I, Michael P. Darcy, hereby submit this original work as part of the requirements for the degree of Master of Architecture in Architecture (Master of).

It is entitled:
Work / Ethic: A Systemic Approach to Sustainable Urban Renewal

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This work and its defense approved by:

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Work / Ethic

A Systemic Approach to Sustainable Urban Renewal

A thesis submitted to:

The Graduate School
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abstract:

This thesis seeks to address global issues of sustainability through the development of a systemic approach to urban renovation and renewal that simultaneously deals with issues of urban blight and vacancy, and maintains the existing character of the urban fabric. Reusing the existing urban fabric minimizes environmental costs of material production, acquisition, and transportation, while sustainable master-planning and architectural concepts, adapted from existing projects seeking similar ends, address broader goals of awareness, passive and renewable energy infrastructure and an ethical awareness of the environmental costs of construction. This systemic methodology addresses urban renewal at three scales and develops strategies for each one: the entire neighborhood; the structures that inhabit it, and the infrastructure that supports them; to the detail-construction scale. This thesis proposes utilization of ecologically sustainable architecture and neighborhood master-planning that serves as a vehicle for psychological, societal, and ethical shifts toward a paradigm of sustainable urban renewal.

The proposed project examines methods of modifying the Mockbee Complex on West McMicken Ave. in Cincinnati to serve as a mixed-use hub, a beacon of sustainability, and an anchor program that can help foster the rehabilitation of the adjacent Brewery District, Brighton Arts District, and Over-The-Rhine. Specific features include: (1) Infill housing that densifies the community and portrays values of ethics, economics, and ecology; (2) Transit and pedestrian infrastructure, both new and reactivated, that connects to multiple neighborhoods; (3) Integrated approach to energy self-sufficiency that utilizes minimally invasive infrastructure; (4) Functional anchors that aid in community building through contextually specific programming (5) Passive means of heating, cooling, and lighting through creation of large cut openings in the existing built form; (7) Kit of parts that utilizes reclaimed material types, conceived as a pre-fabricated modular system of construction.
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I. Preface

Growing up in Cleveland, Ohio, I was exposed to issues facing “rust belt” cities first hand. Cleveland, like Cincinnati, had an industrial and urban construction boom in the early 20th century that has since left many vacant or under-utilized industrial structures and spaces across the urban landscape. These industrial vacancies are typically surrounded by neighborhoods that are in desperate need of renovation and rejuvenation in the form of density, connectivity, and sustainability.

My grandfather, a brick and stone-mason who had built a few of the homes in the aforementioned neighborhoods, instilled in me at a very young age the value of working with my hands. I gained an appreciation of construction means and methods through first-hand experience on many family projects. All of the family projects I worked on growing up were design-build, often using materials from disassembling other buildings or leftover from other construction projects.
In addition to my family background, I attended St. Ignatius High School in a mixed use urban area of Cleveland called Ohio City, not far from the steel mills that my father worked in to put himself through college. During my time at St. Ignatius, I was exposed to the negative impact of the urban environment in decline, from the ever growing shortage of quality infill housing and homelessness, to the lack of jobs to support residents of these urban neighborhoods. Along with the recent resurgence of the steel industry, the thriving healthcare market, and the entertainment districts in Cleveland, there has been an influx of younger generations returning to Cleveland’s urban core and surrounding urban boroughs. This influx provides a new need for solutions for urban housing and renewed neighborhood vitality.
When I left Cleveland to attend college and graduate school in Cincinnati, I was exposed to many of the same issues that affect post-industrial urban environments. Being exposed to these issues first hand in design studio has allowed me to approach the concepts of adaptive reuse of materials and structures in many of the areas of Cincinnati that require urban renewal. Through my undergraduate and graduate experiences, I have been afforded the worthwhile opportunity of working in a design-build studio project set in Walnut Hills, an urban borough of Cincinnati. The premise of the project was to reactivate a vacant urban community space through use of adaptable architectural elements. The biggest challenges of this project to create elements that could act as transformative architecture were twofold: (i) being mindful so as not to detract from the character of the historical context of the neighborhood, and (ii) working within the confines of a paltry budget. This challenge called for creative and unorthodox means of material acquisition, which, in turn, drove the overall project design.
Terry Boling, Professor of Architecture at the University of Cincinnati, headed up the studio design-build project. We were introduced to the concept of “material alchemy” with the goal of effectively finding new ways to utilize existing or found materials for new construction. Multiple trips to the local metal scrap-yard and checking with local industries for scrap or waste, as well as traditional reclaimed material retailers, were utilized to generate iterative studies. The result of the design-build project culminated in an adaptable prototype to serve as a framework for other transformative spatial urban community interventions.
This group of experiences culminated in the mindset that existing buildings and materials have an inherent value that is far more compelling to maintain than merely considering the monetary value or “worth.” This mindset establishes these precepts:

• that neighborhoods are worth saving, not replacing;

• that the value of any building should be measured based on its significance within the existing community’s context;

• that the methods of construction used initially to create a building or neighborhood (hand tech vs. machine tech), and its potential for adaptation to other programs / uses, may, in the eyes of the existing community members, far outweigh the pure cost issue;

• that this method of valuation is integral/imperative to the people who intend to “improve” the community and to the people who make up this community.

With this in mind, most existing buildings in the urban environs of Cleveland, Cincinnati, or other post-industrial cities in similar situations, are worth saving to mitigate the negative impact of the construction industry on the environment (material acquisition and transportation), while at the same time saving money on materials and labor in construction, and maintaining the historic urban fabric.
II. Problem

**Sustainability**

In 1987, the concept of climate change and sustainability was introduced by Gro Harlem Brundtland in Our Common Future, also known as The Brundtland Report. “Sustainability” is therein defined as: “Meeting today’s needs without compromising the ability of future generations to meet their own needs.”1 Our Common Future introduces the triple-bottom-line (a.k.a. Green Braid concept) as “Economy, Ecology, and Social Equity.” The report details the issues relating to consumption of resources and the extent of human damage to the planet while suggesting methods for the mitigation of these negative impacts.

Fast forward to 2014: Sustainability is no longer a choice, but a necessity. The advances in science and technology since The Brundtland Report was published have allowed scientists to better analyze the issue of climate change. The International Panel on Climate Change (IPCC) recently published a series of studies that go into detail regarding the impact of climate change and the many issues that must be addressed in order for humanity to slow down-and reverse-the negative impact on the planet. The report primarily “details the impacts of climate change to date, the future risks from a changing climate, and the opportunities for effective action to reduce risks.”2 It has identified: “[o]bserved impacts of climate change [that] have already affected agriculture, human health, ecosystems on land and in the oceans, water supplies, and some people’s livelihoods. The striking feature of observed impacts

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is that they are occurring from the tropics to the poles, from small islands to large continents, and from the wealthiest countries to the poorest.”  

There have been many other independent studies that either confirm or worsen the outlook for the future of our planet if humanity continues on its current destructive trajectory. Other such studies have commented on the fragility of civilization relating to allocation of resources, including energy: “The fall of the Roman Empire, and the equally (if not more) advanced Han, Mauryan, and Gupta Empires, as well as so many advanced Mesopotamian Empires, are all testimony to the fact that advanced, sophisticated, complex, and creative civilizations can be both fragile and impermanent.”  

