

A Design Thesis Submitted to the Department of Architecture and Landscape Architecture of North Dakota.

By:

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ABSTRACT

Issues relating to solid waste management and human interaction thrive as a current and future challenge for human existence. Due to the abundance of waste produced within our community, utilizing our advancements in new technology will enable a more sustainable environment. The abundance of waste produced around the world has negatively impacted our health, safety, and welfare for our current generation and those to come. A shift is required in our environmental understanding, social interactions, and economical practices in order to increase the use of by-products and other disregarded resources. As a Recombinant Material Waste Research Center, this 56,300 SF project defines the community's current and future relationship with material waste in Fargo, North Dakota. Through the innovation of new materials, the proposed facility would allow a better understanding of the collaboration and material management required in order to successfully manage solid waste in the Fargo Community. Architectural design along with the skills of a diverse set of occupations is a key component in the realization of material innovation and building design. These traits will guide future generations and myself towards a more cyclical and environmentally receptive process for material waste management.

Key Words

Interaction | Solid Waste Management Collaboration | Sustainability | Material Waste | Recombinant | Research Facility



PROBLEM STATEMENT

How do material interactions impact future relations between humans and solid waste management?





PROJECT TYPOLOGY

A Recombinant Material Waste Research Facility

56,300 SF (Type 'B' Occ.)

THE CLAIM

The pertinent relationships relating to waste management and human existence thrive as a current and future challenge for human existence.

Actor(s) -

Waste Management Industry

Action(s) -

Collaborative Waste Management Design, Research and Education

Object(s) -

The interaction and innovation of new materials

PREMISES

OPERATIONS

The waste management industry and local material business supply chains set the foundation for how a community considers and implements waste management practices. Research facilities that improve upon today's material industry can transform disregarded by-products into usable resources. These resources may include waste from design, construction and demolition practices as well as operations that negate wasteful energy usage.

MATERIALS

Due to the recent growth and diversity of community involvement in the Fargo-Moorhead area, material management practices need to be redeveloped and implemented. New sustainable research and material practices currently exist but these resources have yet to reach their full potential. Continuing to facilitate the exponential growth of the communities' waste will require innovative material research, design and education integration.

INTERACTIONS

With the increasing amount of waste, alongside the vast amount of advanced technology and sustainable strategies; design and awareness can encourage the coexistence between humans and the waste we produce. The interaction of materials and collaborative methods will sustain a community for future growth. This interaction between material waste management and educational research can increase productivity and community wide involvement.

THEORETICAL PREMISE

The Waste Management Industry sets the standards for how we live, learn and educate. These standards are what directly impact the current community and future generations. It is our responsibility to better understand, educate and collaborate in the process of re-using the by-products and resources we discard on a daily basis through research and product development.

PROJECT JUSTIFICATION

The current solid waste management system, although relevant to today's standards are not ideal or suitable for the community's exponential growth and abundance of resources. Disregarding these waste management issues will cause significant consequences for future growth and the environment. Residents of the Fargo-Moorhead Area reside here due to the comfort in community, education, health and resources. Through design research, programmatic requirements and collaborative business methodologies in the Fargo-Moorhead Area, this thesis will aim to define the residents' current and future relationship with waste management. With the creation of a sustainable and educational waste management research facility; I look to provide a greater understanding and opportunity for the Fargo-Moorhead Area to turn waste management into an achievable goal.



THE PROPOSAL

The Narrative

This proposal identifies key issues, methods of research, study areas as well as a core theoretical framework that will inform the study. Focal points of research uncover policy oriented and business management case studies and will integrate site observation, content analysis and data collection. In an effort to uncover more about solid waste management in the Fargo-Moorhead Area, the study examines the scale and process of solid waste management and will strive to alter our future dynamics of this process as planned and implemented in our current ineffective system through the development of a waste research facility.

Solid waste has been identified as a critical issue around the world. Altering waste management practices used today would significantly change the way we react to waste produced by humans. I look to connect the dots between waste management facilities and community practices that accept the ineffective processes we currently abide by. The over arching goal of this project is to offer innovation and collaboration to future generations that ultimately coincide more closely with environmental consciousness. This will guide future generations and

myself towards a more cyclical and environmentally receptive process.

My first hand experience in the Fargo Moorhead community as well as my current position as the United States Green Building Council Student Organization President will allow my passion for the environment and building systems to collide. Advancements in waste management aim to bring the environment, building development and human health into a harmonized system. I strongly believe that by reorganizing the waste management process we can work toward a level that disregards threatening laws and regulations and looks for alternative, collaborative means for such issues. By providing universities and local businesses the opportunity to work in a collaborative and organized process we will act in a more cyclical, cradle-to-cradle, approach instead of the current linear business plan being utilized.

How would this change the environment, building methods and processes, as well as our community involvement and integration? Most importantly, how would this change the future of our planet?

USER & CLIENT DESCRIPTION

The solid waste management research facility will be owned, utilized and staffed by three primary clientele.

OWNER

The recombinant material research facility will be owned by a private investor.

TRI-COLLEGE & COMMUNITY MEMBERS

The solid waste management research facility will be directly accessible and lead by the Tri-College University system. Professional researchers and students from the surrounding universities will work in a collaborative environment, leading design charrette and research. The facility will also be available for local community members and businesses to also utilize the facility to educate the entire community.

FACILITIES MANAGEMENT PERSONNEL

The research facility will be operated and maintained by local professionals and students who are hired by the owner to ensure organization and functionality.

MAJOR PROJECT ELEMENTS

This proposal identifies the major project element for the thesis that includes a material research, education, and collection facility¹.

RECOMBINANT MATERIAL RESEARCH FACILITY

The Recombinant Material Research Facility will educate, collect, and research materials collected in the solid waste stream within the Fargo-Moorhead community acting in lieu with the Fargo Municipal Land Fill and Tri-College University.

SITE INFORMATION



Figure 1.0 Region Map

The Fargo-Moorhead Area currently lacks sustainable design practices in the solid waste management system. With a growing economy and population, the current systems will require innovation, research, management and collaboration. The tight niche community and adjacent Tri-College University offers a site with an abundance of opportunity to reduce, reuse, and recycle solid waste in a more sustainable and environmentally friendly way.



SITE INFORMATION

LEGEND

46°54′06″N 96°48′38″W NDSU Technology Cir. N. Fargo, North Dakota Cass County

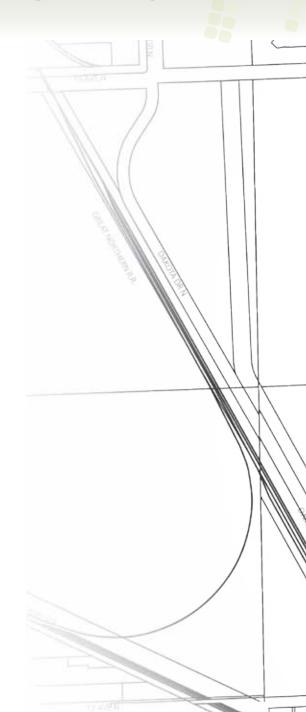
Site Nodes

Site Area

- 6.7 Acre Site

Major Landmark

- NDSU Research Park







PROJECT EMPHASIS

This thesis project will focus on how architectural design, education and collaboration can impact the future relations between humans and solid waste management. The over arching goal of this project is to offer innovation and collaboration to future generations that ultimately coincide more closely with environmental consciousness. This will guide future generations and myself towards a more cyclical and environmentally receptive process for material waste management in the Fargo-Moorhead community.

A PLAN FOR PROCEEDING

Research Direction

This thesis proposal identifies key issues, methods of research, a project typology as well as a core theoretical framework that will coincide with the theoretical premise and unifying Idea. Focal points of research uncover policy oriented and business management case studies and will integrate historical context, site analysis and data collection. In an effort to uncover more about solid waste management in the Fargo-Moorhead Area, the study examines the scale and process of solid waste management and will strive to alter our future dynamics of this process as planned and implemented in our current ineffective system with the creation of a recombinant material waste research facility.

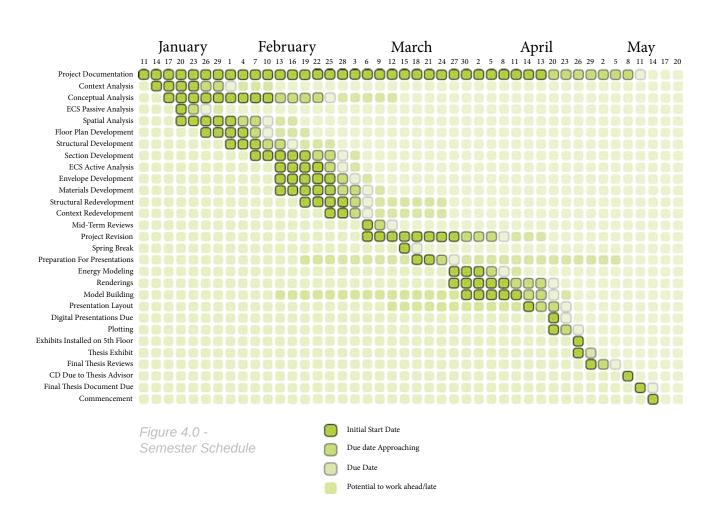
Design Methodology |

This thesis will implement the 'Mixed Method Quantitative/Qualitative Analysis' approach. Through this method the transformative strategy will provide quantitative and qualitative data, concurrently, and help guide the theoretical premise and unifying idea. Data collected will be integrated throughout the project and implemented in graphic and text format at varying stages determined by the specific requirements of the theoretical premise. Quantitative and Qualitative data will include statistical data, that of which will be gathered and analyzed locally as well as from reliable and reputable archival searches.

Documenting the Design Process

This thesis project will be documented and archived throughout the design and research process. All Research, analysis, photos, drawings, sketches and writing documentation will be gathered and scanned bi-weekly to show process and design development. Upon completion, a physical and electronic copy of this documentation will be presented and made available through the North Dakota State University's online Institutional Repository System.

SPRING SEMESTER SCHEDULE



PREVIOUS STUDIO EXPERIENCE

ST YEAR

ARCH 130 & 172 DESIGN STUDIO | 2009-10'

Heather Fisher & Christina Tapper

Projects:

Master Copy Image Re-Iteration Mapping Motion

ARCH 271 DESIGN STUDIO II | FALL 2010

Darryl Booker

Projects:

Tea House Boat House

ARCH 272 DESIGN STUDIO II | SPRING 2011

Joan Vordebrugen

Projects:

Montessori Schoo Dwelling



ARCH 371 DESIGN STUDIO III | FALL 2011

Regin Schwaer

Projects:

Modern Cliff Dwelling McCanna House



ARCH 372 DESIGN STUDIO III | SPRING 2012

Projects:

ARCH 471 DESIGN STUDIO IV | FALL 2012

Projects:

ARCH 472 DESIGN STUDIO IV | FALL 2013

Projects:

ARCH 771 DESIGN STUDIO VII | FALL 2013

Projects:





THE PROGRAM Theoretical Premise | Unifying Idea Research

PREFACE

"One may say that we seek with our human hands to create a second nature in the natural world" (Cicero, 1836).

INTRODUCTION

"It was characteristic for Le Corbusier to break an overall architectural problem into its constituent parts, then develop designs in which each element represented the solution to that particular part of the overall problem" (Sobin, 2007). Through a number of key discourses, this research examines solid waste management and research facility within history, theory and the complex interrelations that exist in the human understanding of materiality. Among these discourses I have structured the history and theoretical dilemmas being illustrated across these renowned works to make sense of today's world; bringing what we know from our past into our current and future practices. These excerpts reflect our historical and present-day relationships between man and the material world and show how these intricate relations affect our existence.

