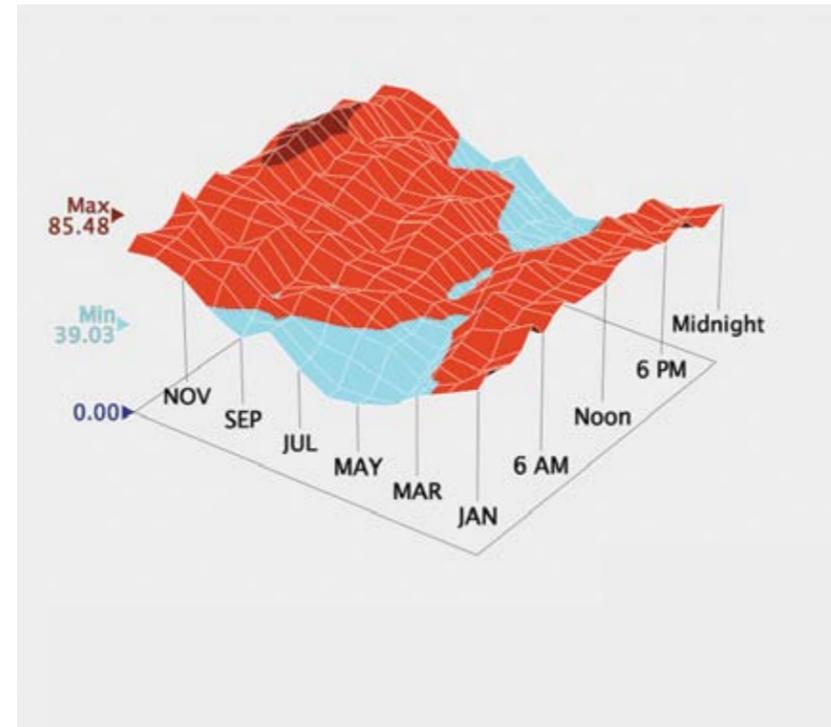
### 3.3 Site Analysis

Sun chart for Hannover, Germany. This chart reveals the position and angle of the sun throughout the year. This information is needed for passive lighting and heating design.

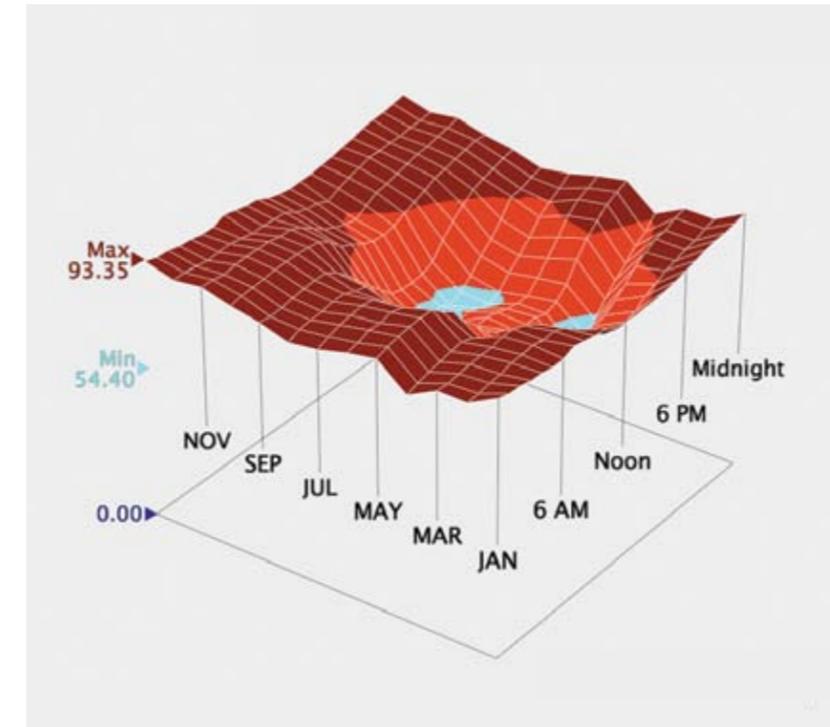


Wind rose for Hannover, Germany. This chart shows the predominate direction of the wind throughout the year. Informs thinking about natural ventilation in building.

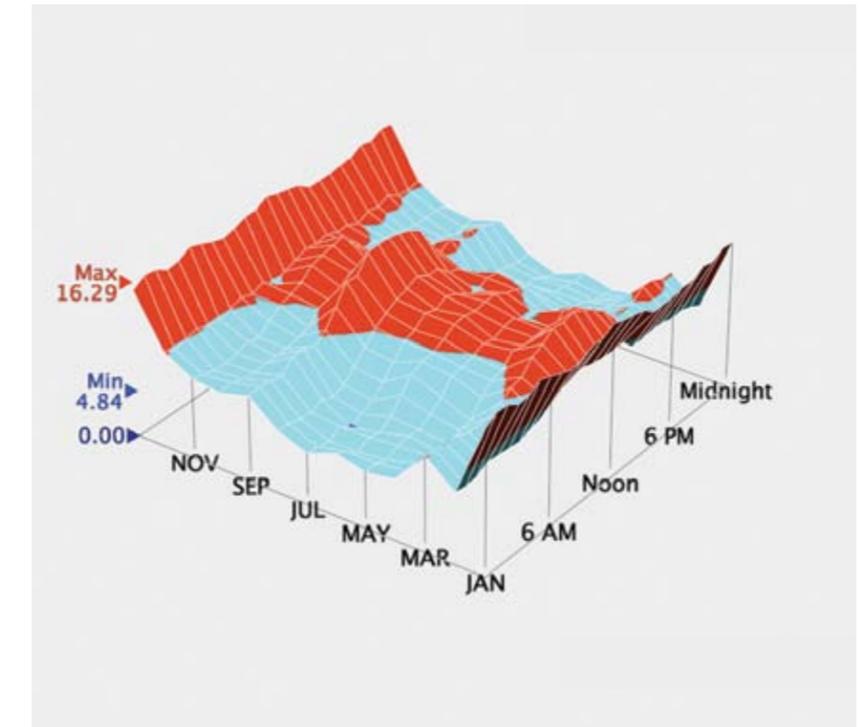




Percentage of sky cover



Percentage of relative humidity



Wind speed in feet per minute

## 4.0 Program

### The Hannover Principles, By William McDonough

1. Insist on rights of humanity and nature to coexist in a healthy, supportive, diverse and sustainable condition.

2. Recognize interdependence. The elements of human design interact with and depend upon the natural world, with broad and diverse implications at every scale. Expand design considerations to recognizing even distant effects.

3. Respect relationships between spirit and matter. Consider all aspects of human settlement including community, dwelling, industry and trade in terms of existing and evolving connections between spiritual and material consciousness.

4. Accept responsibility for the consequences of design decisions upon human well-being, the viability of natural systems and their right to coexist.

5. Create safe objects of long-term value. Do not burden future generations with requirements for maintenance or vigilant administration of potential danger due to the careless creation of products, processes or standards.

6. Eliminate the concept of waste. Evaluate and optimize the full life-cycle of products and processes, to approach the state of natural systems, in which there is no waste.

7. Rely on natural energy flows. Human designs should, like the living world, derive their creative forces from perpetual solar income. Incorporate this energy efficiently and safely for responsible use.

8. Understand the limitations of design. No human creation lasts forever and design does not solve all problems. Those who create and plan should practice humility in the face of nature. Treat nature as a model and mentor, not as an inconvenience to be evaded or controlled.

9. Seek constant improvement by the sharing of knowledge. Encourage direct and open communication between colleagues, patrons, manufacturers and users to link long term sustainable considerations with ethical responsibility, and re-establish the integral relationship between natural processes and human activity.<sup>8</sup>

These design guide principles set by William McDonough for Expo 2000 have become the basis for many projects since the then, however, they were never fully realized at this original site. Principles 6, 8, and 9 set the framework for this thesis and final design scheme.