The key issue here being access to energy, resources, food, and other community-sustaining elements.

**Housing Demand**

The IPCC studies identified population growth as another issue that goes hand in hand with sustainability. With growth in population comes greater demand for housing, energy, infrastructure, and materials. A housing study published in 2013, prepared for the Urban Land Institute found that a majority of both Millennials (e.g., those born between 1980’s to the early 2000’s) and Baby Boomers (e.g., those born between 1945-1962), the largest age groups of recent generations, are moving to, or plan to move back to mixed-use environments in the next five years (through 2018). The younger Millennials tend to prefer to more compact urban environments with walkable amenities, a community trait that is also sought by the Baby Boomers. There is currently a deficit of quality housing to fulfill those needs in many aging industrial cities like Cincinnati. This demand for urban renewal / housing coupled with the realities of the current urban environments present a unique opportunity to create a new paradigm of urban renewal. There is, of course, development that is currently ongoing to meet

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3 Ibid. 
the needs of these urban pioneers, but this new infill generally neglects larger issues of global sustainability altogether.

Vacancy / Neglect / Demolition

As previously stated, the current trajectory of development of our planet under existing methods and precepts will effectively destroy the earth’s current ecosystems and many of their inhabitants unless meaningful, significant changes are implemented to correct those methods currently utilized in our society. In the US, the architecture and construction industry accounted for 40% of total solid waste (or 136 million tons / year) in 1996. Forty-three percent of this waste is from residential construction projects. This figure has since increased to 170 million tons / year in 2003.6

The demand for new urban development coupled with the quality or lack of existing residential housing options, presents a unique opportunity for our generation and those that follow: the opportunity to create true sustainable urban renewal. In other words, to engage in development initiatives that do not seek to destroy existing communities in order to create entirely new ones. Initiatives that seek to build on what exists and fill the gaps to independently sustain each urban community.

The most significant challenge to implementing sustainable technologies is that these technologies currently account for extremely high start-up costs for any type of new construction: residential, commercial, or industrial. Adding to these significant costs are the costs of renovation to existing buildings and infrastructure. Further, there are added costs of demolition required to make the existing urban community setting suitable for any renovation to take place. Therefore, it is extremely challenging to initiate and implement urban renovation that does not price the existing community’s residential offerings out of the then-current residential market due to the current developer-driven systemic renovation paradigm: tear down everything old and replace with everything new.

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A new paradigm—a completely new mindset—is required to meet the demands of our new urban pioneers while maintaining the essence of the existing communities. This paradigm is embodied in the “triple bottom line” concept originally put forth by The Brundtland Report: “Ecology, Economy, and Social Equity,” and summarized by David Orr: “How and how intelligently we weave the human presence into the natural world will reduce or intensify other problems having to do with ethnic conflicts, economics, hunger, political stability, health, and human happiness.”

III. Research Discussion

This thesis poses research questions at three distinct yet interrelated scales:

• At the Master Plan scale, can a thriving sustainable neighborhood be created from the historic bones of an existing neighborhood?

• At the Building Form scale, how can existing vacant structures and spaces be utilized to create more ecologically, socially, and economically sustainable urban built forms?

• And at the Construction / Material Detail scale, can a kit of parts or modular methodology be developed for the transformation of prototypical building / spatial types and conditions based on principles of the adaptive reuse of building and material life-cycles?

Renovation

There are a multitude of recent texts and architectural works that relate to the Research Questions set forth above relating to urban renewal as it relates to adaptive reuse and aspects of the Triple Bottom Line of “Economy, Ecology, and Social Equity.” Anna Weier, a psychologist and environmentalist from the University of Manitoba, sought to perform, describe, and analyze an experiment that looked specifically at sustainable renovation of the existing urban low income residential sector.\(^8\) The primary goal of the project was to suggest well-thought

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out solutions to previously determined barriers to such projects. These barriers were determined as a part of the initial research for the project investigating the current discourse surrounding the issue.

The project culminated in a year long design-build renovation that was meant to be an example for others to follow. In the author’s conclusions regarding the experimental project, Weier recognized many of the shortcomings of the project and suggests how she could have changed her approach to get a better outcome. First, she recognized that many of the barriers to affordable, sustainable, urban residential renovation exist outside of the realm that can be affected by one person, let alone one profession. She determined that systemic infrastructure renovation / revision is required—an industry-wide shift in mindset—before any real systemic change would be possible. She also realistically suggested that this shift in industry mind-set must be accompanied by generous (federal, state, and local) government incentives and grants in order to overcome the cost/affordability barrier.

**Infrastructure**

One of the major issues identified by many industry experts is the lack of infrastructural support for sustainable systems to be integrated effectively into an urban community. Spiro Pollalis, et al, seek to address the challenges surrounding the implementation of sustainable infrastructural systems in their work *Infrastructure Sustainability and Design.* This work address the challenges from a holistic viewpoint including quality of life, as well as other social factors; lack of current government incentive programs; and, of course, costs of implementation for these necessary sustainable systems. They present two important ideas are presented, among others: (i) “social sustainability,” which is defined as “enhancing community livability by providing outreach, developing policies, and designing built environments that address both fundamental needs and also the well-being of a community;” and (ii) socio-ecological sustainability, aimed not only

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at preservation of existing natural resources and areas, but also at restoration of
natural areas within the existing fabric. These two concepts begin to provide a
framework within which socially sustainable environments can be designed that
positively impact the quality of life within the community.

Pollalis, et al, also discuss issues relating to the significant costs of sus-
tainable development. They cite the concept and methodology of Sustainable
Return on Investment (SROI) developed by economists of HDR, Inc. \(^{10}\) The SROI
concept is an effort to justify sustainable development from a cost / profit stand-
point and has been utilized to undertake many urban projects of varying scales.
The text provides multiple case studies highlighting the energy savings and
SROI, culminating in a quantification of the positive results for each sustainable
development project. These are only a few of the many lessons to be learned
from Pollalis, et al, but the aforementioned concepts provide a framework to
move forward into further productive research and meaningful progressive action.

Given the lessons learned from the examination of the texts by Anna
Weier and others, it was made clear that an overarching master-plan approach to
urban sustainability is key to success. For this reason, projects that exemplified
sustainable master-planning and building design were sought for analysis.

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\(^{10}\) Williams, John, and Stephane Larocque. “Introducing the Sustainable Return on Investment (SROI) an Objec-
BedZED: Bill Dunster & ARUP Engineering

The Beddington Zero Energy Development in London (BedZED) is a useful example of a sustainable urban housing development at a scale that includes multiple residential and commercial units working in conjunction with one another. Architect Bill Dunster, working in conjunction with engineers at ARUP, designed BedZED, considered a mixed use development. It includes 82 affordable dwellings of different scales and types to accommodate as many family types as possible. It also provides commercial office spaces of differing scales to accommodate anything from start-up businesses to sizable companies. The hallmark of this development is that it is almost entirely “off the grid.” Bill Dunster explains:

“On balance over a year, if the plant performs reliably, with only its planned maintenance downtime, then slightly more power is generated than is actually required on site. If this surplus power is between 5 and 15% of annual demand, it should be possible to pay off both the embodied initial construction carbon and the planned maintenance / replacement carbon footprint.”