A COMPLEX SERIES OF INTERRELATIONS

A post-structural view of who we are and how we came to be.

Human culture has significant a relationship with, and impact on, the over arching structure of society. This commonly overlooked and more so misunderstood theoretical paradigm has a large impact on the way humans progress. This concept of progression symbolizes the development of our human mind. body, technological innovation and social ramifications we are familiar with today versus a thousand years ago. This, directly correlating to our progressive development, is an understanding of the concepts dictated through post structuralism, dialectical historicism and materialism. These relationships are critical to the understanding of who we are and how we act as humans today and will guide us to how we act and react in the future. These interrelations with the world around us can be associated with the geographical, social and cultural norms for how humans coexist in our world of complex obscurities (Murdoch, 2006).

"Geography is the study of relations between society and the natural environment. Geography looks at how society shapes, alters and increasingly transforms the natural environment. creating humanized forms from stretches of pristine nature, and then sedimenting layers of socialization, one within the other, one on top of the other, until a complex natural-social landscape results. Geography also looks at how nature conditions society, in some original sense of creating the people and raw materials which social forces 'work up' into culture, and in an ongoing sense of placing limits and offering material potentials for social processes. The 'relation' between society and nature is thus an entire system, a complex of interrelations. Thus, the synthetic core of geography is a study of nature and society relations" (Peet, 1998).

The views and influences from the Post-Structuralist construct provide several areas of interest that give insight for our material world today. Johnathan Murdoch in his publication, Post-Structuralist Geography – A Guide to Relational Space, specifically recognizes cultures. economies and nature as three main human inquiries geographical (Murdoch. 2006). Geographical inquiries, in this sense, symbolizing the relationships developed from not only the spatial and social processes but more so the material constructs developed from the social and cultural norms around us. These pre-developed cultural and social norms form us and define who we are, how we act and what we make of ourselves. The geographical context from which we are born is then the basis for how we initiate our thought and eventually process the world around us. Conceptually a mind boggling process, but thinking into the future takes a great deal of understanding in terms of our historical past, cultural behavior and the nature in which we live. Each individual theme holds a relation and in order to

seek a greater understanding we must seek the interrelations that each of these hold and critically analyze them in our past and current lives. This today can be seen as relationalism (Murdoch, 2007).

Relationalism is the association and spatial connection we find between humans and what Murdoch denotes as 'the thing.' This relationship, most commonly understood in a geographical sense, can also be linked to social, cultural and natural pieces of the earth. For me, this so-called 'thing' symbolizes the material matter and products that denote our relationship to the world in its most physical state. This interrelational study will bring together those attributes demonstrated by the mind as well as those portrayed as physical components that we see tangible in our daily life (Murdoch, 2007).

DIALECTICAL HISTORICISM

Recognizing the interrelations of the material world

Dialectical historicism enables the concepts of relations and interrelations to be recognized in a more literal and direct application to the material world around us. "Dialectical materialism is the world outlook of the Marxist-Leninist party. It is called dialectical materialism because its approach to the phenomena of nature, its method of studying and apprehending them, is dialectical, while its interpretation of the phenomena of nature, its conception of this phenomena, its theory, is materialistic" (Stalin, 1938). Prior to this understanding by Stalin, the concepts of Dialects initially began with famous philosophers Hegel and Engles. Hegel was able to sum up the connections and relationships we speak of within the material world in what is called a System of Logic. This 'Logic' is what uncovers the internal contradictions in concepts (thesis) and shows how they pass over into their opposites (antithesis) and give rise to new richer

concepts embodying the synthesis of both thesis and antitheses" ("Marxists Internet Archive"). These same ideas are expressed in the ideas of Marx and several other philosophers working to understand the relations we hold. This analysis of dialectical historicism and materialism is also derived from history, culture and societal norms; very similar to the geography on which we live. Thus, comparable to the concepts and critical analysis of post-structuralism relational space recognized and by Jonathan Murdoch. Marx later describes the ideal as, "nothing else than the material world reflected by the human mind and translated into forms of thought" (Stalin, 1938). The dialectical means of truth indicated here state that nature is a phenomenon that constantly changes and moves. Similar to our natural and habitual human ways, we consistently change as well. The interrelational problem and disconnect here is the pace at which these alter. Our social and collective mind sets change at a much faster rate in comparison to natural forces and even more so, the geographical context for which we live. Even with the variable change in pace, we as humans remain connected. Even more so, we remain dependent on these cultural, social and natural changes that result in who we are and what we become. Taking into account the social, cultural and natural connections, it allows for a more thorough explanation for our surroundings and existence (Stalin, 1938). Engles proceeds to state,

"All nature, from the smallest thing to the biggest, from grains of sand to suns, from Protista, to man, has its existence in eternal coming into being and going out of being, in a ceaseless flux, in unresting motion and change. Therefore, dialectics takes things and their perceptual images essentially in their interconnection, in their concatenation, in their movement, in their ruse and disappearance" (Stalin, 1938).

Nature tests the concepts of dialectics. The dialectical conception of motion proves that nature and humans alike are progressive mechanisms

consistently developing. This however, is not a consistent cyclical motion, but a transition from an old qualitative mind set to a new qualitative mind set. This, in other words, is a development into a much more complex and deeper form of the world around us. complexities that dialectics offer the world enable causes for confusion and frustration. The struggle that arises between the new and old ways of living creates fear, anxiety and mistakes due to the power of contradictions. This transition, as Lenin states in his philosophical Notebooks, "In its proper meaning, dialectics is the study of the contradiction within the very essence of things. Development is the 'struggle' of opposites" (Stalin, 1938). shows the importance of dialectical historicism among our past, present and future social lives as well as within the natural world we currently reside. The importance of understanding our past is just as important as looking to the future. Our ability to relate and comprehend the interrelations that exist between humans and the material world will then guide us to a more meaningful and brighter future (Stalin, 1938). With this understanding we can then take a closer look at the material world and the philosophy of materialism that constitutes so much of the world around us.

MATERIALISM

A philosophical theory of the "Inner Kernel"

development of matter, mentioned by Stalin in his discourse states, "the multifold phenomena of the world constitutes different forms of matter in motion, that interconnection and interdependence of phenomena as established by the dialectical method, are a law of the development of moving matter" (Stalin, 1938). This development of matter in a more literal sense can be dictated for human understanding or material development. Matter is nature and as philosophical materialism of Marxist holds, "Matter, nature, being, is an objective reality existing outside and independent of our consciousness; that matter is primary, since it is the source of sensations, ideas, consciousness, and that consciousness is secondary. derivative, since it is a reflection of matter, a reflection of being; that thought is a product of matter" (Stalin, 1938). This in a more derogative meaning to our current understanding would say, "The material world to which we ourselves belong is the only reality....Our consciousness and thinking, however surpra-sensusous they may seem, are the product of a material, bodily organ, the brain. Matter is not a product of mind, but mind itself is merely the highest product of matter" (Stalin, 1938). This further affirming that the material world in which we belong allows for us to use our brain to create the perceptions, ideas and sensations we feel makes us connected to the extended world we strive to perceive. Marxist philosophical materialism believes that nothing in the world around us is truly unknowable. Through experimentation, research, collaboration and practice we can create the physical and mental notions of life that stimulate our mind and body. This however cannot be done

without the current and future efforts of scientific research and practice (Stalin, 1938). The meaning we derive with after these studies will then push our perception of material understanding, sensation and correlating relationships with the human mind and body to a new level of qualitative and quantitative Those sensations and meaning. desires, as Stalin would suggest, "Must not base its activities on abstract 'principles of human reason', but on the concrete conditions of the material life of society, as the determining force of social development; not on the good wishes of 'great men,' but on the real needs of development of the material life of society" (Stalin, 1938).

The driving force of a society is its development of the material world. The material world enables new social ideas and opinions to be created that in return facilitate a more progressively developing society. These manifestations of opinions push for a new set of standards and values that of which continuously establishes new principles within an entire society.

To do this Stalin states,

"Social ideas, theories and political institutions, having arisen on the basis of the urgent tasks of the development of the material life of society, the development of social beina. themselves then react upon social being, upon the material life of society, creating the conditions necessary for completely carrying out the urgent tasks of the material life of society, and for rendering its further development. Hence, in order to be able to influence the conditions of material life of society and to accelerate their development and their improvement, the public must rely upon a social idea that reflects the needs of development of the material life of society, that which is...prepared to smash the reactionary forces and to clear the way for the advanced forces of society" (Stalin, 1938).

This in a historical sense can all relate to the geographical conceptions previously mentioned above by Jonathan Murdoch. Geography represents a constant and slow moving portion our

natural world. This derogative and slow change allows for us to understand and grasp the development and influences we have had on the world. Comparing to the consistent change of our society and relationship to the world around us, the geographical ties to the world are millions of years old. Simply narrowing down our human understanding of and perception for change in time can help determine the most controlling and influential aspects to our social svstem. Through the concepts provided by historical materialism and Stalin we can accurately state, "The method of procuring the means of life necessary for human existence is the mode of production of material values - food, clothing, footwear, houses, fuel, instruments of production, etc. – these of which are indispensable for the life and development of society" (Stalin, 1938). All of the examples mentioned here are essential for human survival, and together create the productive forces of society we see today. This critical operation of materials seeks the understanding of material value as well as a cognitive understanding of

the relations in which the production of these materials require (Stalin, 1938). As we begin to look deeper in the interrelation complexities behind our material existence we begin to wonder, what if these essential materials run dry? What if these materials cease to ever exist in our future? What then do we consider to be our essential materials of life?

MATERIAL RELATIONS & THE VALUES THEY DEPICT

The Methodical Means for Human Existence & Material Value

Conceptually a material phenomenon is derived from our current time, cultural formalities and natural implications we see important at any given point in time. Although these social and cultural priorities may not directly correlate with an individual's current mind set, social and cultural phenomena change at a rate slower than the individual perceptions of generations. This lag time is what identifies a deeper and more philosophical view towards the

world, more specifically regarding the material world and values for which we see idealized currently.

We have already come to the conclusion that there are complex relationships between mind and matter around us. These active relationships are essential to who we are and begin to describe how we are all intertwined (Bohm, 1990). These ideas manifest even further when the concept of matter was viewed as an extended substance, one that occupied space, versus the mind as a thinking substance, one that does not occupy space. Descartes introduced this concept and changed the way we look and feel about the world around us. This essentially allowed for us to make sense of the values we hold within the world around us (Bohm, 1990). Maurice Godelier summarizes the authenticity of the word value in this excerpt stating,

"A natural resource cannot exist without some intervening human agency which defines it: there are thus no resources as such, but only possibilities of resources provided by nature in the context of a given society at a certain moment in its evolution" (Cronon. 1983).

We seek technology, education, and understanding in order to create more effective economies, friendlier environments, and social equalities. If we continue down the path that we are on, our lives will not only change but our sense of values as well. As described in this quote by White, we find, "We no longer have a landscape, a world that is our own; we have "valuable resources" (White, 2007).

Our sense of difference between what is natural and nature will be construed into what is valuable and worthless. Is this the type of society we want to live in? How does this theory lead into the value of waste? Are the by-products of our society a useless commodity or something that can turn the world around into a better place. With our knowledge and skill sets, are we better than this type of living or is this really the destiny our minds have brought us too? We need to quickly regain consciousness of our surroundings

and realize the opportunities that have already surpassed us and the opportunities that are about to fly past us as well. Although this task may seem unsettling and uneasy to even approach, by working together with the general public and environmental agencies, we can search for a more promising future.