REMOVE WASTE



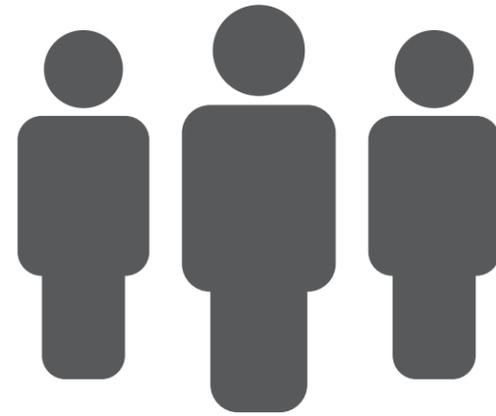
Principle 6, the genesis of McDonough's Cradle to Cradle, leads to the program of the project. The remaining pavilions on the site sit empty, abandoned, unused. They are waste. The built environment does not reflect the very temporary nature of the event. Instead of lasting for several months, they will rot here for years. Many have already been destroyed and Hall 10 is currently being destructed. This same fate awaits the surviving pavilions where they will do nothing more than add to landfills. This process goes directly against any sustainable thought. This program will be a recycling processing center and storage site. Individually each pavilion may not contain much material, but together they are a wealth of resources. Wood, glass, steel, concrete abound along with many unused technical systems. This center will work to salvage as much as possible from the structures. The materials will be prepared as needed for either use in other building projects or to be recycled and reused in new ways.

DESIGN BETTER



It is imperative that the new buildings learn from the mistakes of the expo and the design is proactive in resisting the same end. New structures are necessary because the remaining pavilions would require much work to be inhabitable. The permanence of these structures also betrays the temporary nature of the work being done and again fails to learn or respond to past failures. The warehouse, research labs, and gallery are designed to meet their temporary needs. The various components are capable of being disassembled and used elsewhere as necessary. For example, the precast concrete blocks that will be used for offices and research are capable of existing completely independently of the rest of the built environment. There is an understanding here that this will not last forever, nor is it meant to. This knowledge is carried throughout from a schematic level to the specific design of bolt connections and foundations. Ultimately all that will remain is a footprint, a memory of what once was.

## EDUCATE PUBLIC



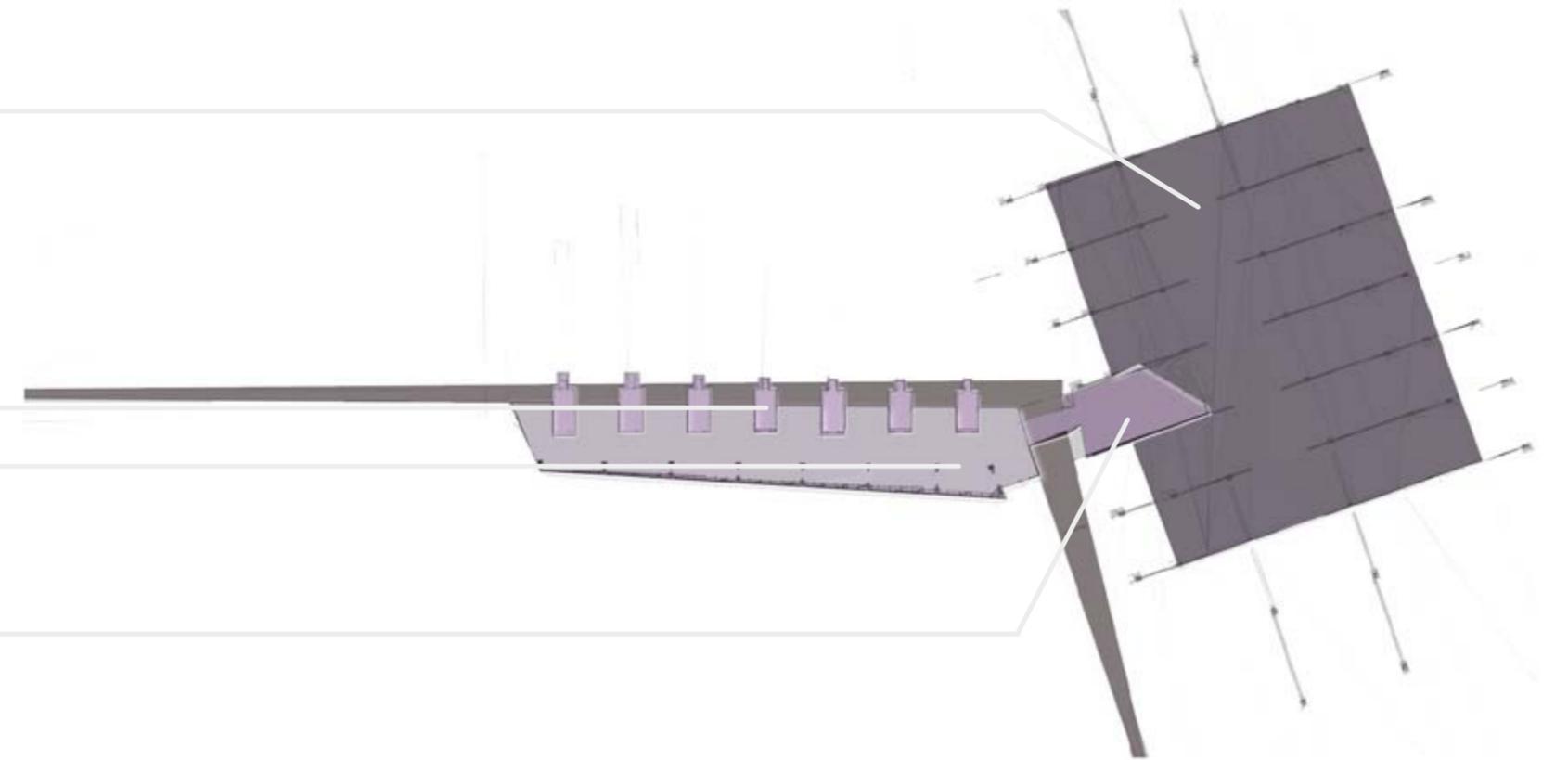
The final portion of the project is the need to educate. As McDonough realizes in Principle 9, the sharing of knowledge is a vital part of the process. This educating will occur in two ways on the site. First through interacting with the 'ghost' pavilions and secondly through the education gallery. Once stripped of use able resources, remnants of the pavilions will remain as markers, reminders of the past, and the failures of the expo. Like grave markers they will speak of what has been and alert to the necessity of change in regard to our wasteful obsession with mega events like the expo and Olympics. These markers will vary from visible structure to the outline of concrete foundations. The second mode of education will be through the gallery in the main structure. Here, visitors will be able to learn about the process of recycling the expo as well as the methods used. This space can also serve as an art gallery to host events also informing the public for the need to alter our ways and learn from past mistakes.

**Research offices**  
Spaces for research in the fields of recycling, building methods, materials, and practical application of the resources at hand.

**Warehouse**  
Used for storage and assembly of materials. This portion operates as the preconditioning center for future recycling. A place for learning and experimentation

**Public Gallery**  
Open to the public this open space will be used for a variety of purposes. It will hold art exhibits pertaining to the work of the center. Educational events and showcases will also be on display here.

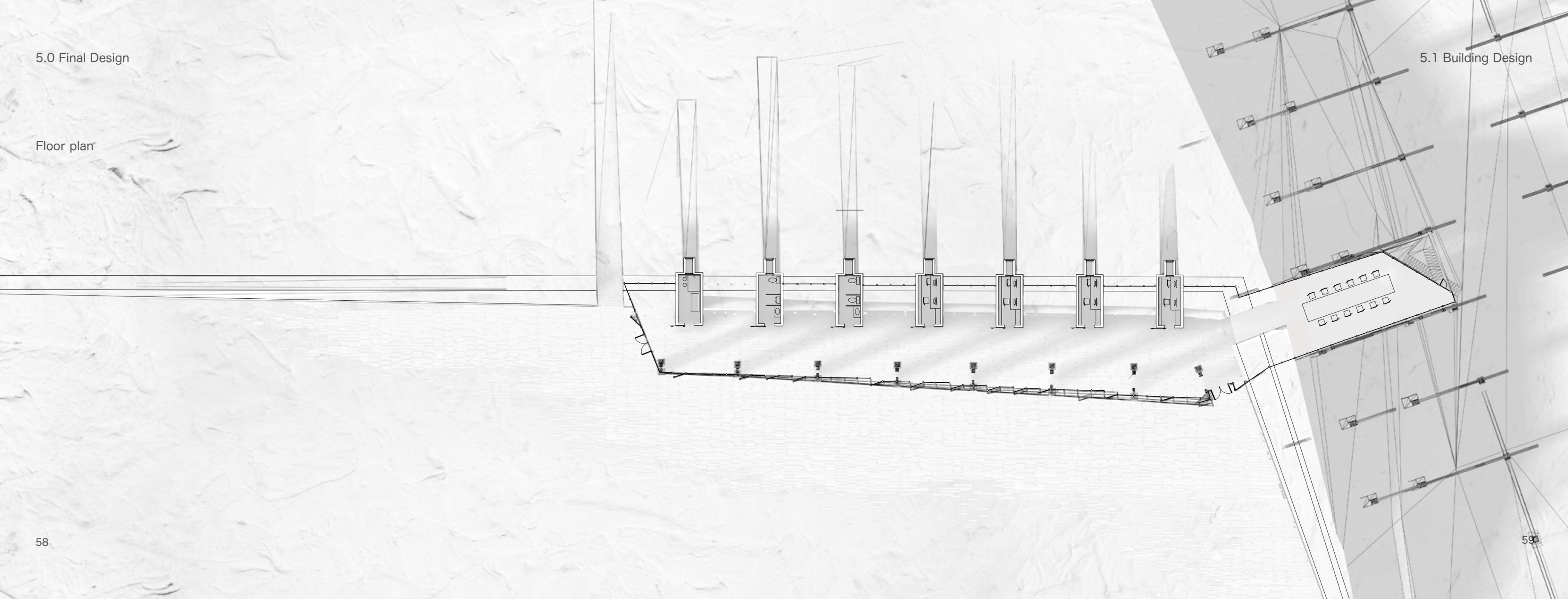
**Conference Room**  
The 'bridge' component between the warehouse and research components. It physically brings them together and allows access to both levels. Also a center for public lectures and events.