Therefore this project provides an excellent model for new residential mixed use construction, for its exemplary sustainable urban design and construction techniques.
BedZED utilizes master-planning concepts that can be directly attributed to sustainable design principles. The development is mixed-use residential and office within a semi-urban context and boasts a multitude of active and passive sustainable concepts and systems in addition to aiding in the creation of a neighborhood eco-system. The CHP (Combined Heat and Power) Power plant provides a majority of the power to the development utilizing a bio-fuel harvested from local areas. The residential rowhouses are solar-oriented to take advantage of passive solar gains as well as being prepared to add photovoltaics as costs decrease.

The building/construction material selection is largely based on sustainable concepts of adaptive re-use and minimal impact. The structural system includes reclaimed steel as well as reclaimed hollow core concrete floor slabs serving as thermal mass. The cladding system takes advantage of the materials that require minimal upkeep including untreated wood cladding and brick masonry.
Another example of a successful sustainable urban housing development is the Solarsiedlung am Schlierberg developed by Rolf Disch Architects. This development exemplifies solar oriented design, as is easily recognized in the master-plan. The development utilizes renewable energy sources in the form of photovoltaic roof arrays. The project’s renewable energy sources coupled with its south-facing orientation produce an overall surplus in sustainable energy resources. The photovoltaic arrays are tied into the municipal electrical grid, and, therefore end up supplying the energy for a portion of the surrounding community.

Located in Freiburg, Germany, the master-planning strategy takes full advantage of the southern exposure of the development site while maintaining proper spacing of buildings and structures to avoid overshading, which would have a detrimental impact on the solar aspects. The interstitial space between rows of housing are used for household garden plots. The masterplan includes a mixed-use development program of mixed retail and residential spaces. The Freiburg development thus serves to benefit the community in many ways: by attracting retail traffic to sustain the local community, supplying sustainable forms of energy, and reducing CO2 and often harmful energy-related emissions.\(^\text{12}\)

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**Solarsiedlung Am Schierburg**: Rolf Disch

Sustainable concepts applied to an institutional development can be found at Ball State University in Muncie, Indiana, has taken a unique approach to sustainable energy infrastructure by capturing the earth’s natural capacity for producing heat through use of a geothermal network. The network stretches across campus providing heating and cooling for 47 buildings. It is made up of multiple master-plan components, including power stations, well fields, and hot and cold water loops. The power stations house the mechanical equipment that runs the system. The well fields were strategically located under existing parking lots, parks, and gardens to allow for greater efficiency of land use.

As of late 2012, the geothermal system cools 47 buildings and heats 22 buildings.

The environmental and economic cost of new construction creates a difficult impasse for the majority of average citizens seeking more sustainable housing and communities. Renovation of existing housing is often seen as a more cost effective alternative than buying a developer built home. The benefits of renovation however, are not limited to economics: “Renovating an existing historic home can save up to 50% of embodied energy when compared to a national average home.”

The following group of architectural developments take advantage of the concepts of adaptive reuse in an effort to make a positive impact on the life-cycles of materials and buildings.

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The Factory : Calvin Lehew

The Factory in Franklin Tennessee by developer Calvin Lehew is an adaptive reuse of a stove / oven factory into a mixed use development that serves as a retail anchor to support a thriving semi-urban community. The program is mixed-use with residential and light-industrial in the immediate context. The development hosts programs of various public and private use, from farmer’s markets and antique malls, to architecture offices and photography studios. The primary factory building has a large south-facing roof that has been taken advantage of through use of photovoltaic panels. The existing building also makes use of operable high clerestory windows that allow for natural ventilation in the hot Tennessee summers. The development makes the best use of the existing interior conditions by programming according to existing spatial conditions, ideally requiring minimal modification to achieve functionality for the new programs. New steel structure was added to some areas of the high-bay factory space to create a second floor. The minimally modified existing structure complements the relic to create a place with a unique character while serving as an impetus for further neighborhood development.
**Z-Gallery : O-Office Architects**

Z-Gallery by O-Office Architects is an international project in Shenzen Guangdong, China that makes use of existing vacant dye factory structures to serve as shells for interior programs that breathe new life into the site. The development is in its early phases of a master-plan that utilizes the entire facility to create a mixed-use arts district. This first phase includes artist’s studios and galleries and is meant to function as a reception or initial public interface for the district. The architectural intervention takes advantage of the exposed thermal mass and natural ventilation built into the existing structure. The interior program is articulated through the use of additive black polygonal modules that sit in stark contrast to the heavy, white, and weathered concrete framework of the relic in which they sit. The additions do not occupy the entirety of the interior space so that there is an interstitial space between old and new, the relic is allowed space to breathe.

Art Stable: Olson Kundig Architects

The Art Stable building by Olson Kundig Architects in Seattle, Washington, addresses the concept of adaptive reuse and life-cycles of materials and built form at the scale of an individual flat. This new construction project utilizes both active and passive sustainable concepts and systems, including geothermal wells. The geothermal wells are integrated into the structural pilings, this was the first instance of such a systems integration relationship in the United States. The program of the structure is mixed-use Live/Work and is dual-zoned to allow for maximum adaptability to the current needs of the community. The concept for the interior fit-out is to create a shell to be sold as an adaptable spatial unit. This concept allows for residents to create their own space specific to their needs, whether it be an art studio, an apartment, or both. To add to the customizable nature of the building, the north facade is left for residents to punch their own openings specific to their needs.

The CARGO project is an example of the adaptive reuse of both structure and spatial modules to create functionally appropriate spaces while maintaining the ability of future adaptability and reconfiguration. The existing factory interior boasts high-bay spaces with clerestory windows that provide indirect light and natural ventilation to this office space. The large open office area sits on the factory floor while the private and semi-private office functions are located in the double-stacked containers along the existing factory wall. The interior program is articulated through the use of additive metal shipping containers whose rough exterior and modular design sit in stark contrast to the heavy white factory walls of the relic in which they sit.
Relic Rock : DCH Global

The Relic Rock project by developer DCH Global Inc. takes the concept of adaptive reuse and material life-cycles to the scale of the individual components used to construct the building. Relic Rock utilizes a modular system of reclaimed steel structure and panels. The system was developed for new construction from the ground up and utilizes commonly used steel sections and sheet metal panels. The system integrates all interior systems for plumbing, electric, and HVAC into a single cohesive gridded system. The system allows for disassembly and further re-use at the end of its life-cycle in this configuration.

The concept of adaptive re-use is explored at multiple scales in the Wyckoff Exchange project by Architect Andre Kikoski. A vacant warehouse space is re-activated by opening the facade to the adjacent streetscape to allow for public interaction. The programs are meant to fill the needs of the growing arts & creativity district of Brooklyn, New York. The functions include food retail and a live-music venue. Using minimal demolition / intervention, the once vacant structure has found a use. The concept of adaptive reuse can be seen in many aspects of the development from the scale of the entire building to the details of material selection.
Alber’s Mill Renovation: McCool Carlson Green

This renovation project in Tacoma, Washington provides an example of an adaptive reuse of a masonry load bearing multi-story structure. The existing factory building was modified to create large openings at lower floors where the footprint of the existing structure is increased. This was accomplished through selective demolition and the addition of a new steel structural system to complement the existing masonry architecture. The additions to the existing building are clad in materials that complement the existing weathered palette while taking a more contemporary form.
One of the common themes found within the discourse regarding sustainability is the requirement of a societal and/or psychological shift towards that goal. Noted authority on ecological design David Orr provides insights into this topic in his text Architecture, Ecological Design, and Human Ecology. The most important concept put forth by the text is primarily psychological in nature. The way we think about design and shape our environments plays a direct role in how we think about and perceive our relationships to our environments. “Design inevitably instructs us about our relationships to nature and people that makes us more or less mindful and more or less ecologically competent. The ultimate object of design is not artifacts, buildings, or landscapes, but human minds.”