COLLABORATIVE MANUFACTURING

Making Sense of Social Collaboration of Materials

During material manufacturing and production, Marx says, "men not only act on nature, but also on one another. They produce only by cooperating in a certain way and mutually exchanging their activities. In order to produce, they enter into definite connections and relations with one another and only within these social connections and relations does their action on nature, does production, take place" (Stalin, 1938). The correlation we make with

a product and manufacturing of a product is single handedly related to the value we, as a society, place on that object. These forces are derived from the producers of materials and materials being produced that have in fact developed the society we are today. This same notion applies to our future. The producers of materials and the materials we produce will coincide with the future development and natural amenities within our society. These material values are then again placed on our society, culture and more specifically the natural world we reside in



CONCLUDING SUMMARY

Our expectations for how we live today will have a strong influence for how we view the future tomorrow. As humans, we have continually rejected the idea that earth will, at some point, give way to our strong appreciation to destroy. It may so seem that we do not actually realize our nature of destruction but, concluding the readings above, I would state otherwise. We are sympathetic and we are knowledgeable, but we are also stubborn, influential beings. Our drive to posses or be possessed has encouraged us to engage in a battle that we will never win. This battle may as well be considered a foolish act of irresponsibility, leading towards the extinction of mankind. The relationship we have endured with our planet has nearly succumbed to a breaking point in which major decisions need to be conducted. This connection between man and nature has withheld its responsibilities to remain symbiotic rather that a destructive force upon nature. Our dependency on nature dwindles day by day and although

our minds tell us otherwise, we guiver knowing the day of the inevitable could be soon. We continue to work and educate ourselves in a manner of innocence and hope, but only to realize we are not seeking the actual problem but a period of grace to which we can only continue to try to understand relationship with the natural our environment. Our continued efforts only seem to push us further away from our actual goals, but for some reason we continue to do so. We have utilized our minds in a way that only destroys and in our pursuit to make this situation better, we will have to undergo one of the biggest and most stressful senses of 'change' we have ever had to endure.

"Man is finally going to have to face the fact that he is a biological system living in an ecological system and that his survival power is going to depend on his developing symbiotic relationships of a closed-cycle character with all the other elements and populations of the world of ecological systems" (Boulding, 1965).

TYPOLOGICAL RESEARCH

Case Studies



WASTE TREATMENT FACILITY

Batlle & Roig Architects



RMIT DESIGN HUB

Sean Godsell



SPIRALAB

KINO Architects

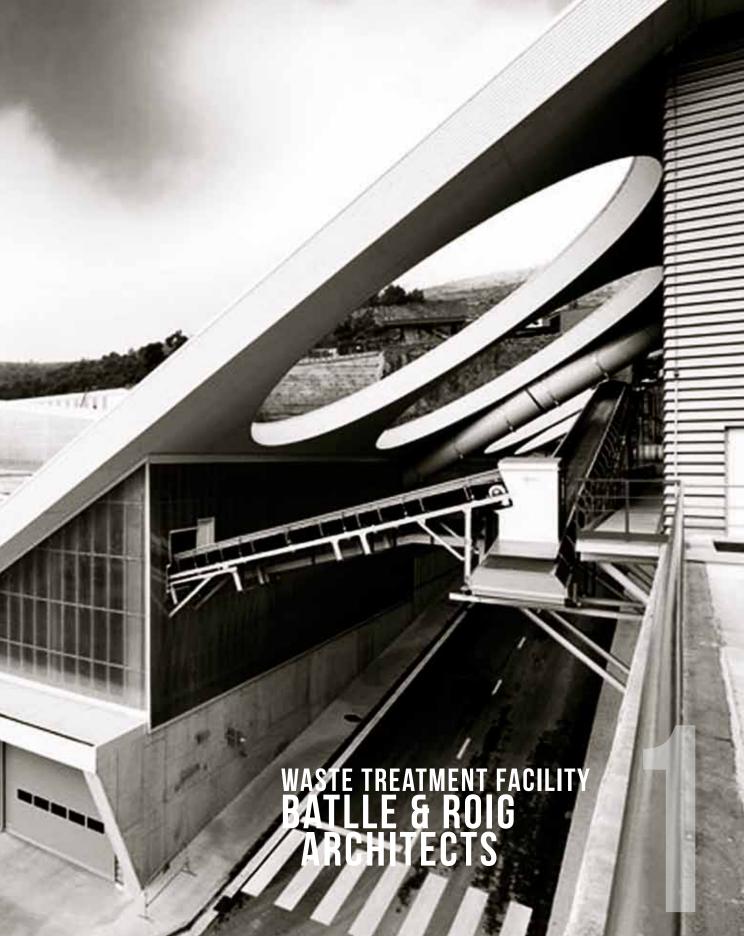


FRESH KILLS PARK

New York City - Dept. of City Planning







CASE STUDY #1

WASTE TREATMENT FACILITY | Batlle & Roig Architects

Architects: Batlle & Roig Architects

Location: Vacarisses, Barcelona, Spain

Client: Consorci per a la Gestió dels Residus del

Design team: Vallès Occidental

Enric Batlle Durany and Joan Roig i Duran

Collaborators: Xavier Ramoneda, architect, Mario Suñer,

architect, IDEMA, engineering

Work date: 2010

Area: 45.000 sqm **Budget:** 74.000.000€

Engineers: IDEMA, engineering

Landscape architects: Enric Batlle Durany and Joan Roig i Duran

Contractor: UTECTRV (FFC + HERA + URBASER)

Commonly referred to as CTRV, this waste treatment facility was designed by Architects Batlle & Roig. The waste treatment facility's location was specifically choosen because of a landfill which sits directly under the current building. This controlled waste landfill was reaching its capacity and also caused major topographical problems for the area. Because the current owners of the facility realized its capacity and future limitations for the site, ideas were drawn for possible

options for the site. In an effort to not damage any more of the environment in the area, Batlle & Roig decided to place the CTRV design in an area that has already been damaged by the site's landfill practices.

The building as a whole reaches a total area of about 74,000 square meters containing two large treatment areas. Although the building foot print is rather large, the project integrates a roof and facade design that actively integrates

within the adaptation and restoration processes of the site. This roof structure is comprised of many sustainable attributes and continues along side the entire structure, connecting both of the two treatment facilities.

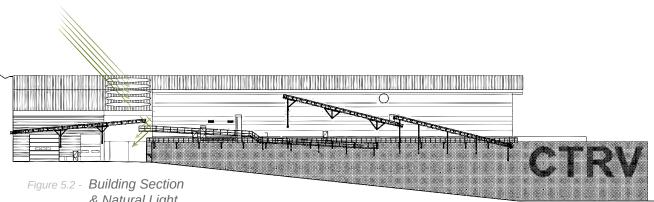
The structure utilizes water and energy generated by itself to run the rest of the plant, making it a very self sufficient building. Last but not least the facility also contains forced air vents, skylights and a green roof. The green roof more specifically is comprised of circles of native shrubs and ground cover that are intended to balance the impact of the building on the environment. This technique enables the architects and landscape designers to shy away from any ideas of camouflage or mimicry and instead utilize the surrounding environment and natural habitat in the restoration process.



Figure 5.1 Waste Treatment Facility

CASE STUDY #1

WASTE TREATMENT FACILITY | Batlle & Roig Architects



& Natural Light

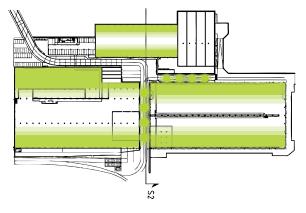


Figure 5.3 - Plan To Section & Natural Light



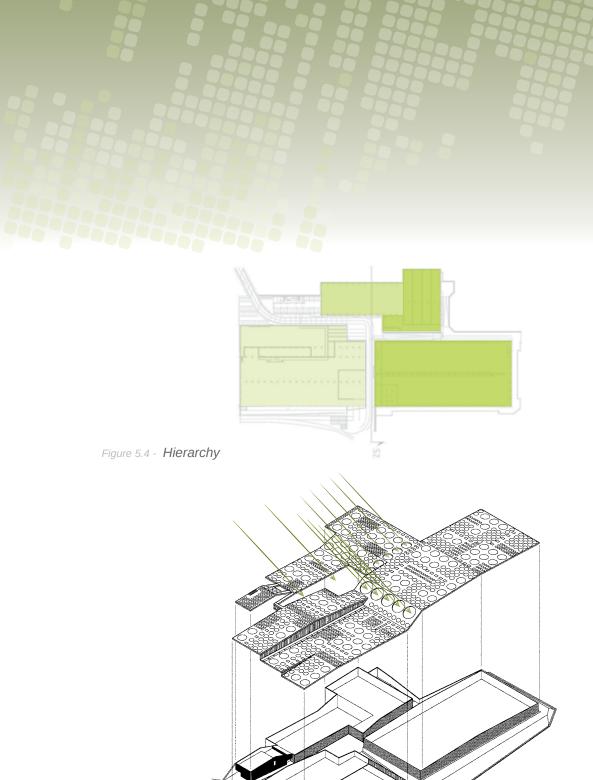


Figure 5.5 - Natural Light Axonometric

Material Interactions | Page 51



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WASTE TREATMENT FACILITY | Batlle & Roig Architects

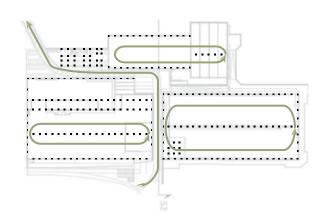


Figure 5.6 - Structure & Circulation

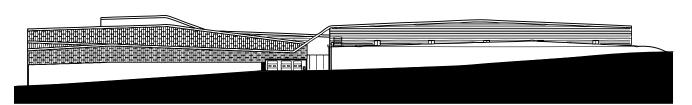
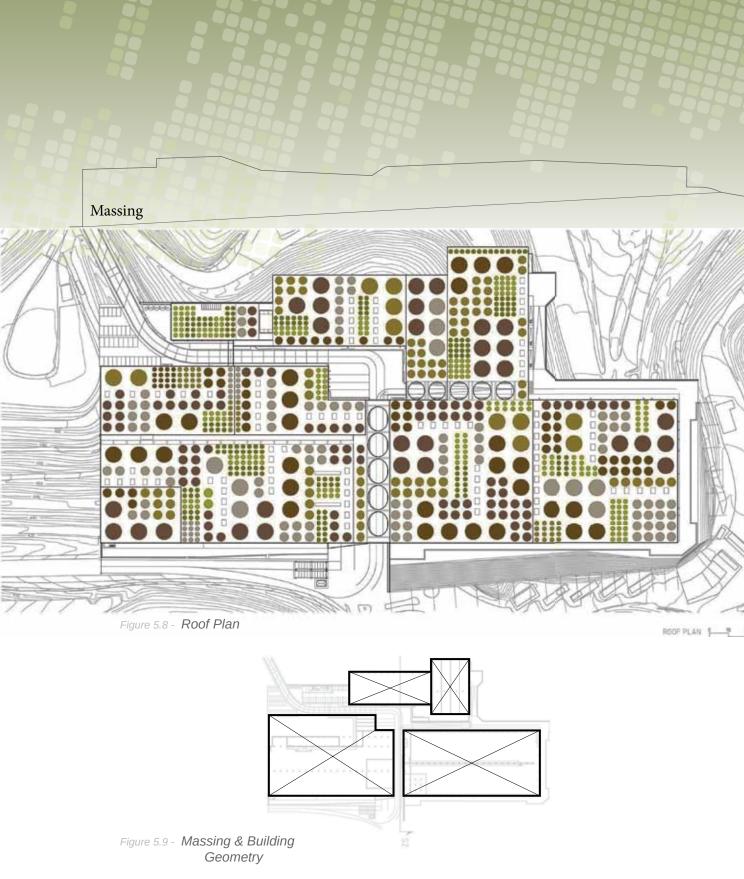


Figure 5.7 - Building Elevations







Architects: Sean Godsell

Location: RMIT University, Melbourne, Australia

Architects in Charge: Sean Godsell, Hayley Franklin

Associated Architects: Associated Architects: Peddle Thorp Architects,

Chris Godsell, James Hampton, Raf Nespola

**Area:** 131,931 sq. ft.

Work date: Year: 2012

Structural & Civil Engineers: Felicetti Pty Ltd

Landscape Architecture: Sean Godsell Architects
Interior Design: Sean Godsell Architects
Facade Contractor: Permasteelisa Pty Ltd

Project Management: Aurecon Pty Ltd

The RMIT Design Hub offers accommodations for a diverse array of professionals from fabric design, architectural and landscape design, design to aeronautical industrial engineering. The hubs ability to accommodate such a diverse community allows for collaboration and design potential to reach its fullest The hub offers researchers extent. the ability to take full advantage of the spaces they inhabit and make changes to them suit their particular needs. Typically, RMIT has found

that researchers and their teams stay between six month to three years at which a new team of researchers would then accommodate the space. Due to the variety of occupations and research, the building design has to be able to accommodate possible workshops for model making as well as studios for three dimensional printing, computers, and as far as virtual reality modeling. The key to a programmatic design such as the one being described in the RMIT Design Hub is flexibility and adaptability and one that can always evolve with the



changing tenants and technology.