Why build a new building?

If waste is already such a problem, how is building more an improvement? As seen in the site documentation the existing infrastructure as not aged well in the past 10 years.

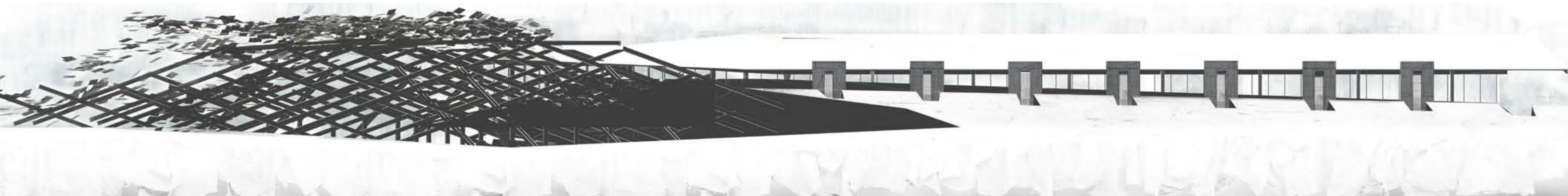
To reuse one of the remaining pavilions would require a significant amount of renovation. Rebuilding the old would only reinforce these previously wrong building decisions. A new building will be more efficient and can specifically meet the needs required by this new program. The design and construction of this building also become an important part of the process. It is a way of new design and building that must happen. The building here itself will become one of the educational tools of the facility.