This is to say that the design work of current generations will inform the way that future generations think about design and what its role is in shaping the built environment.

If there is not a societal psychological and ethical shift towards sustainable means of living then humans will effectively destroy themselves. Either through societal collapse and anarchy, or “natural” disasters brought on by human destruction of the ozone layer leading to global warming, and further climate change.

The Centre de Documentation by Architect Gunther Domenig is an adaptive reuse of an existing building that evokes an analysis at a psychological level as a result of its history. The building once served as the congress of the “Third Reich.” Its architecture was meant to be example of the power of fascism. The thin diagonal “beam” intervention lies in stark contrast to the thick orthogonal building masses of the existing structure. This is meant to be an architectural denial of the power of fascism. The program of the building is primarily educational and therefore allows the building to exist as a relic for current and future generations to learn from. The “power” of the structure can be deduced from its massive structural masonry walls, and these walls have been left largely intact. The spaces within these walls, however, have been deconstructed to allow the new intervention to contrast the monumentality of the structure and undermine its fascist associations. This concept of addition and subtraction is extended to the material palette of the new intervention. In addition to it’s stark contrast in form, the new intervention is clad in glass and anodized aluminum, standing in stark contrast to the concrete and red brick masonry walls. The concepts put forth by this project are an excellent example of architecture representing psychological, social, and ethical ideals, and the concept that these ideals can be further shaped by the architecture.
The current state of discourse surrounding the topic of Sustainable Urban Renewal, with regards to adaptive reuse and the braided bottom line is quite broad and ranges across theories and practices being performed by many disciplines around the world. From small scale experiments in renovation and sustainability, such as the work done by Anna Weier, to large scale master plans aiming for zero carbon footprint and other lofty environmental goals similar to the work done by Bill Dunster, there is no shortage of information to pave the way for this proposal.
IV. Solutions

"History is governed by those overarching movements that shape and meaning to life by relating the human venture to the larger destinies of the universe. Creating such a movement might be called the Great Work of a people . . . The Great Work now, as we move into a new millenium is to carry out the transition from a period of human devastation of the earth to a period when humans would be present to the planet in a mutually beneficial manner . . . This is our Great Work and the work of our children." - Thomas Berry

This quote from Thomas Berry emphasizes the responsibility of the current generation of architects and designers to take up the task of bringing about this next stage of what Jiddu Krishnamurti called, “transformation of the mind, a way of living differently.”

While there are many projects seeking similar ends with regards to the “triple bottom line”, the current state of discourse does not include a built project that encompasses in their entirety the concepts that are examined herein. A systematic architectural approach to urban renewal that utilizes adaptive reuse and sustainable design concepts, both active and passive, focused on energy production, and efficiency of built-form. The process utilizes existing building stock to maintain existing urban fabric and sense of place. The goal here is that the architecture should fit into every aspect of its environment. Citing multiple economic systems including those developed by Paul Hawken (Natural Capitalism) and HDR’s SROI (Sustainable Return on Investment), one could safely hypothesize that costs of renovation could be repaid over time through use of sustainable building practices and renewable energy sources. Ultimately the architecture

produced as a result of this process will serve as a vehicle for a societal / psychological shift towards ecological sustainability and policy reform, as outlined in detail by David Orr.

Sustainable renovation is the key to maintaining the existing urban contextual fabric. It can be a holistic approach to urban renewal that is based on the concept of the Braided Bottom Line. This proposal has culminated in strategies for architectural interventions at multiple scales, specifically to address a neighborhood shift towards a sustainable model. The neighborhood has been examined at a master-planning scale to determine strategies and other frameworks required to create a sustainable model. Within this Master-Plan there are specific areas that will be further examined in varying degrees of detail. The ideal outcome of this work would be to develop a number of design processes and principles that can contribute to making the case for sustainable renovation. Strategies discovered through this process will include aspects that are regionally specific to “rust-belt” cities while being scalable and adaptable to other urban environments around the world with similar conditions.

The architectural intervention embodies the concept of the Braided Bottom Line placing an emphasis on environmental, economic, and social equity. An adaptive reuse live-work mixed use intervention fills the programmatic gaps in the existing neighborhood fabric. The main components making up the program include residential, retail, and light-industrial community shop components coupled with sustainable design concepts. Other programs such as transit infrastructure, agriculture, and single family home renovations are looked at in a broad manner, as more of a framework for the design-work that is being sought for the purposes of this thesis.

25 The term “rust-belt” is used to describe midwest post-industrial cities, such as Cleveland, Cincinnati, and Pittsburgh.
The proposal operates under the assumption of an ideal future condition. Maximum transit efficiency will be attained through utilization of the previously abandoned infrastructural systems that have an extremely close proximity to the proposed site along with all modes of transport that are currently in use including bus, pedestrian, bicycle, and vehicular.

Therefore, to summarize, the principal design aims for this thesis are:

• Mitigation of human impact on the environment so as to not impede future generations, through use of sustainable master-planning, and architectural concepts.

• Adaptive Reuse of materials and building stock to extend life-cycles, lessen the negative impact that the architecture and construction industry has on the environment, while maintaining existing contextual fabric.

• Creation of a new sustainable urban renewal paradigm that seeks to densify, connect, and sustain existing urban communities through use of sustainable renovation and infill, access to public transit and local food, and renewable energy infrastructure.

• Design of a mixed-use neighborhood anchor from the bones of an existing structure that exemplifies the existing contextual fabric and character of the neighborhood, while forging new values in the form of sustainable architecture.