One of the key goals for an education and research facility is to encourage the collaboration between non-related fields. This interconnectivity allows for ideas to spark and designs to flourish. In order to successfully accomplish this task, Sean Godsell designed a physical exhibition space as well as a design archive for the research fields to share. There are also several areas that include lecture halls, seminar rooms and multipurpose spaces to further express the importance of collaboration and exchanging of ideas. The building as a whole incorporates sustainable design strategies that push concepts of water, waste and recycling management to the next level. The building incorporates a green roof, evaporative cooling elements as well as an evolving sunshading device on the building facade that is not only automated but adaptable to new technology as it becomes available. The buildings adaptability and success in meeting the needs and sustainable strategies of today as well as tomorrow while providing comfortable working environments for tenants to spur ideas.



Figure 6.2 RMIT Design Hub

### CASE STUDY #2

RMIT DESIGN HUB | Sean Godsell

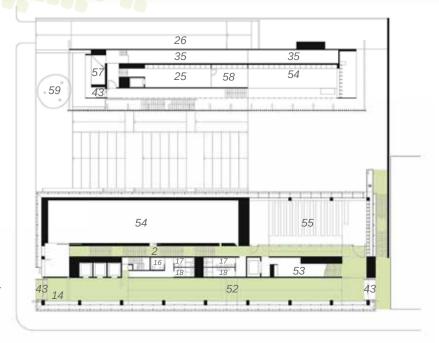


Figure 6.3 - First Floor Plan

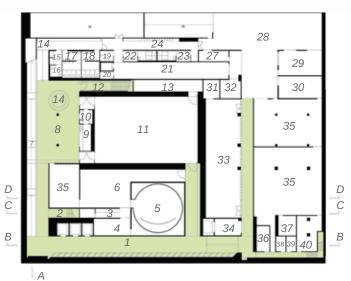
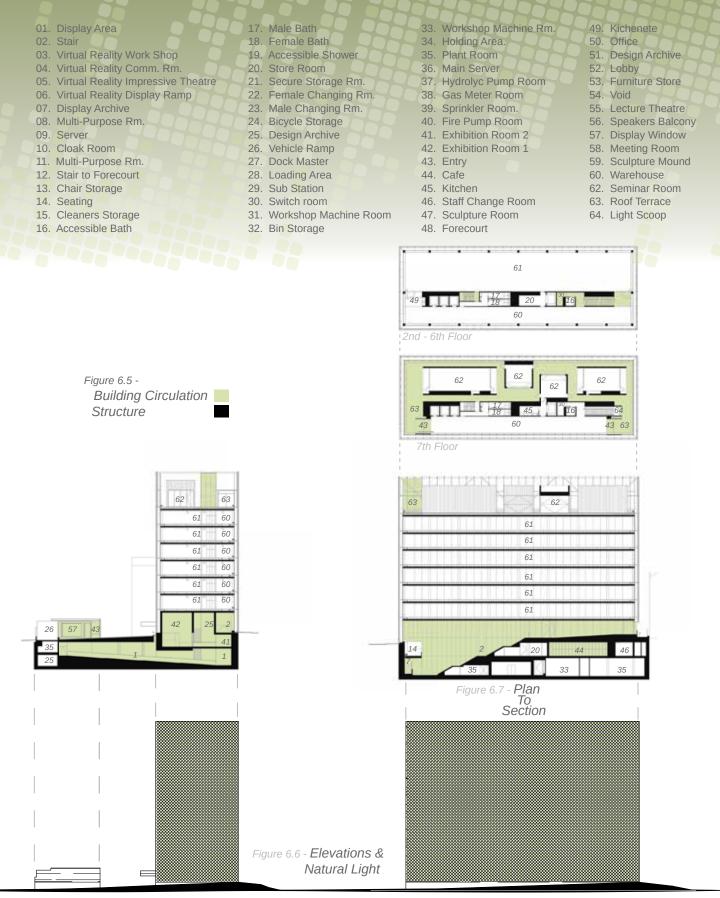
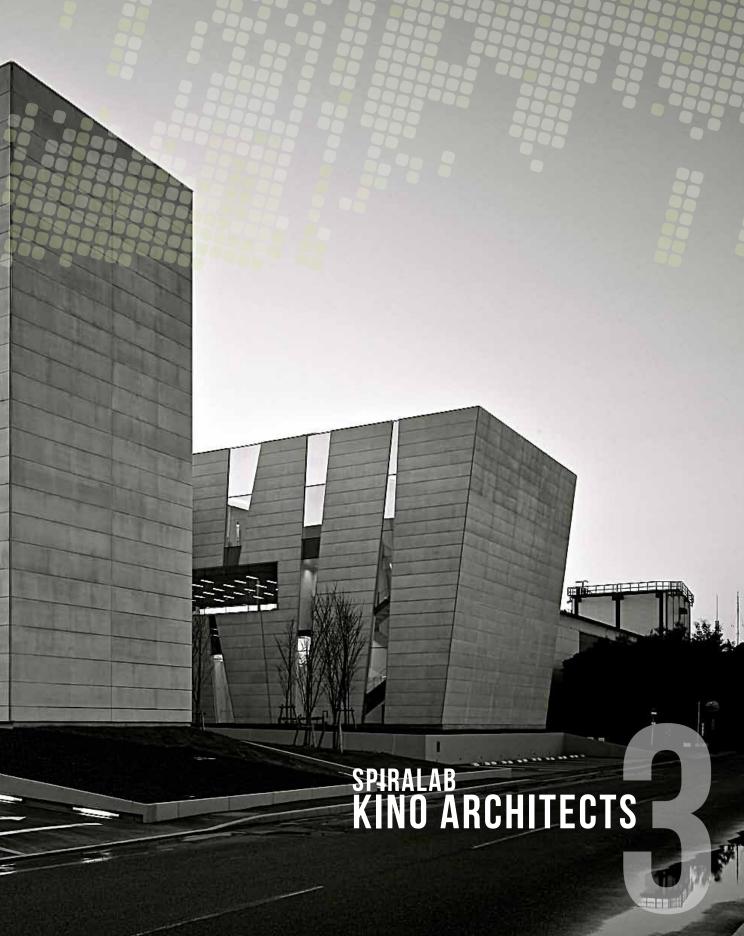


Figure 6.4 - Ground Floor Plan









**Architects:** KINO Architects

Location: Chiba, Chiba Prefecture, Japan

Architect in Charge: Masahiro Kinoshita

Building Area: 13993 sq. ft. Total Floor Area: 32291 sq. ft.

Year: 2009

Designed by KINO Architects. SpiraLab revolutionizes the idea of lab design. Acting as a research lab for a world leading materials development corporation, the structure and building layout emphasize the future of material research. The lab evolved through the symbolism of a 'spiral' and three basic requirements set forth by the owner. These three requests stated that the building must entail concepts of 'Research Efficiency', 'High-Security' and 'Comfort'. Located on an Industrial site near Tokyo bay, the building responds to the requests of future tenants and researchers as well as portrays a highly dynamic and versatile style of architectural design.

#### (1) 'Research Efficiency'

Utilizing a flexible style of architecture enables researchers to adjust their spaces according to their current and future needs. This response also carries on to be an important aspect to the researchers comfort in and around the lab.

#### (2 & 3) 'High Security' & 'Comfort'

In an effort to respond to security and comfort issues, a high amount of diligence was formed around the offices and break areas around the structure. Offices and meeting rooms were separated away from the linear

building structure and symbolically placed towards the center of the spiral remaining separate and confidential yet easily accessible to the tenants. These offices and meeting areas although very high in security standards have translucent walls opening up the space. Lastly, for comfort and security purposes, a common corridor was provided for both researchers and quests but the entrances for each were located on separate sides of the building. This simplified circulation allowed for greater flexibility within the research labs as well as promising views towards the landscape elements located within the middle of the site and building complex. As described by the KINO Architecture group,

"We think that true symbolism of architecture comes from the architecture itself; designed through logical thinking. It's neither a simple "wrapping" nor pure imagination. We hope this building, "Spiralab", helps its researchers develop new materials through logical thinking and will advertise this concept to the world" (KINO Architects, 2013).



Figure 7.2

# CASE STUDY #3

RMIT DESIGN HUB | Sean Godsell

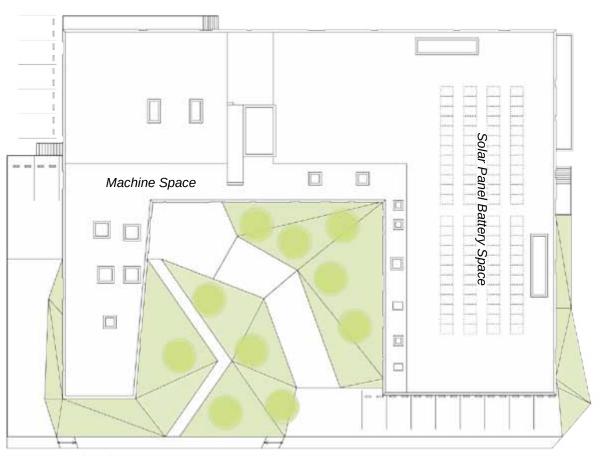
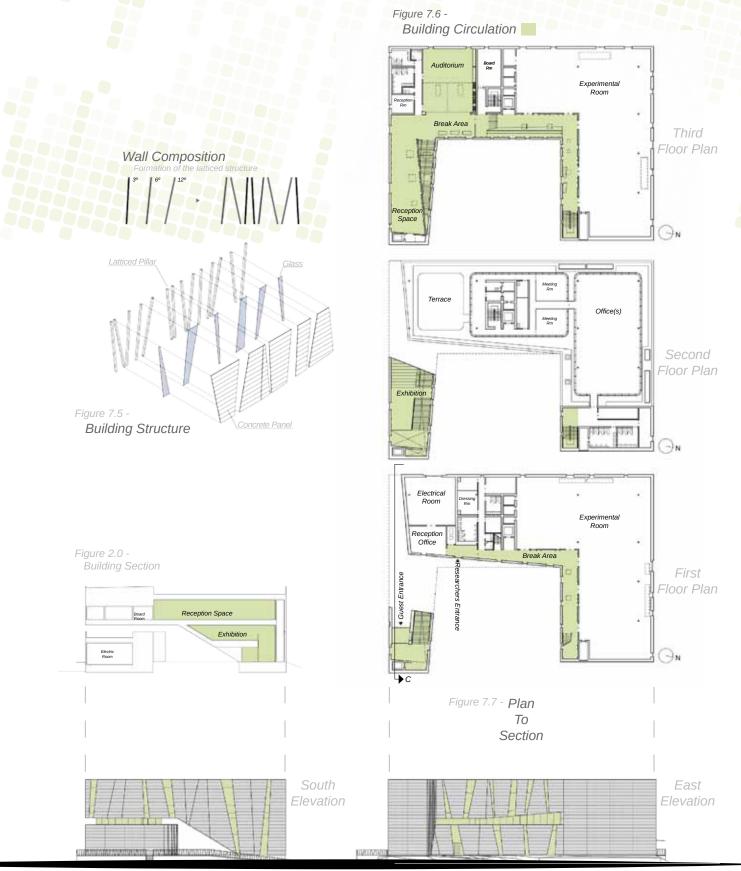