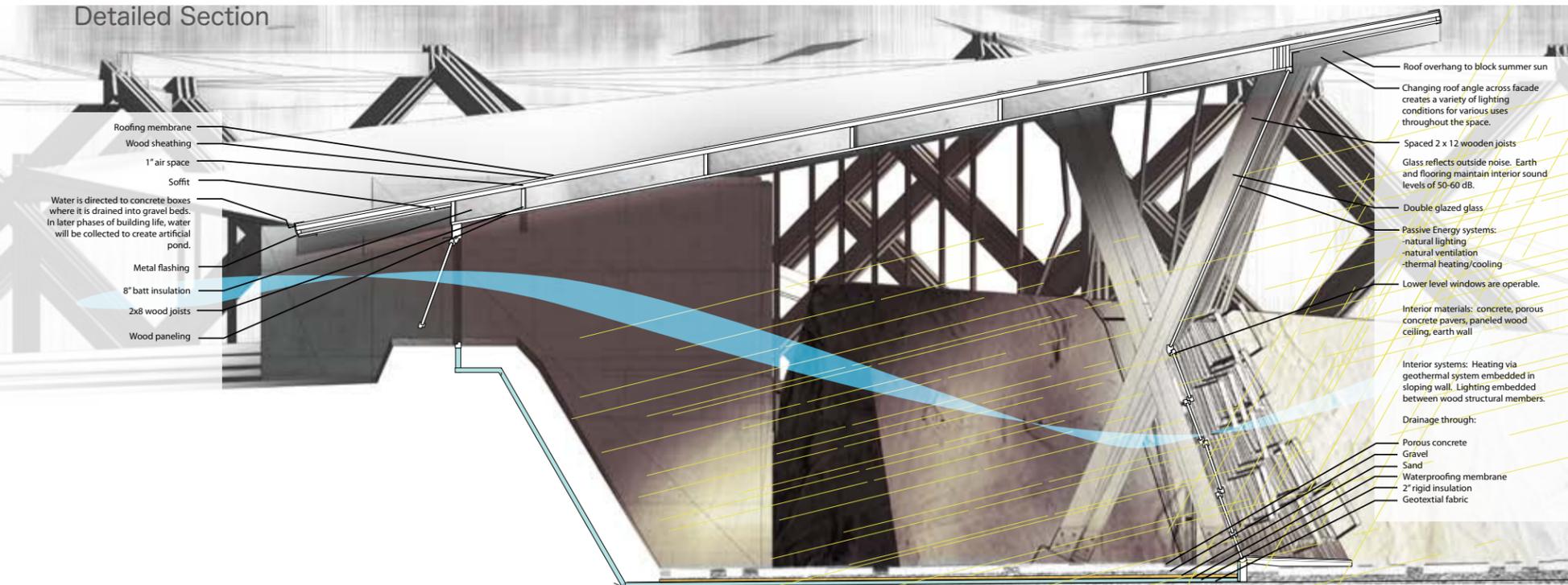
South Elevation



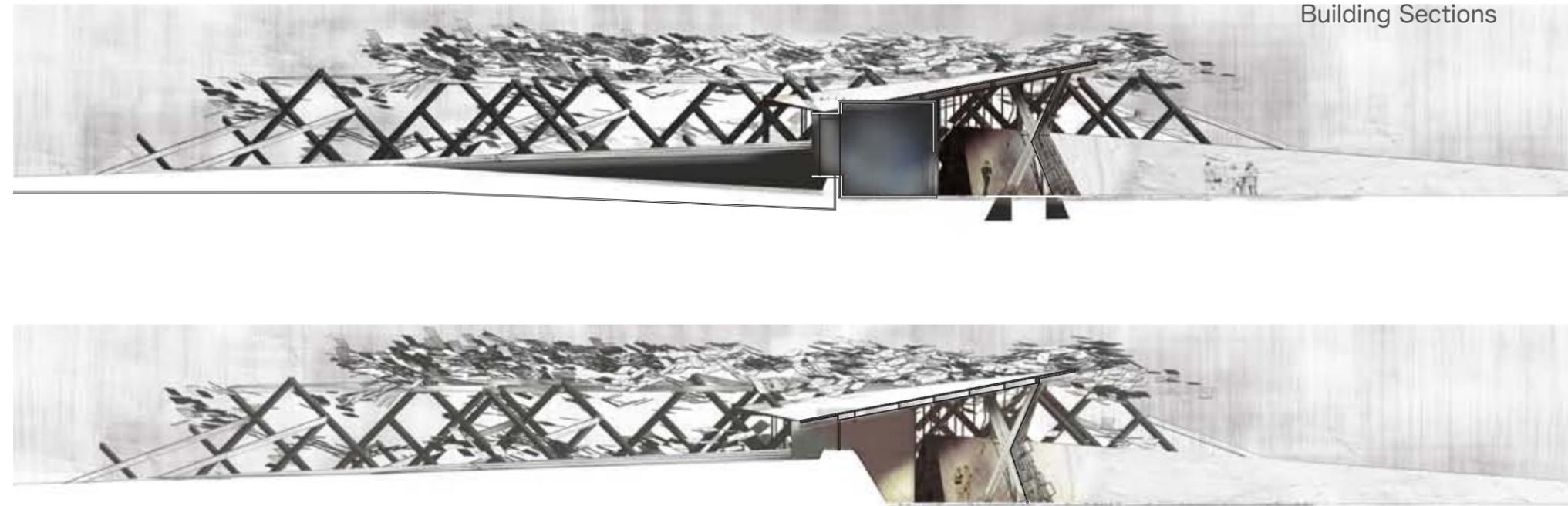
North Elevation



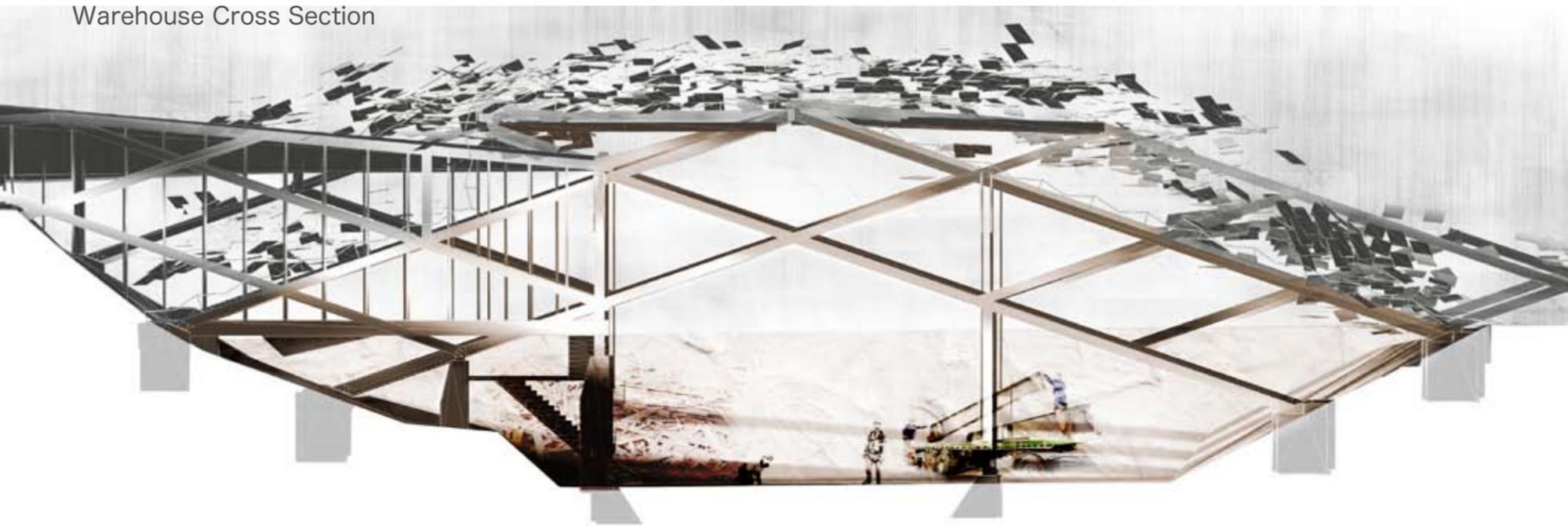
Detailed Section



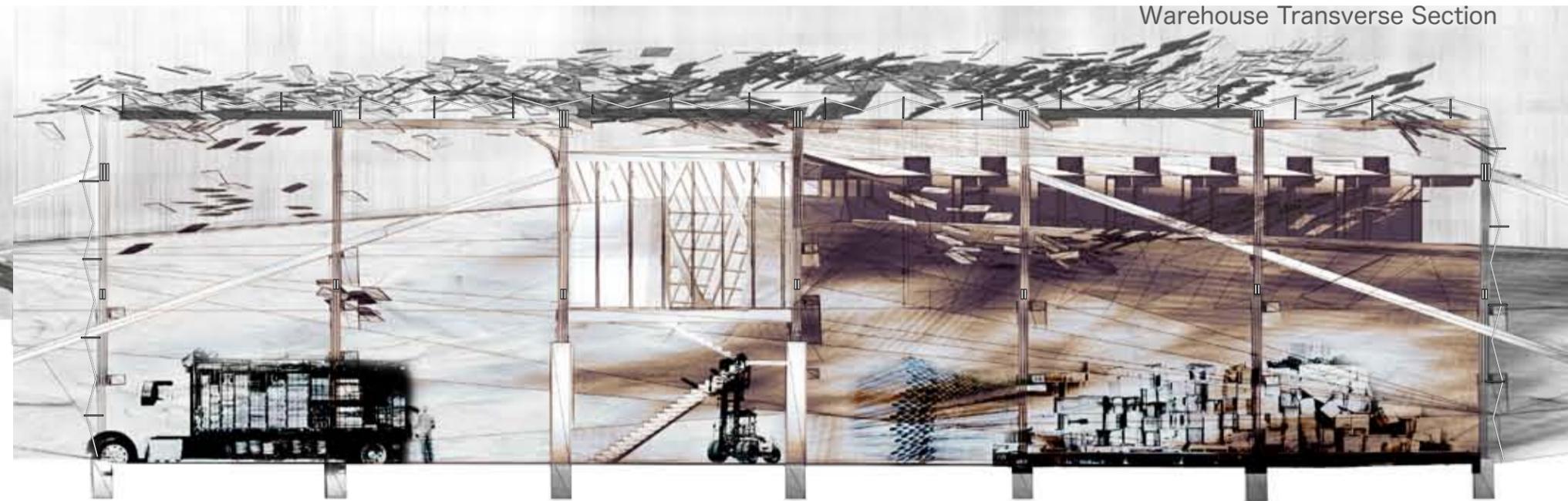
Building Sections



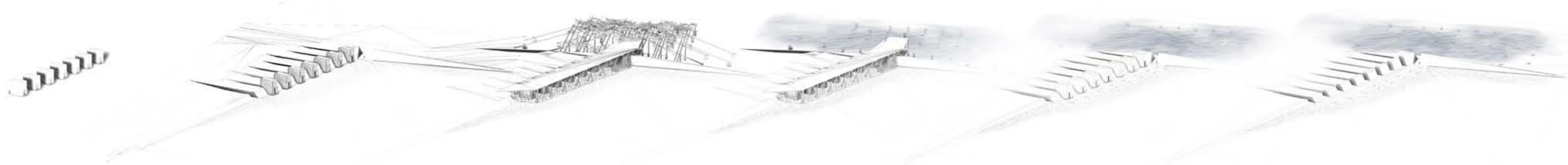
Warehouse Cross Section



Warehouse Transverse Section



Phased Building Diagram



Phase 1: Research labs put in place

Phase 2: Warehouse pit dug out, earth used to create wall and landscape moves

Phase 3: Warehouse and public gallery constructed.

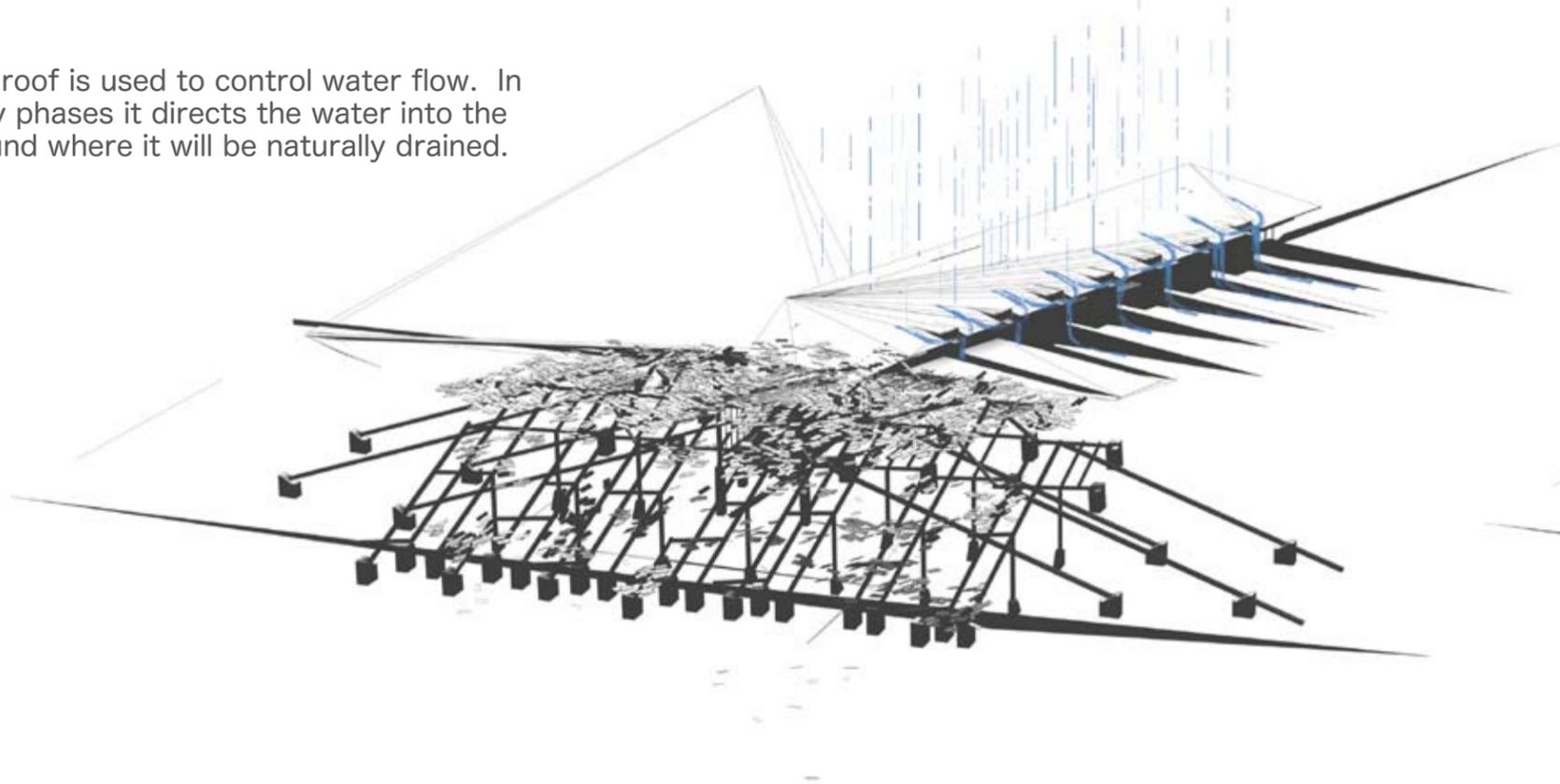
Phase 4: Recycling process finished, warehouse removed and trench area converted to pond.