• Development of a methodology for modification of existing built-form that is based on passive sustainable concepts, to fit within a neighborhood that utilizes renewable energy infrastructure.
V. Site / Context

History

Siting for the proposed thesis project / program is of vital importance due to the adaptive reuse basis of the project. Many other factors also played a major role in site selection: public visibility, proximity to transit, ample vacant land for proposed agricultural component, and historical urban context. The site for this thesis lies within the Urban context of Cincinnati, Ohio. There are multiple semi-vacant buildings near 607 W. McMicken. The site lies along Central Parkway, which was at one time the Miami-Erie Canal (in use for most of the 1800's) prior to being filled in (in the 1920's) for use as a two-level transportation thoroughfare. The neighborhood therefore has been separated by this man-made barrier for quite a long time. On the other hand, the site has been served by a major thoroughfare for many years. The canal was eventually filled in and became the location for a portion of the Cincinnati Subway. There is in fact an abandoned station underneath the street directly adjacent to the existing foundation of the Mockbee complex where the primary architectural intervention is proposed.
The site lies within a primarily residential area, but the primary structures on the site are commercial or industrial in scale. Sanborne Maps (circa 1904-1925) indicate previous uses of the three primary structures, these uses include car repair and storage, sign painting / making, and hospitality / lodging. Abandoned subway tunnels along with the Brighton Station exist underneath Central Parkway at this location; these tunnels play a large role in development of strategies for this project. Transportation is a major factor for this site, as it lies on a multitude of major bus routes, there is a bus stop on Central Parkway only a few feet from the primary structures. Central Parkway, recently converted to a protected bicycle route is also a prime candidate for any future transportation infrastructure upgrades such as streetcar, or commuter rail.
The neighborhood’s current state of disrepair can be attributed to a multitude of issues stemming from the ever-evolving urban condition. The context has historically been home to public infrastructure that helped the neighborhood to thrive as an interconnected part of the city. There was at one time a streetcar, mechanical incline, well-maintained public stairs, and the subway system that was never used, all of which served to ferry residents of the neighborhood to other parts of the city or local borough. The decline of this infrastructure over time coupled with the decline in the economy and lack of jobs has had an extremely negative impact on the neighborhood. The neighborhood was built in an era when most people were reliant on public transportation, and therefore streets are sized accordingly, hence the major issues with Cincinnati traffic volume. Also worth noting is the uniquely diverse nature of the building types in this neighborhood and others built in the same era as a result of the lack of zoning regulations. This results in a variety of building types and uses that are in close proximity to one another, making for a uniquely diverse urban fabric.
The buildings included in the scope of this project were originally built in sections to fill the needs of the owners. The oldest / southernmost portion of the building was built (in the 1860s) to house the Bellevue / Klotter and Sons primary brewing facility. There is also a masonry building across McMicken from the main brewery buildings that was built to serve as the barrel making facility. To connect the two buildings, a tunnel was constructed that runs underneath McMicken Ave. The tower and car-shop sections of the building were built as later additions to serve the needs of the growing neighborhood and surrounding city. The tower historically housed a sign making business, while the shop portion of the building was built for automobile and other storage purposes with a lift large enough to move cars vertically through the building. The building has plenty of historic character and provides an excellent shell to accept future programs that can help the neighborhood to thrive again.

**Approach**

There is a sense of openness from the approaches to the building complex as a result of the wide expansive views created by the drastic level changes across the site. There is also a sense of historical importance or ambiance about the building / site as a result of the weathered material palette, masonry architecture, and faded paint from advertisements of past eras.
The eastern approach has recently received a face-lift, breaking the felt perception of decay and neglect. This single renovation helps show what a renovated neighborhood could look like. Despite this small pocket of renovation, portions of the Mockbee complex buildings and their context are in such dire shape that they look abandoned, despite the fact that there are currently residents occupying them. Many of the buildings to the north (uphill) and west of the site have gone through various updates and renovations and are interspersed among large overgrown vacant lots, making the western approach to the building currently more “natural” from both psychological and aesthetic of view.
The site slopes down from the North to the South, or from W. McMicken down to Central Pkwy, potentially creating accessibility issues and opportunities. There is currently a public exterior stair that runs between the two levels, with approximately thirty feet of vertical difference. There are views from the higher elevation portions of the site that look southwest out over West-End / Camp Washington. There are also excellent views of downtown from the upper floors of the structures. The existing buildings on the site have aspects of pedestrian scale on the W. McMicken (North) side, but the Central Parkway (South) side is used as a loading dock area and lacks pedestrian scale.
Ecology

The vacant land surrounding the primary built forms on the site are full of vegetation, most of which is overgrown in the summer months indicating fertile soil conditions. Proximity to the canal site also indicates the soil conditions would be favorable for agriculture as a result of the years of sediment build up.

There is risk of erosion on the sloped vacant lot directly West of the primary site structures, that is addressed through a combination of built form with planted vegetation. The pre-existing vegetation that lies within close proximity to the site includes medium-sized (10-20’) trees along with medium-sized (3-8’) flowering bushes. The vegetation is concentrated primarily along the northern edge of the sloped vacant site that lies northwest of the primary structures, and the southeastern edge of the vacant lot to the north of the primary structures. This leaves a large amount of open land on two adjacent sites. There is also a large amount of opportunity to reduce runoff and erosion by increasing the amount of pervious pavement in the area surrounding the site.
An effective design must consider the typical climate of the midwest in order to design an efficient response. An appropriate response would consider orientation with regards to the sun and the prevailing winds but for different reasons. A primary objective per Lechner for climate zone 3\textsuperscript{26} which Cincinnati inhabits, is to protect from cold winter winds. This presents an interesting challenge given the other primary objective of allowing in winter sun, considering that prevailing winds on the site are from the southwest. This will require careful design consideration to be executed effectively so as to not inhibit solar gain, but to mitigate harsh winter winds. While the sun is required in winter to passively heat the building, it should be kept off of windows during the hottest part of the year to minimize cooling needs. Therefore an appropriately designed operable solar shading system will be required. Lechner also places particular importance on the building envelope. It is obviously very important, when seeking sustainability, not to waste any energy on HVAC requirements.

Program components for the proposal vary in scale from large-scale neighborhood improvements to individual buildings. It is important for the purposes of this thesis to examine multiple scales in an effort to address all impacts and applications of the proposed systemic approach. All program components will function together to create a more sustainable urban neighborhood environment. Basic components will include residential, workspace, retail, transportation, and agriculture. The activities performed within these program components will include living, working, making, exchanging, traveling, growing, harvesting, and eating. The qualities of the spaces that will be created will vary depending on the specific requirements of each function or activity.

The overall spatial qualities created for the purposes of this thesis are derived directly from the function of the space and the spatial requirements associated with the activities being performed therein. Many aspects of the functional requirements have been examined to derive the spatial qualities, including lighting, floor area / dimensions, ceiling height requirements, infrastructure, and adaptability. The overall spatial qualities of the main structure will be minimalist and include only the required amount of finish to achieve appropriate insulation and comfort on the interior, along with appropriate amounts of natural light.
Masterplan:

Single-family Infill

Densifying the existing neighborhood with residents is a primary objective of the Master-Plan. Currently 86/218 existing lots on the hillside are vacant and lack any building form. Existing vacant lots located on the south-facing hillside portion of the neighborhood will be activated using single family homes. Each single family home is sited at the northernmost edge of the south facing sloped lots to maximize efficiency of land use for agricultural purposes, while allowing for future densification. The design of the single family homes is explored in greater detail in the Design Description section of this document.

Agriculture

The agricultural portion of the program is split into multiple sub-categories based on different types of user interaction and ownership. A large portion of the agricultural space provided is utilized for a CSA (community supported agriculture) organization, which who also runs the restaurant. This allows the restaurant to make the best use of local agriculture while supplying CSA supporters with their share of the crop. The CSA plots are primarily located close to the restaurant on McMicken Ave. There are also multiple satellite CSA plots located near existing buildings that have been renovated to act as agricultural support structures. The benefit of using multiple plot locations is the variety of microclimates (including much optimal south and southwest facing open slopes) and crop types that can be taken advantage of. The CSA would also manage small goat farms residing on the ground previously used by the incline.