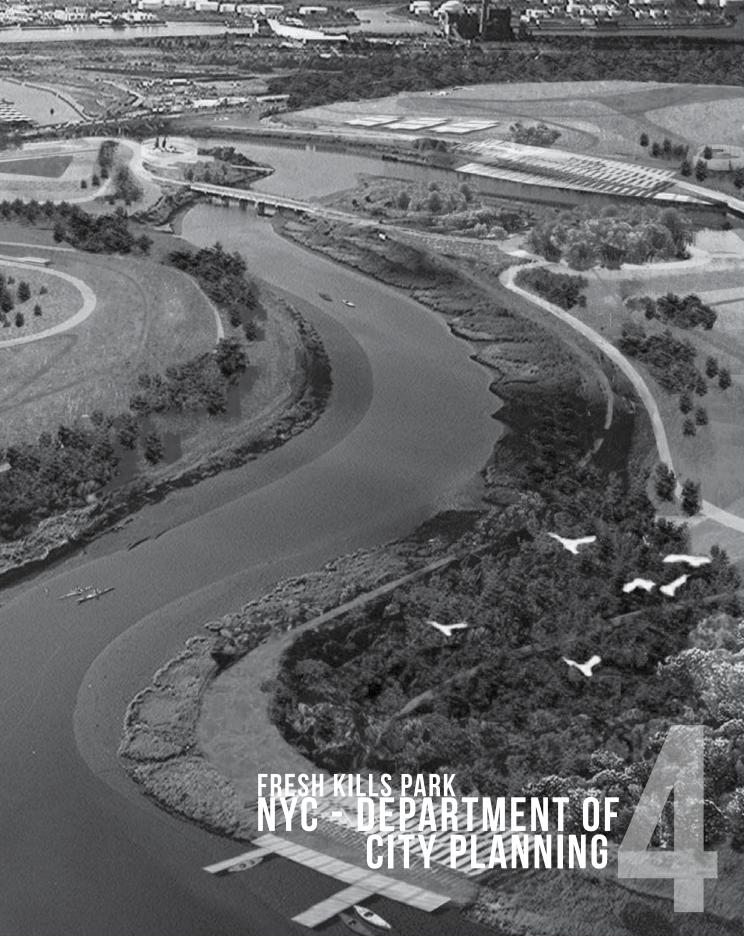
Figure 7.3 - Site Plan



Figure 7.4 - Elevations & Natural Light









FRESH KILLS PARK | New York City - Department of City Planning

**Design** Landfill Reclamation Location: New York City, New York

Design team: NYC - Department of City Planning

NY - Division of Coastal Resources

Work date: In Progress [30 Yr Plan]

Area: 2,200 Acres

As an expression of renewal and restoration, one of the largest landfills located in New York City will be redeveloped into a park that redefines the relationship and balance we have with our landscape. The 2,200 acre site, which is almost three times the size of central park, will support recreational ecological activities. restoration practices, as well as cultural and educational programing to encourage

the publics awareness on the human impacts on our environment. extensive project will take place over the next thirty years and as shown in figure 2.0 involves creeks, expansive meadows and wetlands as well as cohesive circulation for the public to interact with the site.

Led by the New York City, Department of City Planning along with the States



### existing habitats

Figure 8.1 Illustrated Development



Division of Coastal Resources, the programing of the park seeks to support sustainable energy incentives and the natural environmental habitat. From a sustainability standpoint, the park has introduced gas collection infrastructure to collect methane from the buried trash which is then sold to the national grid, generating upwards of 12 million dollars annually. The site also supports photovoltaic systems, wind turbines and geothermal heating and cooling abiding by all green building regulations. The environmental attributes of the site include exploration and education for reforestation, habitat restoration, soil production, water purification as well as several other energy generating technologies.

As shown in figure 2.0 the park is divided into five areas, each portion containing a distinct and diverse program. The sense of character and cohesiveness displayed within each area gives way to the promising experiences the public will have throughout the space. Through the distinct programing, circulation, wildlife and culture experienced, each area displays a dynamic and cohesive site plan for the area.



re biomatrix

### THE TYPOLOGICAL SUMMARY

The Case Study Series

The over arching goal an any architectural project involves designing for the needs of the present without jeopardizing the needs of the future. The case studies examined take this philosophy to the next level. The four specific case studies examined include a 'Waste Treatment Facility' by Batlle & Roig Architects, the 'RMIT Design Hub' by Sean Godsell, the 'Spiralab' by the KINO Architecture and Fresh Kills Park by the group, New York City Planning Department. Each individual project incorporates the flexibility and adaptability required in building design, material choices and site positioning that will be explored further in this thesis project.

This thesis project contains building elements dealing with waste management, material research as well as concepts regarding land reclamation and environmental sustainable building. The case studies examined have provided the concepts and ideas that will allow for this thesis project to better incorporate the meaning of program, circulation, occupancy and sustainable building to a new level.

Successful buildings start with successful concepts, sites and building placement.



As mentioned in the analysis of the 'Waste Treatment Facility' by Batlle & Roig, the location of the facility and sustainable concepts that were desired in the building program directly affected the building placement on the site and form of the structure. Understanding the concepts of context and location also play a major roll in the future ability of the site and natural habitat to adapt to the building's placement. This would also include the intent of the buildings current and future uses, to ensure these building functions are taking into consideration the local communities.

The program of a building is critical to a buildings success in creating happy and efficient spaces for the occupants and quests that walk the halls and work in the building on a daily basis. A typical concept of programing includes a diverse array of information that requires an in-depth understanding of the desired occupancy levels and building functions. The programing for this thesis project involves not only an understanding of the building's functions today but also several years from now. Creating an adaptable and flexible program that responds to the needs of future tenants involves the utmost understanding of

how people function and work. thesis project has the main function of a lab and research facility but also requires the ability for researchers and tenants to transition in and out spaces that may vary in occupations, technology and machinery as well as square footage requirements. The programing incorporated in the case study of the 'RMIT Design Hub' and 'Spiralab' have encouraged the range of possibilities in research and lab design to accommodate flexible and adaptable spaces. As seen in these two case studies, designs that pay specific attention to circulation paths and breakout spaces encourage collaboration and ideas to spur with the other professionals and occupations within the building.

These case studies all provide in-depth reasons as to why a building should be sustainable, environmentally friendly and respond to the health, safety and welfare of the building users and community in which it resides. This thesis will take full advantage of the ideas and recommendations provided by these case studies and provide a foundation to build upon.



# HISTORY OF FARGO

The city of Fargo became an organized city in the early 1870's that of which was primarily due to the Northern Pacific Railroad. As with many of the developing regions around the United States, railroads enabled the organization of cities. The city of Fargo was later named after William G. Fargo, a director of the Northern Pacific Railroad and cofounder of Wells Fargo Express Company.

Well known for the cheap and fertile farmland of the Red River Valley, population began to rise from 600 to 8,000 in about 15 years to a population of well over 200,000 and growing today. The steady population increase then allowed for a more organized city with an abundance of built structures being developed. The persistent prosperity and growth of the agriculture along with government, education, medicine and manufacturing has a bright outlook for the city of Fargo and state of North Dakota. During the first decade of the cities development, concerns for



sanitation and waste management infrastructure were critical issues that needed to be addressed. Fargo was not alone in the issues relating to waste management and as illustrated, this will be an ongoing issue for all societies to come.

### IN THE BEGINNING

"For many years people burned waste, fed it to animals, buried it, and most commonly, tossed it over their shoulder. Some cities became buried, and built over the waste, and others pioneered new ways to save their cities from vermin and disease. Recycling began as a necessity and ended up in present day as a responsibility to the environment" (Ace Disposal Inc, 1980).

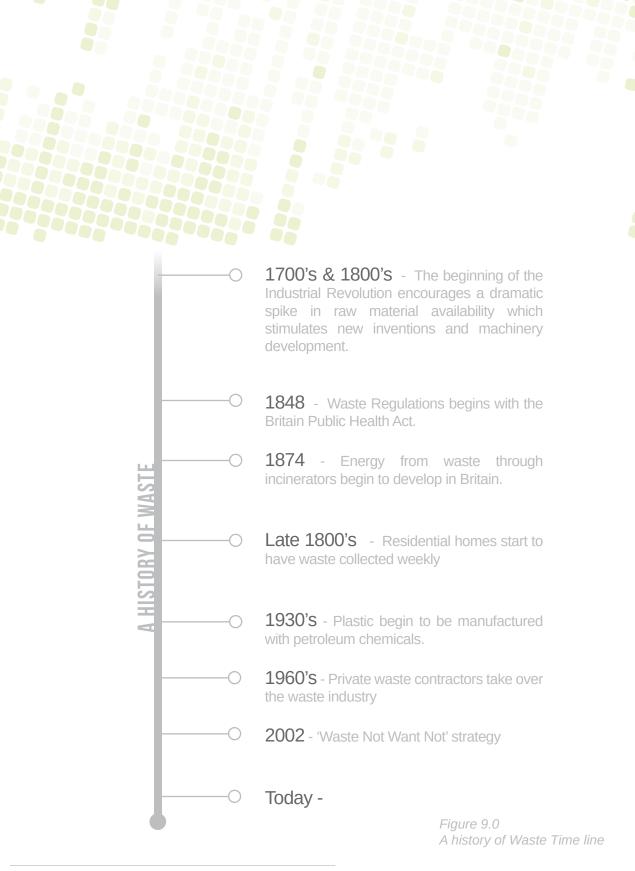
Ancient landfills have shown that in our past everything and anything that could be reused or repaired was. This practice and way of living created minimal amounts of waste to fill the landfills. As populations increased and concentrations of

people were closer together, waste became a problem that could be seen and smelt often times causing deadly diseases. This growing problem soon became an issue that could not be left behind (Ace Disposal Inc., 1980).

The Industrial Revolution, although enabled materials prosperous to become readily available and counteracted the ideas of labour. reuse and recycling. As years went on, reuse and salvaging practices began to be an important aspect with materials such as scrap metal and paper products. The consistent and exponential growth of population allowed little to no space for waste disposal and therefore encouraged the development of a waste disposal system (Ace Disposal Inc. 1980).