Phase 5: Public gallery space deconstructed and research labs remain.

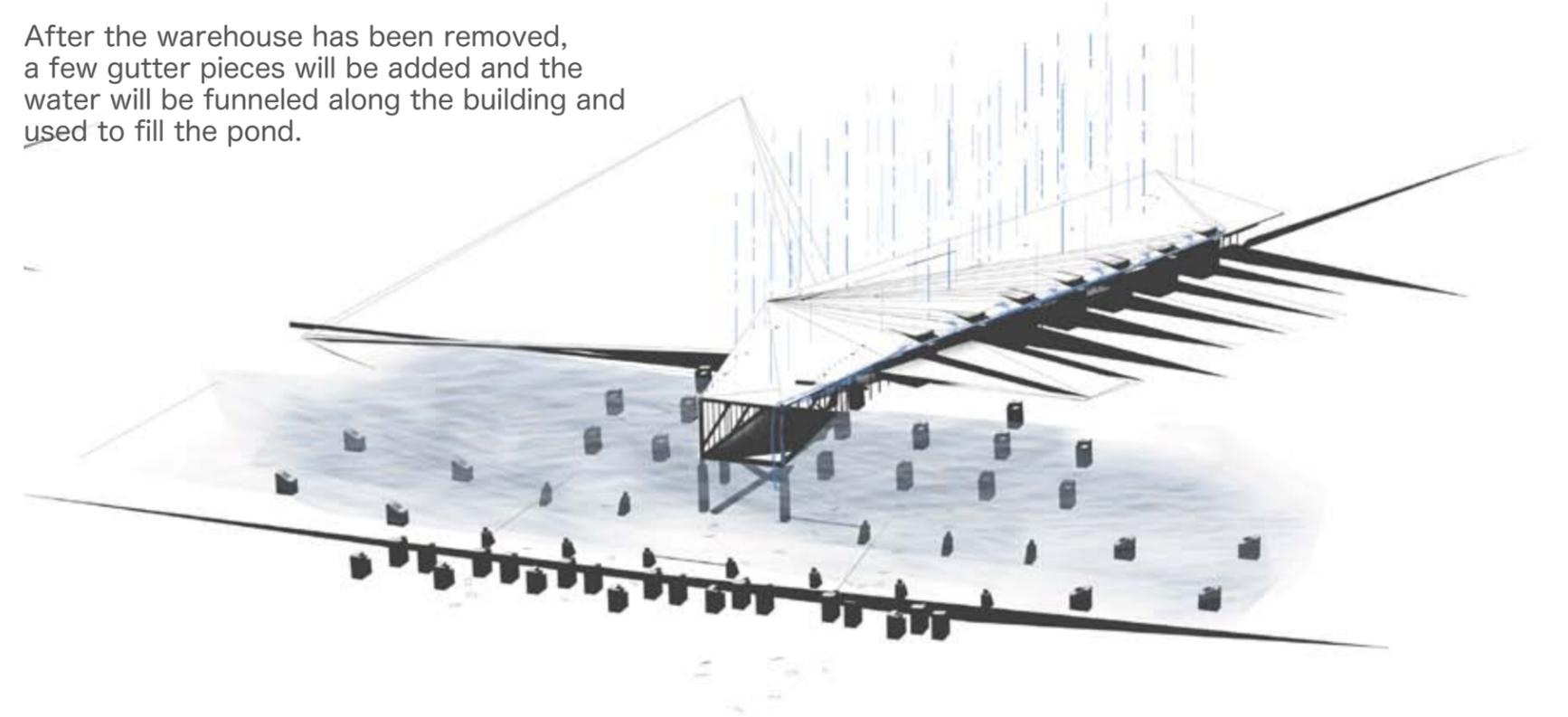
Phase 6: All architecture removed and landscape moves remain intact within the park.

## 5.2 Building Details

The roof is used to control water flow. In early phases it directs the water into the ground where it will be naturally drained.



After the warehouse has been removed, a few gutter pieces will be added and the water will be funneled along the building and used to fill the pond.

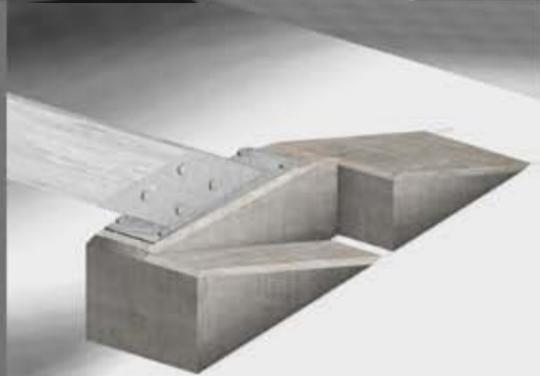
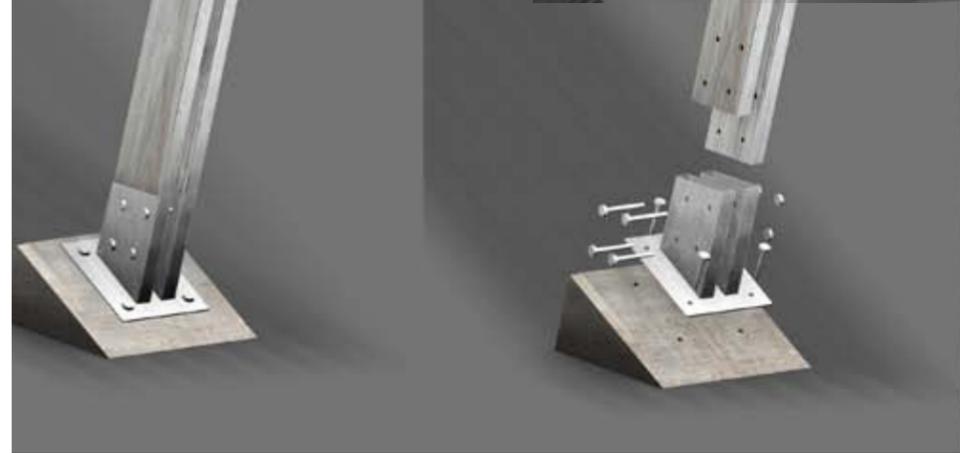
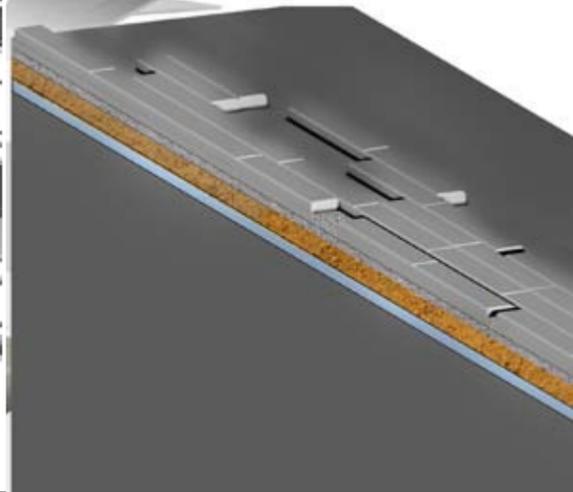
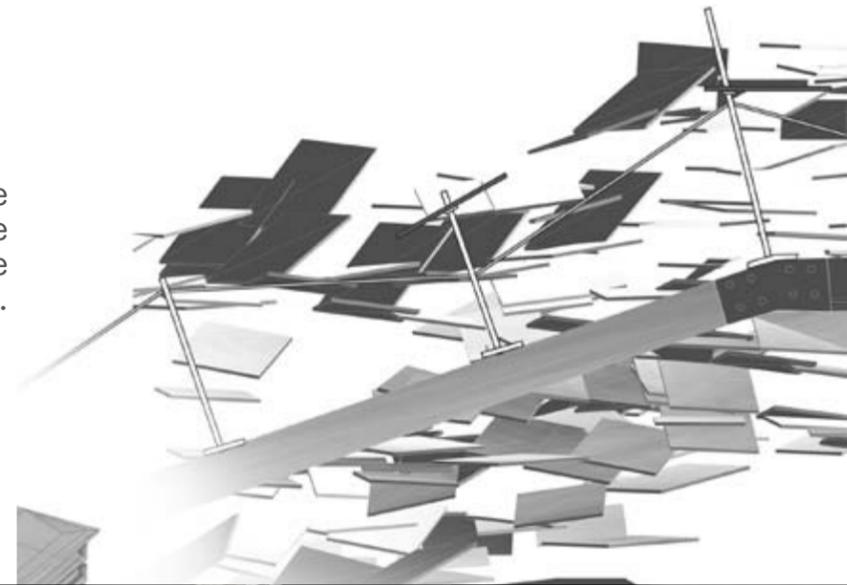