There are also of course large portions of the neighborhood devoted to individual households’ garden plots. Households would also have the opportunity to allow a portion of their land to contribute to the CSA in return for a portion
of the overall crop. Public gardens would occupy space along the edges of the neighborhood. These gardens contain polycultures designed specifically for public forage and extended harvest seasons. The concept of the public forage zones would be both to provide sustenance for people who may be walking or biking through the neighborhood as well as lessening the possibility that people would cause harm to the other agricultural zones in the neighborhood.

**Farm to Table Restaurant**

The restaurant would employ the farm-to-table concept seen in many sustainable agricultural communities. It is located in the old barrel-making facility across McMicken from the brewery. This location places the restaurant along the newly re-activated public circulation axis that runs north to Fairview Park and the Uptown neighborhood, and runs south through the old brewery building and terminates in the Brighton Arts District. The restaurant houses both dining and food processing spaces.

**Hardware**

The Hartke Hardware store in the Brighton Arts District will be maintained and expanded as it is a long-standing neighborhood staple. A large hardware store is key to a neighborhood that is going through transition into a renovated renewed environment. The hardware store will partner with the community shop in fostering a community of makers and artists that will help to bring about the renewal of the neighborhood through renovation. The do-it-yourself attitude of the maker community will not only aid in the renewal of the neighborhood, but will help to sustain the safety and image of the neighborhood through a sense of shared participation and ownership.
Laundry

A public laundry facility / dry-cleaner is a critical neighborhood staple. This facility produces a large amount of excess energy, typically lost as heat. This heat can be harvested and utilized as radiant heat for adjacent spaces or structures. The Laundry facility will also fit into the overall infrastructure and synergies that are being created in the neighborhood. The water used to wash clothes is collected and treated for further use, and the dryer lint is processed and used in composting.

Geothermal Network

The geothermal network designed for the Master-Plan is based on the system designed for Ball-State University. The system is comprised of three primary components: power stations, well-fields, and building interface. The power-stations house the mechanical equipment required to run the system. Power Stations for the geothermal network are located in close proximity to the well-fields which are located in the flattest areas of the neighborhood in order to accommodate the large equipment required to drill the 400’ deep wells. These locations happen to be existing parks and playgrounds. The parks will be returned to their existing park function once the drilling for the system has been completed. The network also makes use of cold and hot water loops that serve other existing local industries including an existing pickle factory and the Germania Brewery.
Wind Farm Network

The wind-farm network designed for the Master-Plan is based on standards set by the size of each individual turbine. The turbine network would be located in the existing Fairview Park. The turbines have been sized at one-hundred feet in diameter. This size allows six appropriately spaced turbines to supply enough electricity to power approximately 300 single family homes, with the geothermal network dealing with the HVAC requirements.

Charging Stations

Electric bicycles and charging stations will tie into the existing network of bicycle rental stations around Cincinnati while serving a main bike thoroughfare. The charging stations are located at various points of public interface in the neighborhood such as the primary intersections where multiple means of transit intersect. Primary locations include: the corner of Central Parkway and Ravine Street, as well as at the top and bottom of the two separate existing sets of stairs that connect the various levels of the neighborhood. Charging stations serve as jumping off points for exploration of the neighborhood, as well as convenience for residents. The charging stations will act as an impetus for further development to take place to serve the newly created nodes.
Mockbee Complex:

Live - Work

The residential lofts are conceptualized as open shell spaces with the addition of an attached green-house room. Living space will be oriented looking south to receive the most direct solar gain, and natural light to help minimize heating needs. The living space will be adjacent to a green-house space, designed as an adapted trombe wall, to foster indoor / outdoor activities as a part of the proposed living experience. There will be an operable system to allow indoor/outdoor living spaces to be created. Food is one of the major factors being designed for in the living component and therefore the cooking and eating spaces will be located within the living space, adjacent to the exterior space. The kitchen will receive large amounts of sunlight during the day, as it will be included within the primary living area. The living space will be open plan to allow all of the daily activities of life to take place in the same space.

Workshop

The workshop portion of the Mockbee Complex is split into three primary sub-programs: the community shop, rentable shop space, and a high-bay build space. The community shop portion of the work-space will house a typical wood shop, metal shop, and welding area. The existing spaces selected to house the shop function have historically been used for auto-repair / storage, as well as other light industrial uses. The materiality will be raw and durable to minimize upkeep requirements and increase ease of use. This portion of the existing building is currently the least well lit in terms of natural lighting. Increasing natural indirect daylighting is therefore a primary objective of the architectural interventions in the shop space. The space will be served by natural daylighting throughout the day using of light-wells, and enlarged south openings to create more ideal working conditions.
conditions for the two-floor shop component of the program.

The rentable shop space is meant to serve a different group of makers than the community shop above. This user is a maker who needs space for their trade or hobby, but already owns the tools they need, maybe occasionally supplementing their collection from the rentable tools in the community shop. The existing space to be utilized for this program currently is located below the community shop space. This space is served by a large freight elevator, as well as a stair connecting to the community shop above and pedestrian tunnel below. The framework for the rentable shop, inserted into the existing shell, will be designed with functionality and adaptability as the primary driving factors. The goal is to allow maximum spatial flexibility to appeal to all manner of makers and the spatial arrangements necessary to fit the needs of said makers.

Adjacent to the rentable shop space, and below the community shop lies the high-bay build space. This space is meant to serve as a construction space for large scale projects and can be utilized by users of both the community shop or the rentable shop space. The space is outfitted with a light gantry crane for manipulation of large scale materials or works.

**Studio - Walk-Up - Educational**

The walk-up studios create a unique environment where clients can interact with artists and makers in their workshop space. The studios would be located on the primary pedestrian level served by McMicken Avenue and would be along the newly created circulation axis to allow potential clients to walk through the space and interact with the makers in their studio spaces. This environment would serve as both a retail and educational environment. Clients would have the opportunity to commission a work and watch it being created. Makers would also be encouraged to offer “how-to” seminars. This concept is built from an existing similar program type seen at The Factory in Franklin Tennessee.
**Bike Shop**

The Bike-shop will serve as a maintenance and bicycle rental facility for the neighborhood. The shop will be located along the existing and developing highly traveled bike route on Central Parkway. The rental facility would tie in with the developing network of Cincinnati rental bikes and allow visitors to traverse the slopes of Cincinnati with ease with traditional, or electric motorized bicycles.