### A NEED FOR INFRASTRUCTURE

"A century ago urban squalor and disease led citizen reformers to demand cities to take action. They did. Cities became



Waste Management | Design Thesis 2013-14'

responsible for disposing of waste. But urban refuse was different then. It was mostly coal ash and food scraps, with a small proportion of simple manufactured products like paper and glass. Today, 71% of our waste is throw-away products and packaging, some containing toxic components. Garbage has changed, but our waste management system has not changed at the same rate" (Product Policy Institute).

After the industrial revolution groups such as the Ladies Health Protective Association and The Municipal Order League encouraged the use of uniformed garbage collectors. By 1930, this concept proved to be very successful. Within fifteen years, the Municipal Solid Waste Management system was intact and progressing as an organized and technological service (Product Policy Institute).

### RESPONDING TO CHANGE

As the 20th Century arrived, a sharp decrease in inorganic waste was sought along with a steady rise in product waste. "Product waste, has increased more than tenfold over the course of the 20th Century, from 92 to 1,242 lbs/person/year in 2000" (Productive Policy Institute). This common practice among the developing society remained a challenge for the Municipal Solid Waste Management system due to the increased amount of hazardous products being thrown away. This crisis allowed for resources and knowledge in recycling programs to be redeveloped and take care of the new waste management criteria (Product Policy Institute).

In the 1980's, governments played a key role in negating the current practices of landfills and incinerators and pushed for recycling collection programs. This was intended to reduce the overall flow of waste to these 'Cradle to Grave' systems and empowered the ideas of 'Cradle to Cradle' philosophies. Although the efforts

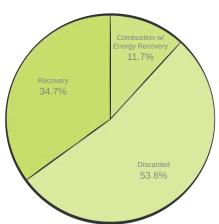
were hopeful, the technology that allowed for mass marketing and production simply overpowered the interest to recycle until municipal curb side recycling was made available (*Product Policy Institute*).

The convenience provided today within our Municipal Solid Waste Management system gives people the ease of following any given policy, yet this convenience also acts as a mask for the growth of our resource consumption. With little to no products being developed for recycling purposes, landfills will fill up and incinerators will continue to pump toxic containments into our environment (*Product Policy Institute*).

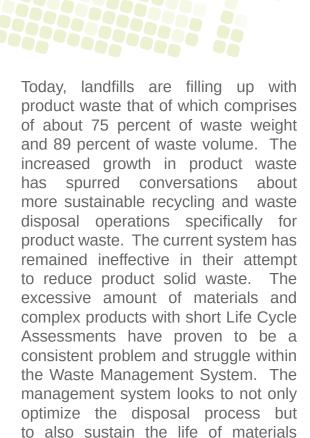
### THE UNINTENDED CONSEQUENCES

The solid waste management industry as a whole was developed in order to protect the public health and wellbeing of the human race. As time, policies and material resources regarding waste changed, the conventional methods and policies towards the system

shifted as well. As a whole, the current system is very effective in managing the generation of bio-wastes yet very ineffective at reducing manufactured product wastes. As Helen Spiegelman and Bill Sheehan of the Municipal Solid Waste Management and Throw Away Society would suggest, we need to focus on the Extended Producer Responsibilities [EPR] (Unintended Consequences, 2005).



Management of MSW in the United States Figure 10.0



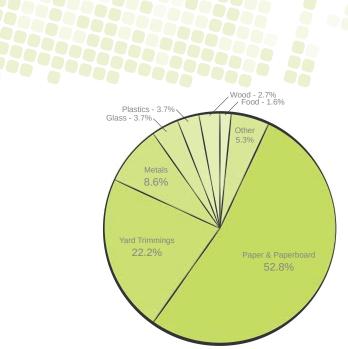
**CONCLUSION SUMMARY** 

Consequences, 2005).

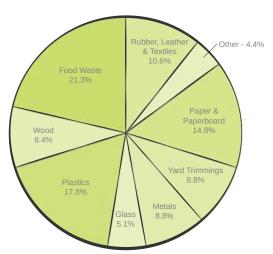
The Municipal Solid Waste System will continue to change and revolutionize the way we see and interact with waste. It is critical that the Waste System works in collaboration with the

and the resources used (Unintended

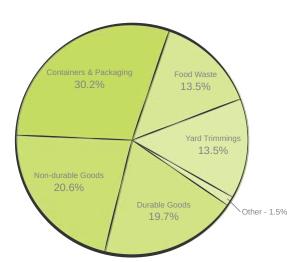
current production and consumption systems as well as the environmental management systems as well. Having clear guidelines and policies dictated towards more sustainable product operations will be a key aspect to the success and reduction of waste directed toward landfills and incineration plants. Helen Spiegelman and Bill Sheehan of the Municipal Solid Waste Management and Throw Away Society would also recommend and encourage research and development in this area. Through research and development our human understanding and relationship with our waste system will be better understood and be a key player in the future of living alongside our wasteful by-products. (Unintended Consequences, 2005).



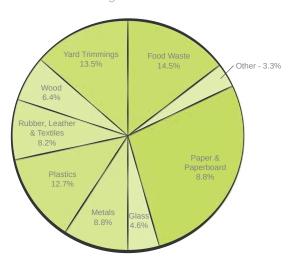
Total MSW Recovery
By Material
Figure 10.1



Total MSW Discarded
By Material
Figure 10.3



Total MSW generation
By category
Figure 10.2



Total MSW Generation
By Material
Figure 10.4

# FACTS & STATISTICS

"Since 1960 throw-away products and packaging waste has tripled – growing at more than twice the rate of population growth (Product Policy Institute)".

"Despite municipal recycling efforts, we are **sending more throw-away products and packaging to landfills and incinerators** today (122.9 million tons) than we did in 1990 (117.5 million tons)" (Product Policy Institute).

"Nearly **three-quarters** of the waste we generate is throw-away products and packaging" (Product Policy Institute).

"Over the last few decades recycling, composting, and disposal of MSW have changed substantially. Solid waste generation per person per day peaked in 2000 while the 4.40 pounds per person per day is the lowest since the 1980's" (US EPA).

"The recycling rate has increased—from less than 10 percent of MSW generated in 1980 to over 34 percent in 2011" (US EPA).

"Disposal of waste to a landfill has decreased from 89 percent of the amount generated in 1980 to under 54 percent of MSW in 2011" (US EPA).

"Nationally, we recycled and composted almost 87 million tons of municipal solid waste. This provides an annual benefit of more than 183 million metric tons of carbon dioxide equivalent emissions reduced, comparable to the annual GHG emissions from over 34 million passenger vehicles" (US EPA).

"In 2011, over 29 million tons of materials, or 11.7 percent, were combusted for energy recovery" (US EPA).

### GOALS FOR THE THESIS PROJECT

### **ACADEMIA**

Academia allows for personal exploration of future technology and practices as well as an opportunity for collaboration among colleagues and professionals. The world of design is created through the spirit of collaboration and exploration of spaces and relationships, that from which we see in studio and classroom settings. This thesis project actively pursues to conceptually answer questions relating to Waste Management and our human relationships among material waste. This exploration allows me to academically work on a project from its initial conceptual drawings to a completed project that explores a real problem within the world around us. Upon completion of this thesis project my academic requirements will be fulfilled and shall receive a Masters in Architecture diploma from North Daktoa State University. Academia is a life long process and upon receiving my masters is only the start to a new era of learning. As a means to continue discussion and learning on this topic, I encourage students, professors and professionals who follow me to utilize this thesis project as a case study for similar typologically explorations.

### **PROFESSIONAL**

Following a strong academic career, pursuing the field of Architecture as a profession is very important to me. Professionally, I look to display my passion for architecture and the built environment. I strongly believe that design has the power to change the world. Problems within the built. social and economic environments can seek better solutions through design education and thinking. Within my professional career I wish to continue to design and educate myself as well as make a difference in the world around me. Just as my academic field has done for me, I look to influence and be influenced by those who I meet in the professional field. My academics thus far have provided me the stepping stones to further pursue my professional career in architecture and in doing so look to become a licensed architect. These academics and professional experiences have enabled me to find a passion for sustainability and look to further pursue this in my future. As I further pursue these dreams, I hope to engage in architectural design that builds upon the current problems in our world and seeks answers to these issues along the way.

### **PERSONAL**

I have long desired to become an architectural designer in the built only further environment and have admired the profession of architecture due to the opportunities that lie in front of us. I will always wish to influence the world around me, but more so be influenced by what I see, who I meet and what I accomplish. Through these influences, I hope for my designs to reflect my past experiences and allow for me to better understand myself and my future endeavors. Architectural design and life are very similar in that each are filled with good and bad, simple and hard experiences but from each we can continue to learn about who we are and the meaning of the world around us. It is how we react to these experiences in our future that make us who we are and what we stand for. Through this thesis project I have proven to myself my ability to provide architectural answers to problems within the world. I strive to provide more answers through architecture and plan on doing so by working corroboratively with the colleagues and professionals who have encouraged me to get this far.



### THE SITE NARRATIVE

"Local uniqueness matters...Spatial differentiation, geographical variety, is not just an outcome; it is integral to the reproduction of society and its dominant social relations. The challenge is to hold the two sides together; to understand the general underlying causes while at the same time recognizing and appreciating the importance of the specific and unique" (Burns & Kahn, 2005).

Site is often defined by its physical and visual characteristics offset by roads, trees and near by structures. Also taking into account the boundaries defined by municipal codes, easements and legal stipulations. The relationship and interaction a site undergoes within a society is a critical diagnostic for a designer to understand. Site, just like any material contains embodied energy that of which effects not only the site itself but the local community in so far as the world and universe we inhabit. This, also commonly referred to as Site Reach, allows for designers measure the interactions and relationships a site plays within its local context. Measuring these interactions and the extent to which a site will effect the local community can play a critical role in sustaining the present and future life of the local community.

The proposed site for the Recombinant Material Waste Research Facility is within North Dakota State Universities main campus in Fargo, North Dakota. This site, currently sits uninhabited with minimal human interaction. The adjacent buildings are primarily research facilities and are typically designed with metal panel, glass and vibrant colors. Due to the low density and minimal topography, wind and light are able to reach every portion of the site.

As with any design, the current society's municipal processes and systems extend throughout the community and is important to ensure these systems stay intact. With a design philosophy of reducing, reusing and recycling the current waste stream, the proposed site allows for the current processes, systems and communication to remain

in a close proximity. The adjacent Fargo Sanitary Land Fill and storage area will act as critical players in defining the research and management practices held within the proposed facility. Acknowledging the required collaboration and common business practices within the community, the site reduces travel and offers a large area for both future facility and storage expansion. Thus, allowing for a high performance design that uses site materials and energy for building that also acts as a depository of materials and energy for future building.