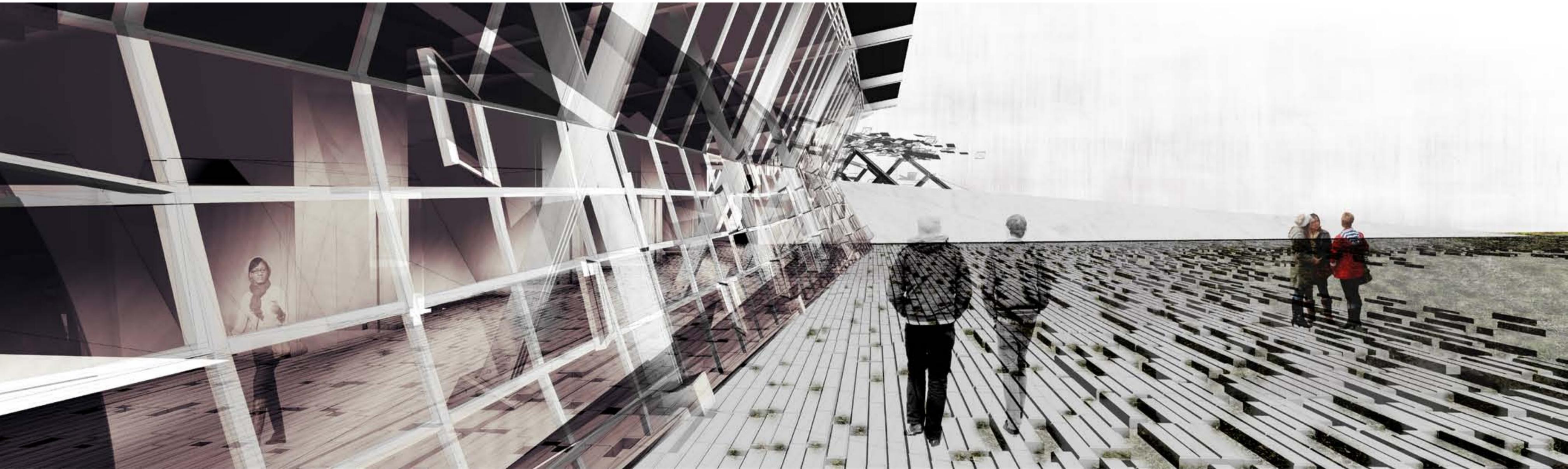


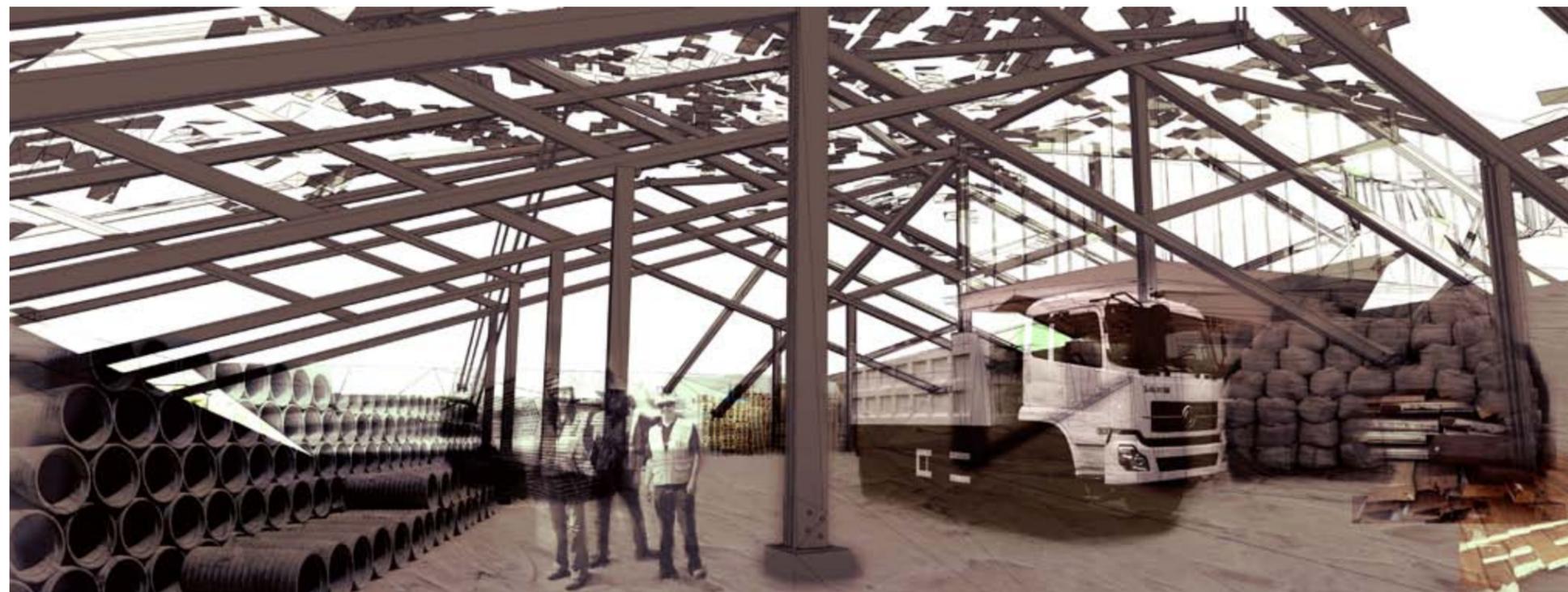
The concrete box offices are prefabricated units that can be assembled and disassembled as needed.

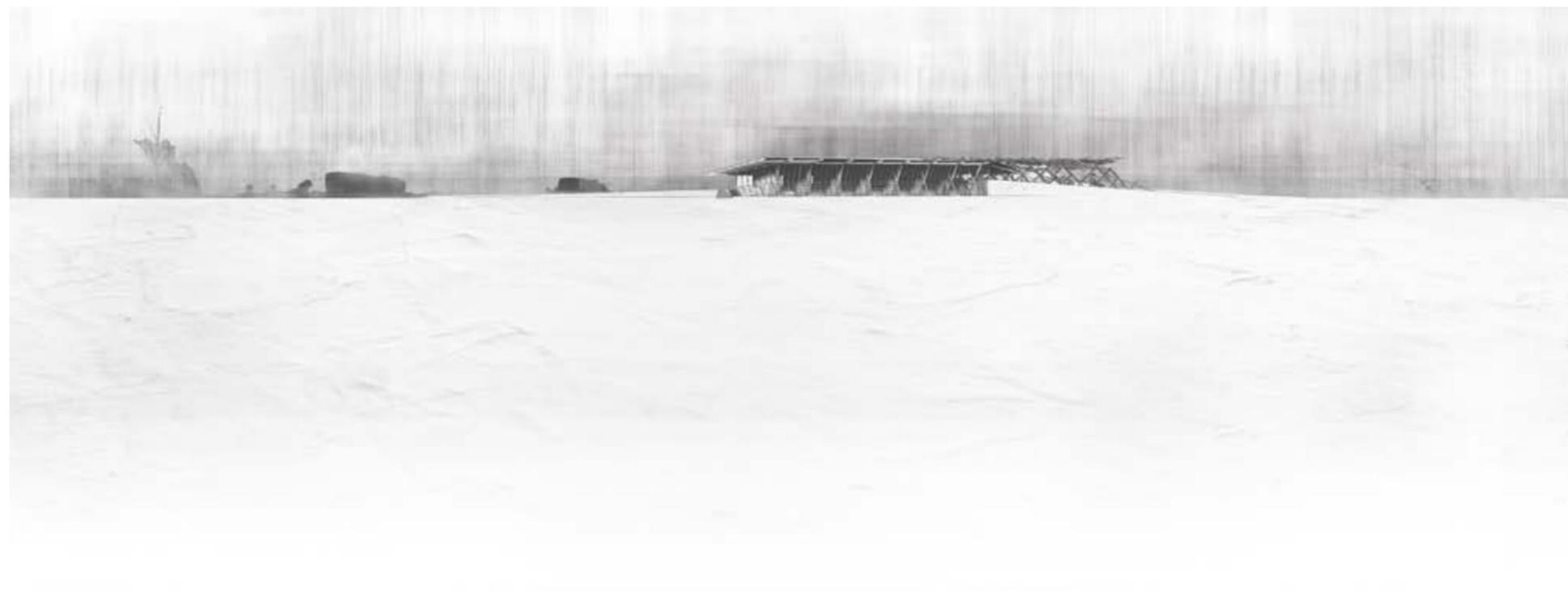


These details reveal the deconstructable nature and reusable quality of the building elements.