**Brighton Arts District - Market**

The retail portion of the project will function as a flexible space that caters to small scale, pop-up retail vendors. The existing space to be utilized for this function is located in the southernmost, three-story portion of the existing building. The market will occupy both levels of the existing building that are served by pedestrian interface interventions. The top floor of the market is served by a public interface on the McMicken (north) side of the building. The portion of the market that is located along McMicken houses everyday needs such as produce from neighborhood / local farmers as well as surplus from the CSA. The upper floor of the market is connected to the lower floor, as well as the green roof via a new stair that cuts through the existing slab beneath the new skylight at the intersection of the newly proposed circulation axes. The green roof above produces fresh vegetables for the local CSA organization. The lower level of the market is served by the stair from the above market, as well as the newly cut circulation axes that connects the Brighton Arts District to the various levels of the hill side neighborhood, as far up as Fairview Park.
The hub component of the program is located at the intersection of the newly cut circulation axes, at the base of the new stair that serves the retail portion of the program. The hub is meant to serve as an informational tool for visitors, regular users, or those passing through the complex on their way to or from work, and is appropriately located to receive maximum pedestrian exposure. The hub element is made up multiple interactive digital displays that show a variety of information including: transit schedules and maps; local concerts, either in-house or in one of the multiple venues in the Brighton Arts District (Rake’s End); local tourist attractions such as Brewery District, or other historic tours; maker seminar schedules, artisan / maker check-in, shop user-count / live-feed; along with community events such as neighborhood harvest, gallery showings, or neighborhood improvement projects. The hub serves as the heart of the public interface component of the entire Mockbee Complex and surrounding neighborhood, located where the largest volume of traffic will interact with the building on a daily basis, it serves as a marketing tool for the various programs within the complex and the neighborhood, as well as increasing ease of use for all users.
**Gallery / Exhibition**

The Exhibition spaces serve as a showroom for the many artists and makers who live and work in the community. The galleries would be located on both of the primary levels of public interface, and integrated into the new circulation axes to allow maximum exposure on a daily basis.

**Concert / Event**

There are multiple concert halls included in the proposed program. The local context includes multiple music venues, but none designed to house a large crowd, or attract a “big-name” headliner. The proposal includes a large music venue capable of having multiple performances occurring simultaneously. One of these stages is located in a space that briefly housed a music venue in the Mockbee Building one level below West McMicken Ave. The other stage is located in the adjacent tower portion of the complex on the same floor level as it’s complimentary space. These two primary stages are separated by a thick masonry bearing wall, but are connected via a small human scale opening located on the opposite end of the concert halls from the stages. The stages are located at the south wall of each space in front of newly cut openings in the exterior wall. These new openings allow natural light to pour into the space. Additionally, the openings operate as the air intakes for the chimney-stack ventilation. These spaces can be “opened” to become open air during hot summer months as air is drawn into the chimney stacks.
**Brewery**

The brewery is located in the portion of the building that historically housed the Bellevue Brewery. This reactivated facility will take full advantage of the existing brewery structure including lagering vaults, and high-bay spaces for modern brewing equipment. The main brewery manufacturing processes are housed on the lowest level of the existing building to be served by Central Parkway. The brewery has multiple nodes including a neighborhood bar, along with administrative spaces and a public interface / taproom. The brewery is tied into the local urban agriculture network to ensure that its bio-degradable waste products are utilized for growing food or hops for the community / brewery.

**Cafe / Pub**

The bar is located on the interior of the southernmost portion of the building along the newly cut circulation axis that extends up the hill, and out into the Brighton Arts District. Located one level below West McMicken Ave, the bar is adjacent to the “intersect” and is thus served by a high volume of pedestrian traffic each day. The bar serves as the primary public interface for the brewery related functions located in the complex. The bar collaborates with the local farm-to-table restaurant to provide a variety of quick-meal types throughout the day. Conceived to function in a similar manner to that of the local Highland Ave. Cafe, the bar would serve coffee, and other breakfast-fare in the morning, and function as a typical pub during the afternoon and evening.
VII. Design Description

**Masterplan:**

The conceptual masterplan strategy can be broken down into three main concepts, Densify, Connect, and Sustain. These three concepts combine to create a thriving neighborhood from the bones of an existing, once thriving community. The concept of adaptive reuse is at work in the master-plan, seen in the reactivation of existing built-form and infrastructure.
The Densify portion of the masterplan intervention aims to increase the amount of residents in the neighborhood while providing necessary everyday amenities currently missing from the community. Where possible the master-plan proposes to renovate and retrofit existing structures to increase environmental efficiency and allow for future use. This includes existing single family homes, warehouse / post-industrial spaces, as well as some tightly packed italianate homes in the Brighton Arts District and along West McMicken Ave. The Master-Plan also proposes new infill housing to fill the many vacant lots on the hill-side.

The construction of these modest homes is based on concepts for the “20k house”\textsuperscript{27} and adapted for the specific site conditions. The design of the infill housing is based on passive sustainable techniques as well concepts of adaptive reuse and material up-cycling taking into consideration both the environment as well as the context. The single family homes are sited appropriately to maximize the presentation of the south-facing slopes for agricultural purposes. Siting the new infill close to one end of the linear lots also allows for potential future densification as population trends show no sign of slowing down. Each home is powered primarily by the neighborhood wind-grid coupled with a district geothermal system. Each home also includes operable windows and roof vents for natural stacked and cross ventilation, as well as exposed thermal mass for added radiant heat in winter. The minimal depth of the footprint of the homes allows for daylight to penetrate all the way through the space in the winter, maximizing passive heat gain. Each home meets the ground in a minimally invasive manner, employing a masonry bearing wall at the north facade, and pad footings supporting columns for the south wall. Each home is capped with a single slope roof sloping towards the north to maximize south glazed area. The stair-core is capped with a single-slope roof the slopes towards the south allowing for the possibility of future PV arrays or skylights to create a “greenhouse stair.”

The Connect portion of the masterplan aims to re-connect the neighborhood to the rest of the city. This portion of the intervention includes the reactivation of existing modes of connection to other parts of the city and adjacent neighborhoods as well as additions of modern connective tissue infrastructure. The existing subway tunnels are utilized to carry passengers to and from downtown, and as far north as Oakley. The existing public stairs are renewed and other more accessible means of transit (electric bicycle network) are added to traverse the slopes in the immediate context. The stair stretches from Fairview Park down to McMicken Ave. before it descends into the old Bellevue Brewery. The circulation route pierces through the brewery and out over the street to terminate in the Brighton Arts District. This effectively connects three neighborhoods through the reactivation and extension of an existing relic.

Electric bicycles and charging stations will tie into the existing network of bicycle rental stations around Cincinnati while serving a main bike thoroughfare. In addition to the literal and physical connection brought about by these infrastructural and architectural interventions, the development includes public programs that help to build thriving communities, namely diverse opportunities and venues in which to Shop, Make, Eat, and Listen. Each of these programs help build communities by bringing together groups of like-minded individuals who have vested interest in their local neighborhood with the aim of a tight-knit local culture rich in both history and prospect.
The Sustain portion of the masterplan aims to provide life’s necessities to the renewed community. This portion of the intervention includes the utilization of renewable energy sources and agricultural applications derived from the specific site conditions and restraints. The sustainable systems designed for the scope of this project include a Wind-Farm network consisting of six (6) 500kWh turbines, along with a district geothermal system with approximately 450 wells, providing power to more than 218 families. The Wind-Farm network is located along the existing ridgeline in Fairview Park to allow for ease of access for construction / maintenance, while allowing the turbines to be at optimal height and spacing for maximum efficiency. In addition to the Wind-Farm network, a district geothermal system is proposed to handle the majority of the HVAC needs for the existing homes, as well as new infill. The system is comprised of two primary components; well fields, and power stations. The well fields are located in existing local parks, and other large open spaces for ease of construction, while creating a more efficient use of land. Two power stations are included in the master-plan to house the mechanical equipment required to run the system. Power stations are located in the Mockbee Complex, and in the Germania Brewery Complex in the Brighton Arts District. This placement is close to the well-field locations to minimize piping runs, while utilizing existing building stock. These systems were chosen as a result of their minimal overall impact on the local urban fabric. In addition, the proposed systems have been chosen as a result of their efficiency and expansion potential to other suitable areas of the Cincinnati including the many parks and ridgelines that existing in the urban context.
Concepts of adaptive reuse laid out in Cradle to Cradle by William McDonough\textsuperscript{28} are considered during the programming and master-planning phases in an effort to create sustainable “metabolisms” that serve to mitigate the amount of waste created. These metabolisms seek to alter the typical life-cycle of a material with the aim of finding uses for the waste products created by our everyday needs.\textsuperscript{29} Many simple sustainable metabolisms exist, such as, reusing waste lint from local laundromats as compost for the next agricultural season providing food to the local owner of said laundromat. Small strategies can begin to play a large role in the overall sustainable nature of a neighborhood, city, and society.