### ARIAL MAP



Figure 11.0 -Arial Site Map & Reconnaissance



















# SITE INFORMATION

### **LEGEND**

46°54′06″N 96°48′38″W NDSU Technology Cir. N. Fargo, North Dakota Cass County

- Legal Lines / Easements
- Existing Utilities

General Vegetation Cover
- Prairie Grass

-Street / Ave- Vehicular Traffic

····· Pedestrian Traffic





# SITE & CLIMATE DATA

Topography & Air Movement

### **LEGEND**

46°54'06"N 96°48'38"W NDSU Technology Cir. N. Fargo, North Dakota Cass County

1'-0" Topography Interval



Air Movement

Site Area



Site Noise



# SITE: SOIL ANALYSIS

Fargo, North Dakota

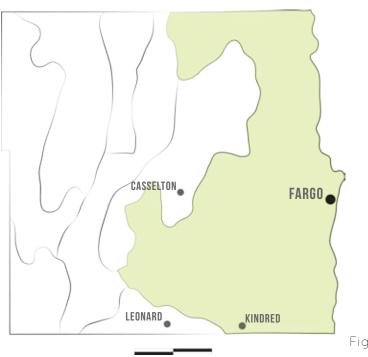


Fig. 2.0

FARGO CLAY

- 5 EMBDEN-ULEN SANDY CLAY
- 2 BEARDEN CLAY LOAM
- **6** BARNES-SVEA CLAY LOAM
- **3** GLYNDON-GARDENA LOAM
- **THAMERLY-SVEA-TETONKA CLAY**
- 4 HECLA-HAMAR SANDY LOAM
- **8** BARNES-HAMERLY CLAY LOAM

### SOIL DESCRIPTION

Fargo's silty clay soil is very deep and drains poorly. These soils were formed on glacial lake and flood plains with typical slopes not more than 6 percent. The analysis below gives a more thorough description of the each layer.

Ap - 0 to 8 Inches of black, silty clay, very dark gray & dry soil.

Bw - 8 to 13 Inches of black, very dark grey, plastic, crushed & rubbed silty clay that has characteristics of a shiny finish when wet.

Bss - 13 to 21 Inches of very dark grey/brown silty clay.

Bkg - 21 to 32 Inches of olive gray silty clay with granular.

**Cgl** - 32 to 48 Inches of grayish brown silty clay with a firm structure and gradual wavy boundary.

Cgl2 - 48 to 68 Inches of olive and pale olive silty clay with prominent yellow/brown concentrations.

Cg3 - 68 to 80 Inches of pale olive silty clay that is very firm, plastic and sticky.

# SITE: CLIMATE DATA

Fargo , North Dakota

### **AVERAGE TEMPERATURE**

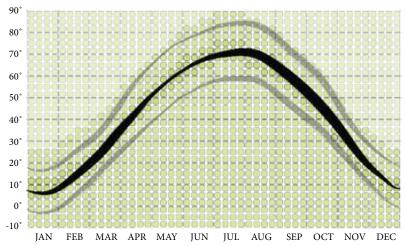
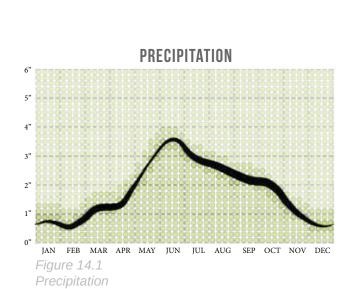
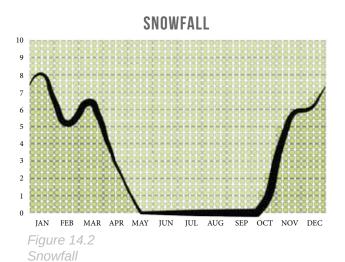
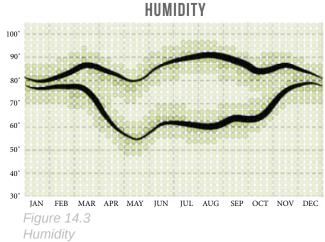
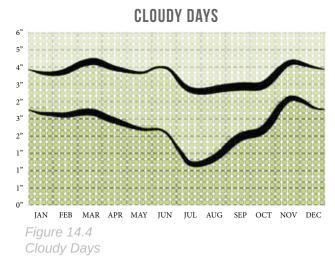


Figure 14.0 Average Temperature









# SITE: CLIMATE DATA

Fargo, North Dakota

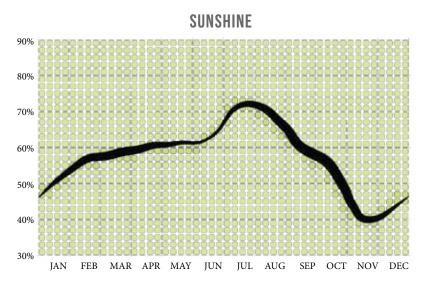


Figure 14.5 Sunshine

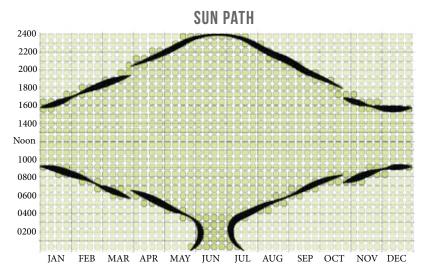


Figure 14.6 Sun Path

### **MAXIMIZE DAY LIGHTING STRATEGIES**

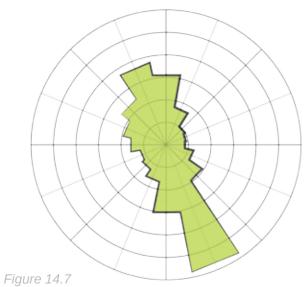
In order to enhance day lighting there are many basic strategies that one can follow when designing. As described in "Heating, Cooling, and Lighting" by Norbert Lechner there are a few guidelines that are recommended when designing for day lighting.

- (1) Orientation is a major consideration for a building and should be adjusted based on the uses of building spaces and climate. The South and North sides are often utilized for their consistent day lighting ability.
- (2) Lighting through the roof is also another beneficial option to maximize daylight in a space. Roof lighting incorporates clerestory's, monitor's, sawtooth's, and skylight style windows to draw in more light where necessary in a space.

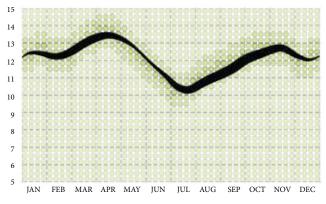
- (3) Form should also be taken into consideration and can affect how the building is viewed due to the ability for natural lighting to reach certain parts of a structure. This can be accommodated through space planning.
- **(4)** Space planning can be an easy way to make sure the maximum day lighting is being used, especially in 'open' space planning.
- **(5)** Color not only effects heating and cooling but the light reflectivity in a space as well. By using light colors, more light can be reflected into a space to utilize more natural lighting.
- **(6)** View and Day lighting incorporate many of the strategies listed above to provide comfortable views by distinguishing a difference between a window used for lighting effects, and a lower window used for viewing abilities (Heating, Cooling & Lighting).

# SITE: CLIMATE DATA

Fargo, North Dakota



AVERAGE WIND DIRECTION 1992-2013



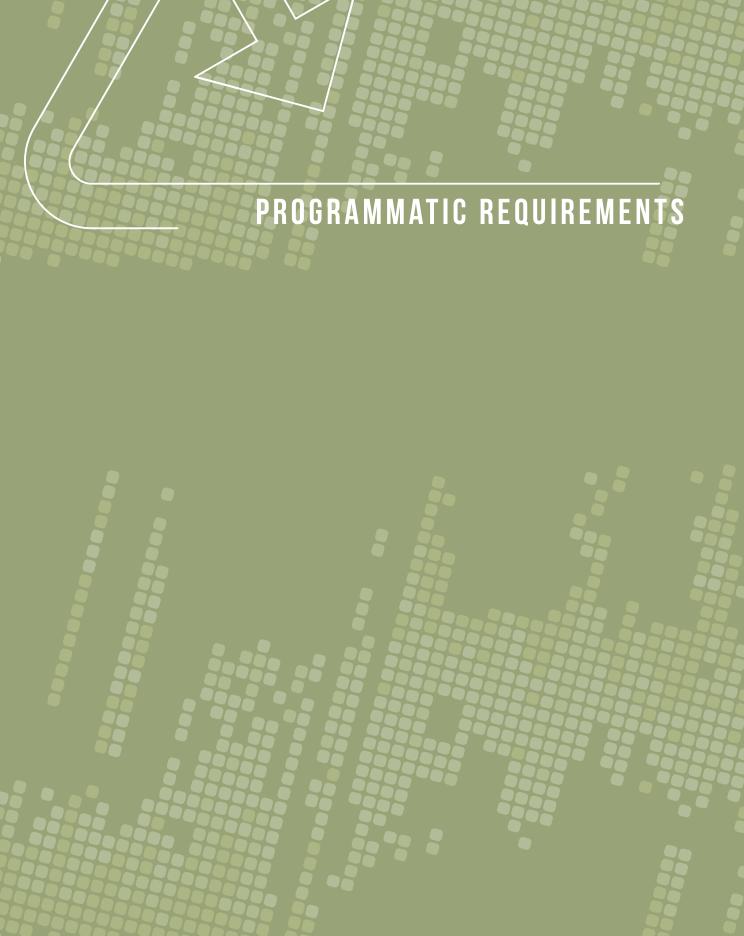
WIND SPEED [MPH]

Figure 14.8 Wind Speed

\*\* The site is greatly affected by wind due to a lack of nearby landforms, vegetation & built structures.



Figure 14.9 Wind Direction by Month



# SPACE ALLOCATION

#### (1) MATERIAL SCIENCE & RESEARCH CENTER

- Reception
- Interdisciplinary Labs [Applied Physical & Chemical Science]
- Materials Labs
  - wet & dry labs to support flexible research & programs
- Computer Lab/cluster -
- Lab Offices –
- Lab Support Spaces
- Lab Breakout Spaces & Conference Rooms –
- Male & Female Changing Rooms
- Storage -
  - Server Room
  - Mechanical Room & Shaft
  - Storage (Equipment...etc.)
  - Secure Archive Storage

#### (2) EDUCATION CENTER

- Gift Shop Store
- Educative Display Area/exhibit –
- Conference Room(s) -
- Seminar/Classroom Space
- Storage –
- Storage (Equipment)

#### (3) MATERIAL MANAGEMENT CENTER

- Material Consulting Areas/Offices
- Breakout Spaces w/ Conference & Meeting Rooms
- Administration Offices [Material transfer & Business Operations]
- Loading & Unloading dock [Material Transfer Location]
- Material Warehouse
- Male & Female Bathrooms
- Storage –
- Server Room
- Mechanical Room
- Storage (Equipment)

# INTERACTION MATRICES DESIGN PROCESS



Figure 15.0 Interaction Matrices

# DESIGN INITIATIVES

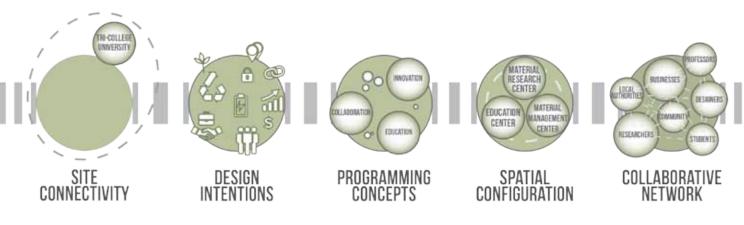
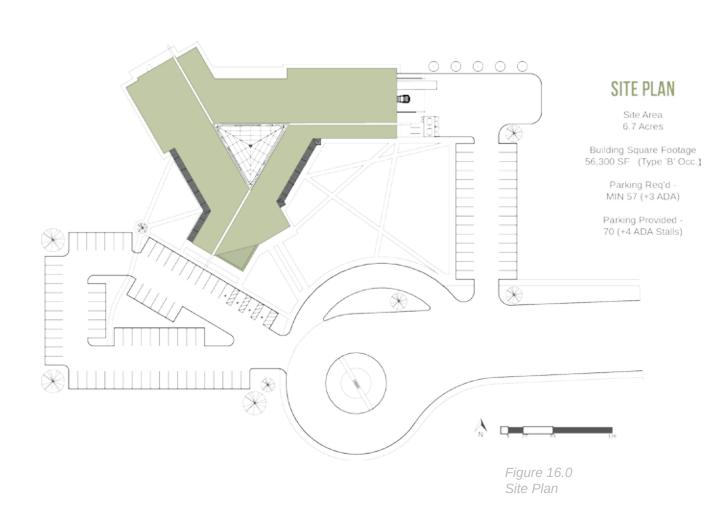