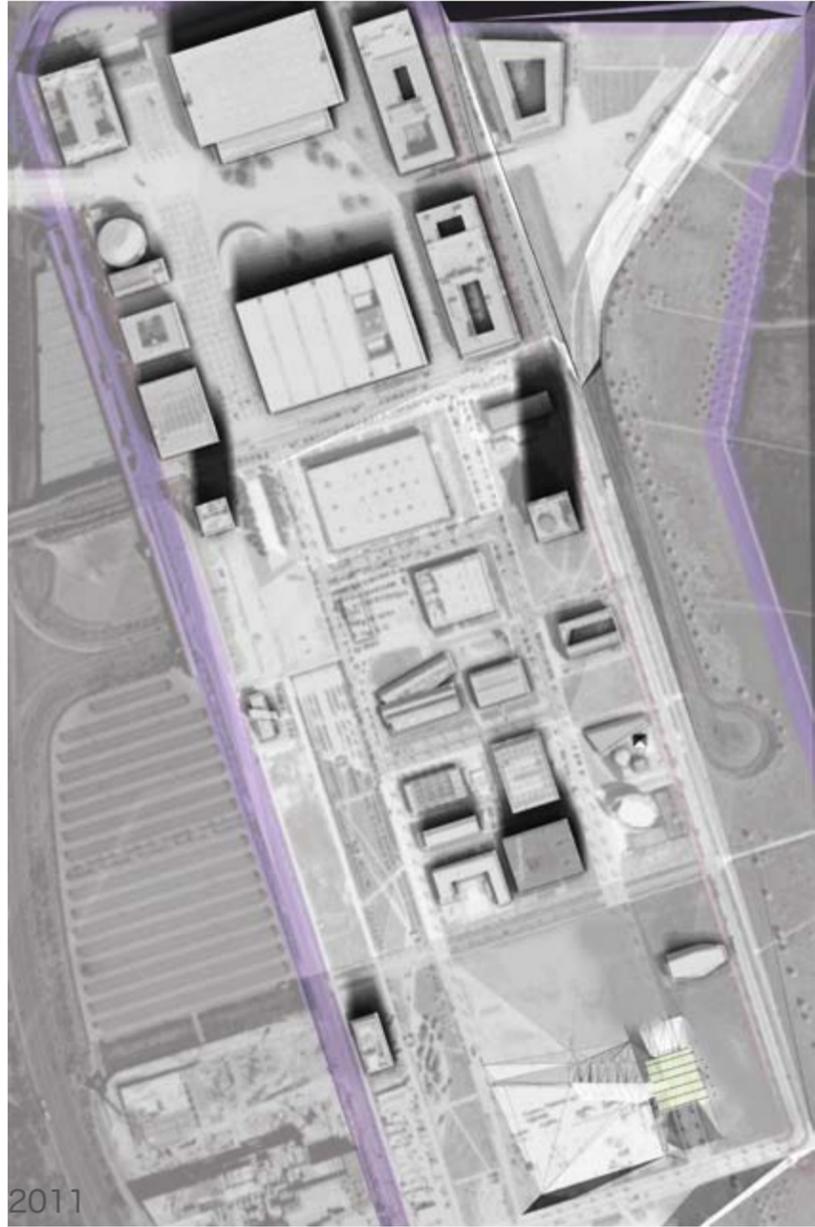




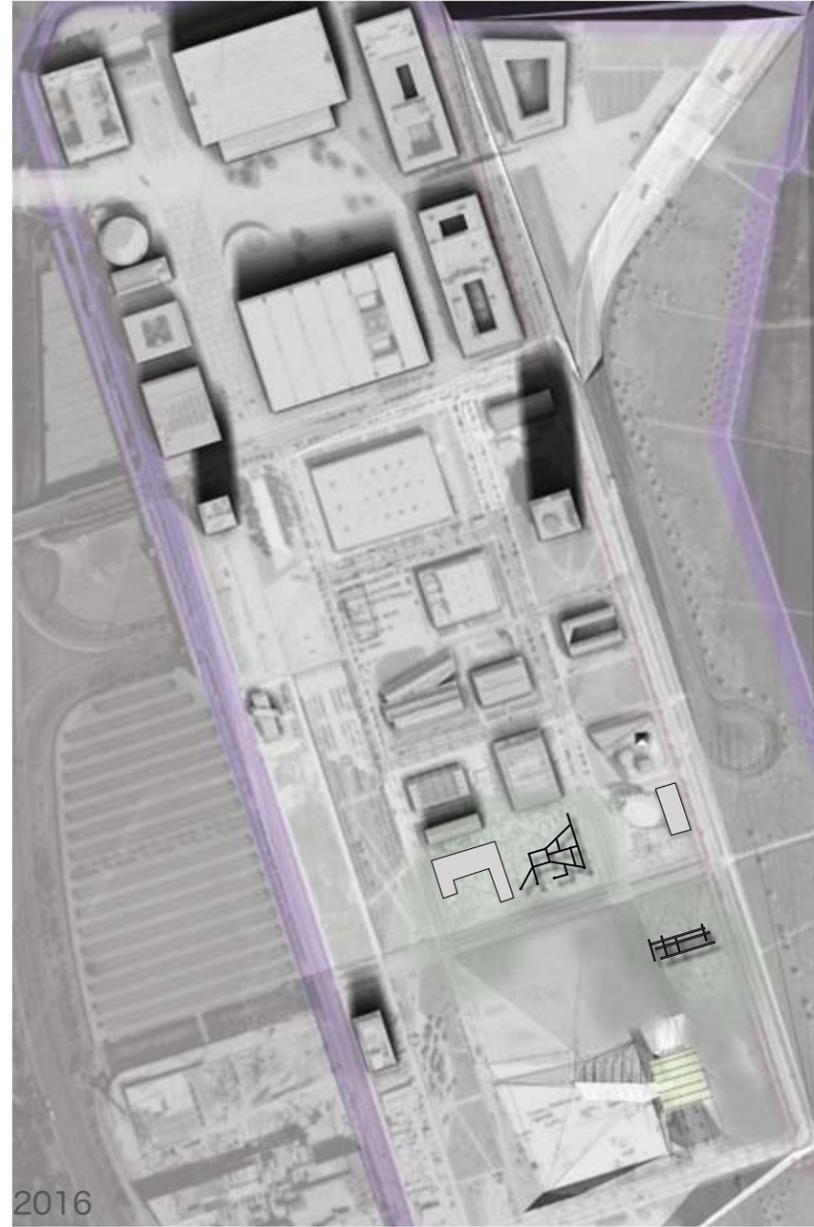




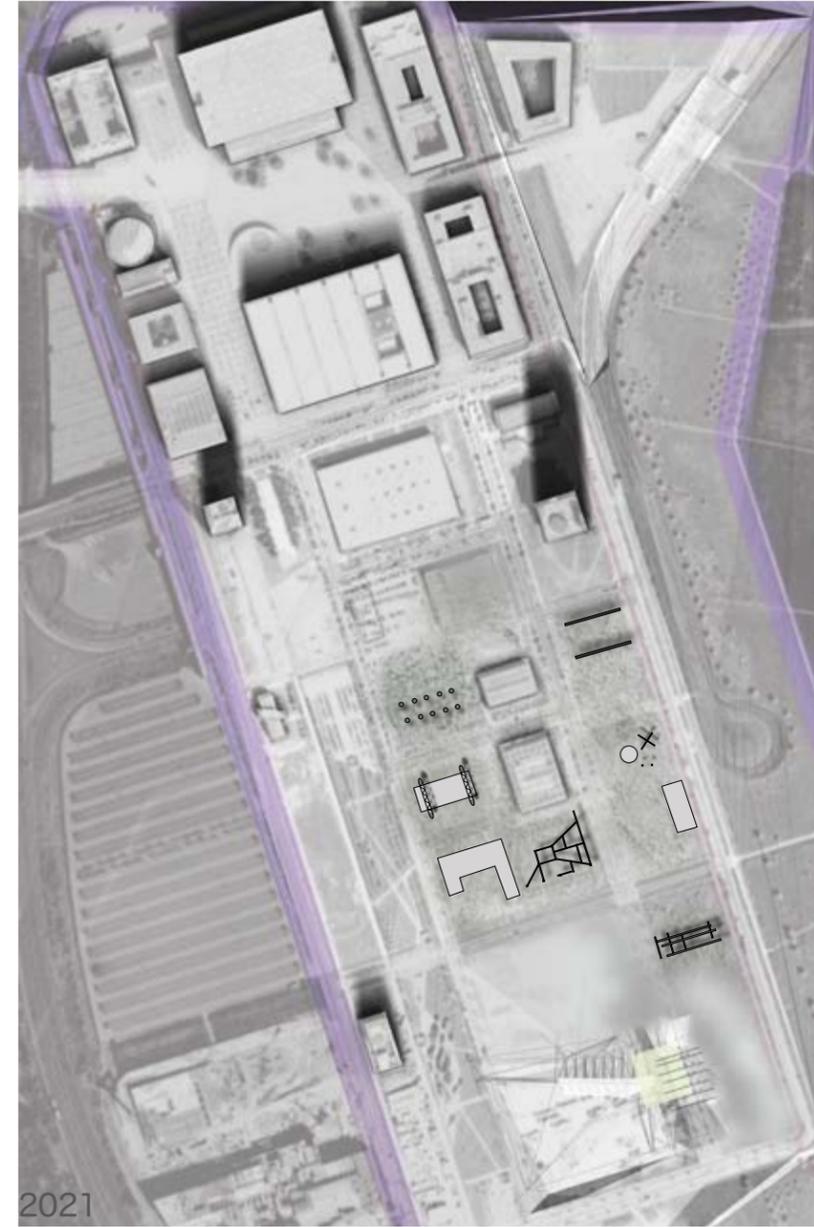
5.3 Site Plan



2011



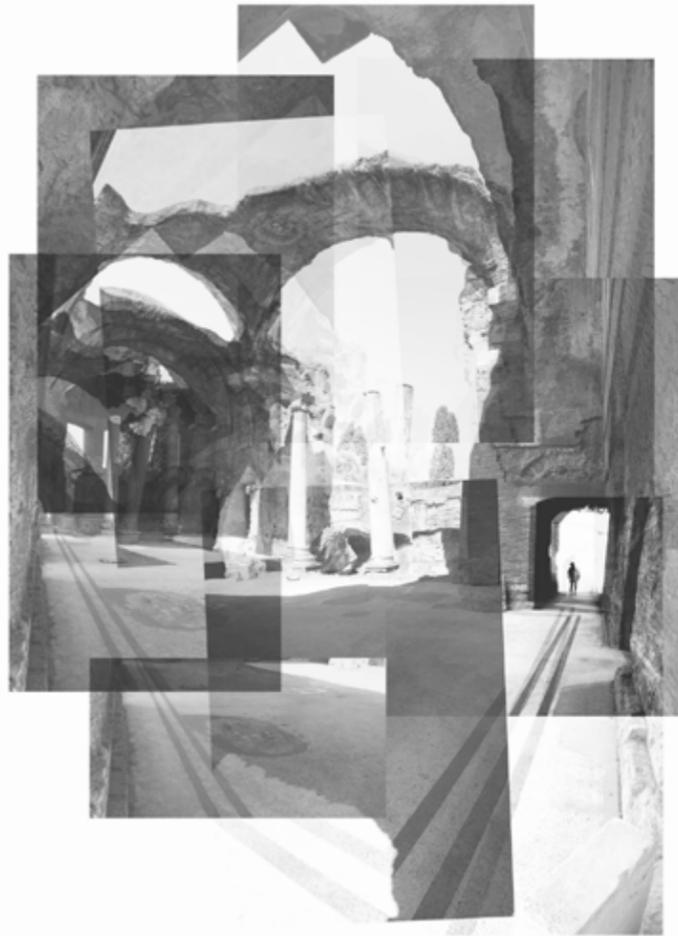
2016



2021



2031



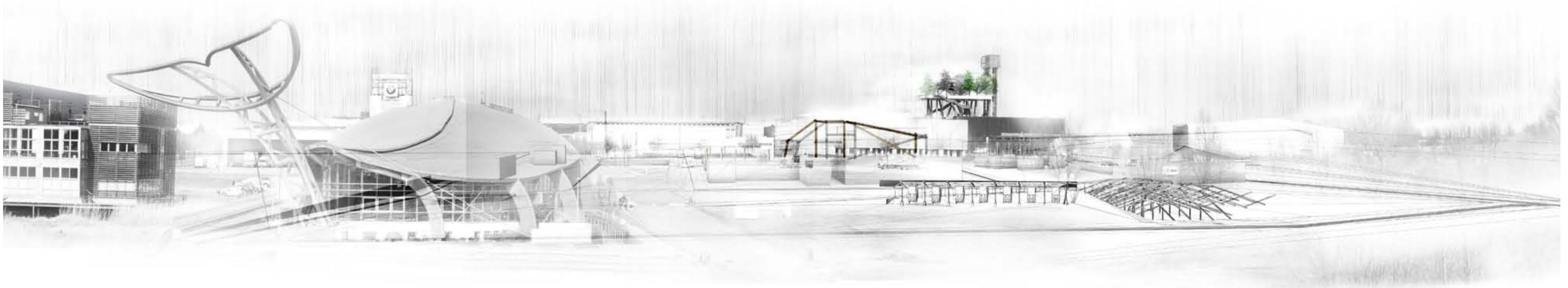
Ruins at Hadrian's Villa and St. Nikolai in Hamburg, Germany



Though ruins, these sites act as memorials to the past. The expo site can also act as a point of reminder, but also looking towards the future as it becomes a fully usable park.



Site Perspective



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[http://upload.wikimedia.org/wikipedia/commons/2/2e/Osaka\\_Expo%2770\\_Kodak%2BRicoh\\_Pavilion.jpg](http://upload.wikimedia.org/wikipedia/commons/2/2e/Osaka_Expo%2770_Kodak%2BRicoh_Pavilion.jpg)

Zachary Jones

# ACADEMIC VITA

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### EDUCATION

**The Pennsylvania State University**, University Park, PA 16802  
Bachelor of Architecture  
Graduation: May 2011

**Sede di Roma**, The Pantheon Institute, Rome, Italy, 00186  
Fall 2009

**Chambersburg Area Senior High School**, Chambersburg, PA 17201  
Graduation: June 2006