Building Form:

Working within the neighborhood masterplan the building form is influenced by the connective tissue interventions as well as passive sustainable techniques. The existing building form is modified to accept new circulation axes by the creation of new openings or the widening of existing openings between the different “sections” of the existing building. These new axes are cut in an effort to bring people through the building on a daily basis. These circulation axes serve not only to connect all sections and levels of the building, but also to tie into the other connective tissue infrastructure that serves to connect to adjacent neighborhoods and the rest of the city. Programs that serve everyday needs such as laundry, food, and drink, plus those that foster community engagement such as open market, live music, and exhibition, are served and united by these newly cut axes.
The existing built form has been modified to maximize the efficiency of passive sustainable concepts, including methods of heating and cooling as well as natural lighting. The architectural interventions utilized to maximize these concepts include ventilation stacks / light wells, along with a modified version of the trombe wall concept. The ventilation stacks serve to increase natural air-flow and allow cross-ventilation to take place. The trombe wall concept is modified to include occupiable “greenhouse” spaces on each level of the south facade used to control solar heat gain in the adjacent living spaces.

A bridge connecting the primary public interface of the building to the Brighton Arts District is added to foster a relationship between the two historically divided neighborhoods. This bridge allows the proposed community of live-work individuals to easily interface with the existing Brighton Arts District.
The interior fit-out of the existing building takes advantage of existing spatial conditions while considering the passive sustainable techniques at work in the structure. All existing circulation cores are maintained or re-activated. New circulation axes and vertical shafts are located along the datum derived from existing circulation core locations, existing openings, and existing chimney stacks. Along these axes, openings are added, reopened, or widened to connect the existing structures to one another. This allows the entire building to utilize the tower’s freight elevator and other circulation cores to traverse the various levels of the interconnected buildings.
**Detail:**

All interior additions to the existing relic are based on a pre-fabricated modular system of construction. This system is used to create partitions, ceilings, floors, screens, exterior glazing, and skylights. The concept of the life-cycle of spaces and materials are explored for the purposes of this system. The system consists of post and beam components derived from typical reclaimed steel L, W, and T sections as well as bearing plates. It is designed using mechanical fastenings at each post so that it can be disassembled for future use of material and/or reconfiguration of space. Panel types are determined based on the functional needs of each program/space and have been based on locally found reclaimed materials to maintain the weathered palette.
Openings are punched or enlarged in the south facade for the creation of the greenhouse trombe-room concept in the residential tower portion of the existing building. Reclaimed steel structure is added to the southernmost structural bay to deal with floor load and lateral support where the masonry was removed from the exterior wall. Additionally, reclaimed steel lintels will be embedded into the existing wall above the new openings to deal with vertical load that was carried by the removed wall. Masonry removed from the exterior wall is re-used as elsewhere in the project; specifically for structure and thermal mass for the construction of the “greenhouse rooms” on the south facade interior, as well as other site improvements such as the new ramp and agricultural “hot-boxes” on the southern facing slopes. All glazing in the project is based on reclaimed window types. Openings in the north-tower facade are enlarged vertically, maintaining the lintel span and opening width thus emphasizing the verticality of the existing facade elements. These openings allow maximum natural indirect light for an ideal live-work space while not requiring any added structure.

Additional south facing openings are created in the southernmost 3-story retail portion of the building that once housed the Bellevue Brewery. The new opening locations are based on the location of smaller existing openings, often combining two openings by removing the existing portion of wall between them and installing a reclaimed steel lintel similar to the residential lintel. The new openings also align with existing large facade openings on the floor above to allow for a clear load path to be maintained in the exterior bearing wall. The north (McMicken) facade of the 3-story “Bellevue Brewery Building” receives a new facade system that fosters public interface. This intervention effectively activates the retail portion of the project and acts as the primary public interface zone on the pedestrian friendly (McMicken) side of the building. The new facade system enlarges existing openings to create large portals between the interior market-place and McMicken streetscape. The system includes large operable doors and screening partitions that can be opened in warm weather to create an open-air market that fosters community interaction.
The light chimneys are another major component of the design. They are created with the goal of providing each floor of the building with sunlight and means of natural ventilation. The chimneys are topped with skylights designed for maximum heat gain during cooler months, while allowing air to be ventilated during the hot summer months. Glazed portions of the skylight are angled at 48.4° to create a perpendicular glazed plane allowing maximum solar penetration during the months with heating degree days (Sept-May) whose average solar angle is 41.6°30. During the cooling degree days, of which there are 988 / 6638 in Ohio each year, the chimney ventilation system is activated. Ventilation fans located within the skylights and at the air intakes on lower levels would be activated to cool air through building. The movement of air up the chimney allows all spaces adjacent to the chimney to achieve natural cross-ventilation through use of operable windows.

Major portions of the existing floor slab are removed to create the light chimneys. New columns and horizontal bracing are added to compensate for lateral loads. A portion of the new shaft is left completely open to allow maximum light penetration and air flow. The other portion of the shaft is fitted with a perforated floor system that allows some light and air to pass through it, while allowing residents to occupy the light chimney and access the existing stair-core for convenience and egress.

“We shape our buildings, thereafter they shape us.” - Winston Churchill32

VIII. Conclusion

This thesis has been the culmination of years of indirect interest and research in the topics of sustainability and adaptive reuse followed by eight months of focused designwork on a specific set of architectural problems. The scope of the project, which seems overbearing, is seen as a necessary framework to get to the meat of the project which lies in the modification of existing built-forms. The primary goal of this, and any further work in this line of research, is ultimately sustainability for the sake of the planet. The scope of sustainability and adaptive reuse that has been proposed in the above thesis, if adopted at a systemic level, can begin to make a considerable positive impact with regards to mitigation of the negative environmental impact caused by humans. In conclusion, much was learned as a result of the pursuit of the immense scope of this thesis. Specifically, that because of existing paradigms of construction and material acquisition it will be a hard-fought battle to convince some critics that sustainable renovation and adaptive reuse are the best all around options for urban renewal. A difficult task should not be avoided simply because it is difficult. We as designers, must take an active role in designing a built environment that will aid in changing the way we think about design, construction, and other unsustainable societal norms. The necessary societal, psychological, and ethical shift required to help mitigate the negative human impact on the environment starts with design. We have the knowledge and the tools we just need to work.
IX. Bibliography