Figure 15.1 Mapping Net

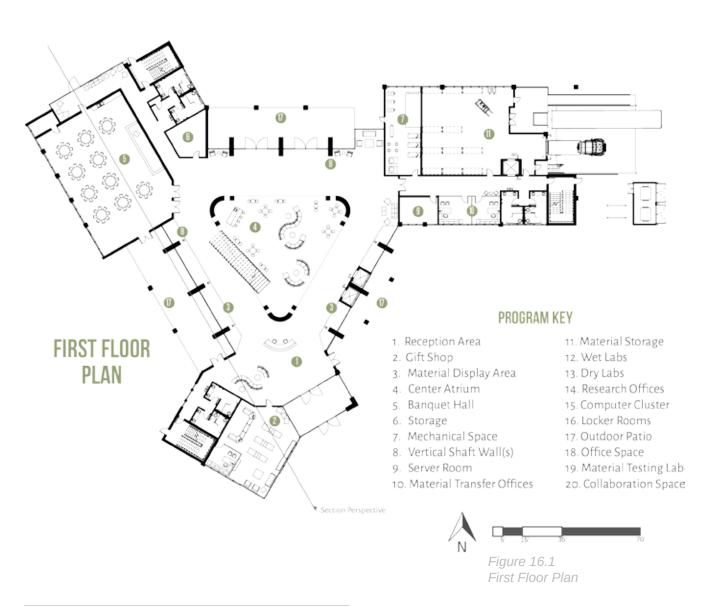


### SITE PLAN





# FIRST FLOOR PLAN



#### SECOND FLOOR PLAN



# THIRD FLOOR PLAN









Figure 17.1 North Elevation

NORTH FI FVATION

Figure 17.2 South West Elevation



Figure 17.3



# EXPLODED AXONOMETRIC

LABORATORY DESIGN

Structural Hallow core slab spread system

Metal panel system [Dri-Design]

Vertical louver shading system =

2 x 4 Troffer lighting — HVAC [Supply & Return] —

Water Return – Fire Sprinkler System – Non-fixed lab furniture – Water Supply (Hot & Cold) – Low VOC semi-gloss paint – with vinyl Cove base Vertical mechanical shaft –

 - Lab Modules to have negative pressure relative to other spaces, no return air from lab to other spaces.
 - VAV system has separate zones for individual lab modules

Monolithic seamless chemical resistant vinyl flooring with integral coved base

3" Topping over slab spread system

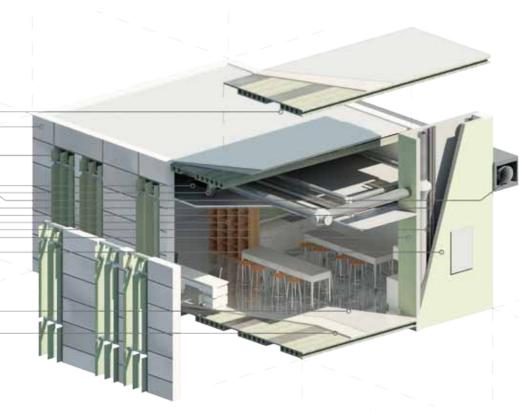


Figure 17.4
Exploded Axonometric

# FRONT PERSEPCTIVE



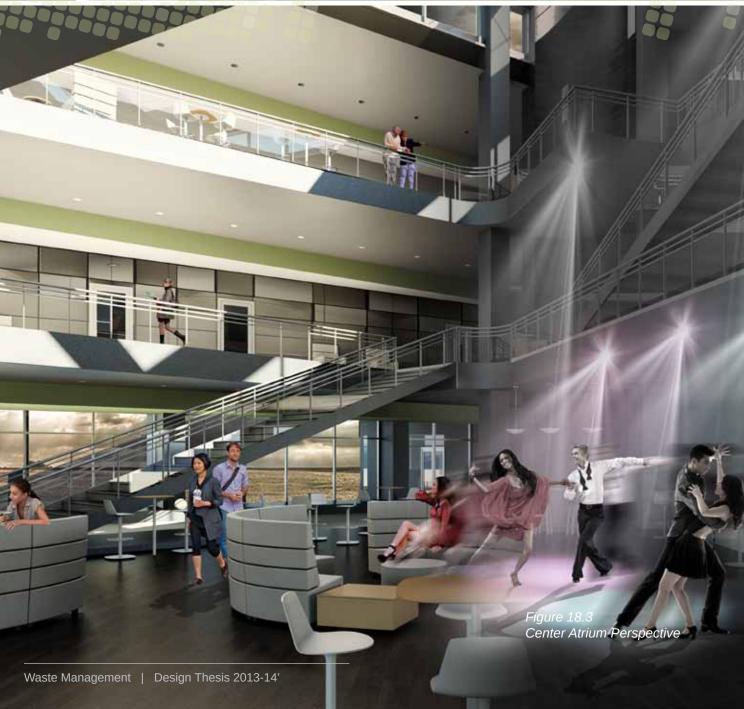


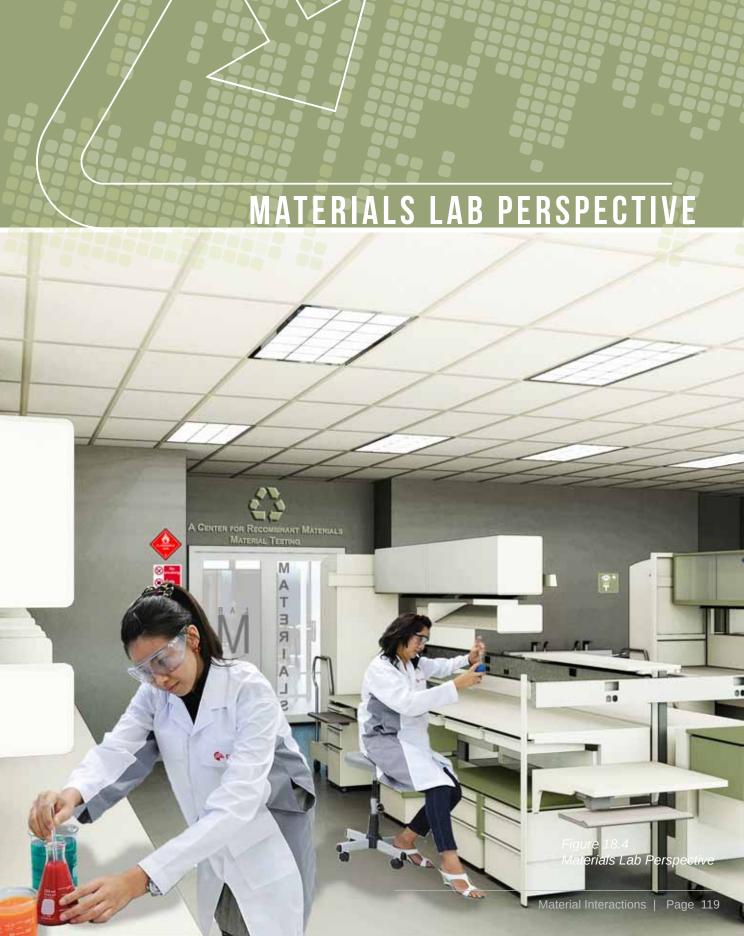
# **ENTRYWAY PERSPECTIVE**











### SUSTAINABLE INITIATIVES

Sustainable design choices can be implemented in a variety of ways. Material selections, site location, energy efficiency and environmental quality are just a few of the sustainable initiatives that stimulate interactions between designers and those who utilize the space. Approaching a new era of environmental design standards, material selection will be an essential step in a holistic design process, rather than an additive element. Understanding the potential of a given material to be recycled or re-used will be a

great influence on our community and the buildings we inhabit. Recognizing these initiatives and the benefits they provide allow for a deeper understanding of the specific processes and life cycles that take place in manufacturing, transportation, and installation of these materials. By providing universities and local businesses the opportunity to work in a collaborative and organized process we will have a more cyclical, cradle-to-cradle approach to sustainable living.





Material Reuse



Recycled Content



Regional Materials



Rapidly Renewable Materials

Figure 19.0 Material Interactions

# **MATERIAL INTERACTIONS**





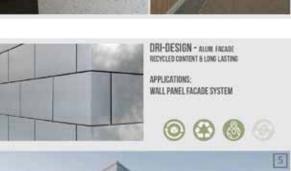
APPLICATIONS: FURNITURE, TILES, COUNTER TOPS, SITE OBJECTS, & WALL PANELS















CONSTRUCTION, FURNITURE, & FLOORS



Figure 19.1 Material Interactions









AGRICULTURAL WASTE PRODUCTS, MYCELIUM

RIGIO BOARD INSULATION, PROTECTIVE PACKABING, ACOUSTIC PANELS

APPLICATIONS:

Figure 19.2 Material Interactions

# PROJECT PHOTOGRAPHY



Figure 20.0 Project Photography







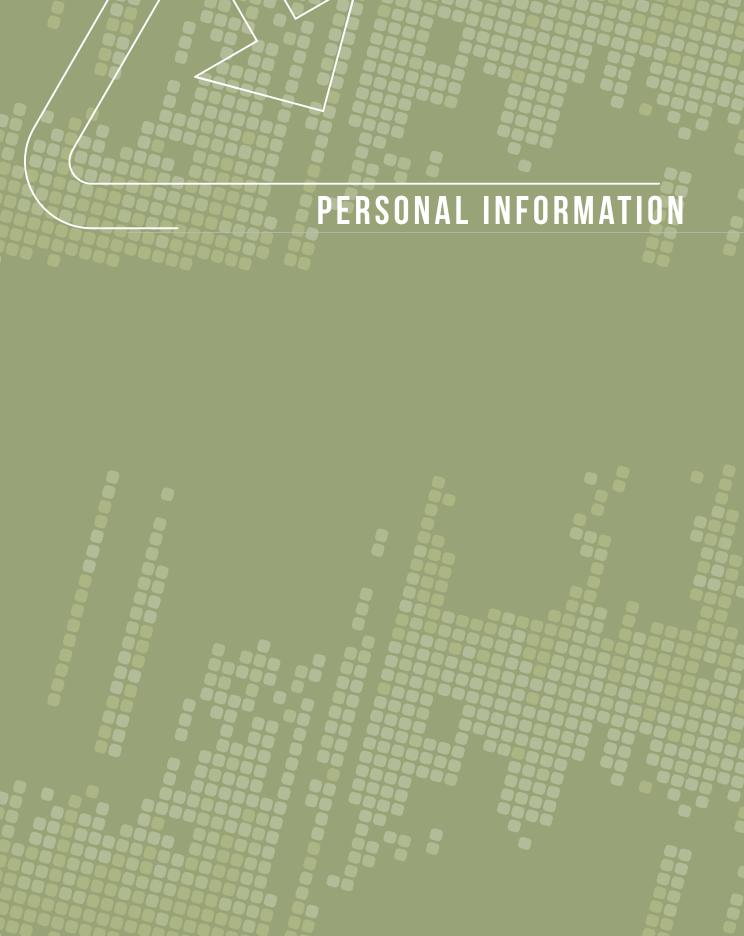
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All photographs & images were taken and/or created by the author of this book, Matthew Peick (2013), unless otherwise noted.





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Figure 21.0 Personal Photo

"It doesn't matter how you do it, as long as you do it really well!"
- Mike Christenson