### WORK EXPERIENCE

#### **Teaching Assistant**

Arch 131s, Penn State University, University Park, Fall 2010  
Arch 499c, The Pantheon Institute, Rome, Italy, Summer 2010

**Certified Flagger**, Valley Quarries Inc., Chambersburg, PA 17201  
Summer 2009, 2008, 2007  
Responsible for the safety of drivers within construction zones.

**Gallery Assistant**, Zoller Gallery, Penn State University, PA 16802  
School Year 2006-2008  
In charge of installing and taking down art shows.

### TECHNICAL SKILLS

Computer: Photoshop, Illustrator, InDesign, AutoCAD, Form Z, Sketchup, Maya  
Wood shop certified, laser cutter and CNC router trained.

### ACTIVITIES

Care For AIDS volunteer, 2011  
40 Kids in 40 Days 40 Days organizer, 2011  
Penn State Navigators, 2006-2011  
    Social Justice Committee Chair, 2010-2011  
    Spring Break Volunteer, 2007-2010  
Schreyer Honors College, 2008-2011  
Concession Stand Manager for PSU Football, 2008

### HONORS

AIA Henry Adams Certificate, 2011  
Penn State 4th Year Design Excellence Award Runner Up, 2010  
Premio Piranesi Prix de Rome: Honorable Mention, 2009  
William H. Hajjar Competition: Finalist, 2009  
Renaissance Scholar, 2006-2011  
Alma Heniz & August Pohland Undergraduate Scholarship, 2008