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Vertical Adaptive Reuse: Balancing the Past and Present

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VERTICAL ADAPTIVE REUSE

balancing the past and present

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COMMITTEE APPROVAL

Vertical Adaptive Reuse

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Finally, I would like to thank God, for all His blessings and letting me get through all the difficulties that I have faced. I have experienced your guidance day by day. I will keep on trusting you for my future.

ABSTRACT

Many countries like the United States are taking lands that are untouched and putting in new structures stripping away the natural beauty of the site. Structures that once thrived in the past lay in waste as society continues to move forward. Architecture can be used to revitalize abandoned historic structures keeping a balance between respecting the past while designing for the present and the future. This a design thesis that proposes to revive an existing structure by adding a vertical addition for the pedestrian to experience the past, present, and future while rising up.

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1. INTRODUCTION

1.1 Restore abandoned structures

With technology advancing, older buildings are taken down and replaced by a new high rising structure. This is the most common practice which is wasteful and unsustainable. Architecture can be seen like us humans, who learn, grow, adapt, and is constantly changing. Taking away a historic building is like taking away the achievements and failures created by man, and letting go of the opportunity to understand our past that we can use in the future.

Abandoned structures are all over the world and Rochester; NY is not an exception. These historic structures that are abandoned should be seen as an opportunity for redevelopment. To bring back to life forgotten building's and serve its community with new activities and programs that is much needed. Many people don't realize that reusing an existing building can be functional, energy efficient/sustainable, cost effective, and aesthetically beautiful.

Adaptive reuse is the process of reusing an existing building for a purpose other than which it was originally built or designed for. We can appreciate the antiquity of the past and maintain that part of our identity while appreciate the ingenuity and innovation of the present (Kerri 2010). In our daily lives past and present is what forms of who we are. The city is the same. Old buildings can interact with new ones, which can benefit the city not just aesthetically but also in the history aspect of the community. The design will have to follow important rules to achieve the manifesto and the success of the design will come from it being balance, vertical, and multigenerational.

1.2 Site – A city of opportunity

Rochester is the third biggest city in New York State yet no one really knows about it. It is a city that has many opportunities to thrive. It has a lot of land, amazing views/scenery, and space. Rochester has many abandoned buildings that can be reused to benefit the community by creating jobs, bringing in revenue, create landmarks, and many more. Being a city of many opportunities, it was a good location to research and develop the central idea of incorporating adaptive reuse. To show outsiders and the people of Rochester its history is not forgotten and it will thrive once again.

Climate is important since it will determine the design of the building, either inside or outside. It helps come up with design strategies to help solve future problems. Rochester is known to experience minimum average temperatures of -10˚ to -5˚ and maximum average temperatures of 77˚ to 82°F. Due to the positioning on the border of a lake effect region, mild to severe westerly winds are prevalent year-round but are often more powerful and sustained in the winter months. Additionally, precipitation occurs on 29% of days, with an average annual accumulation of rain at 33 inches and fresh snowfall at 77 inches. The sun shines an average of 165 days. To address the threats to the building posed by inclement weather, the addition was designed with the four building control layers, water, air, vapor, and thermal.

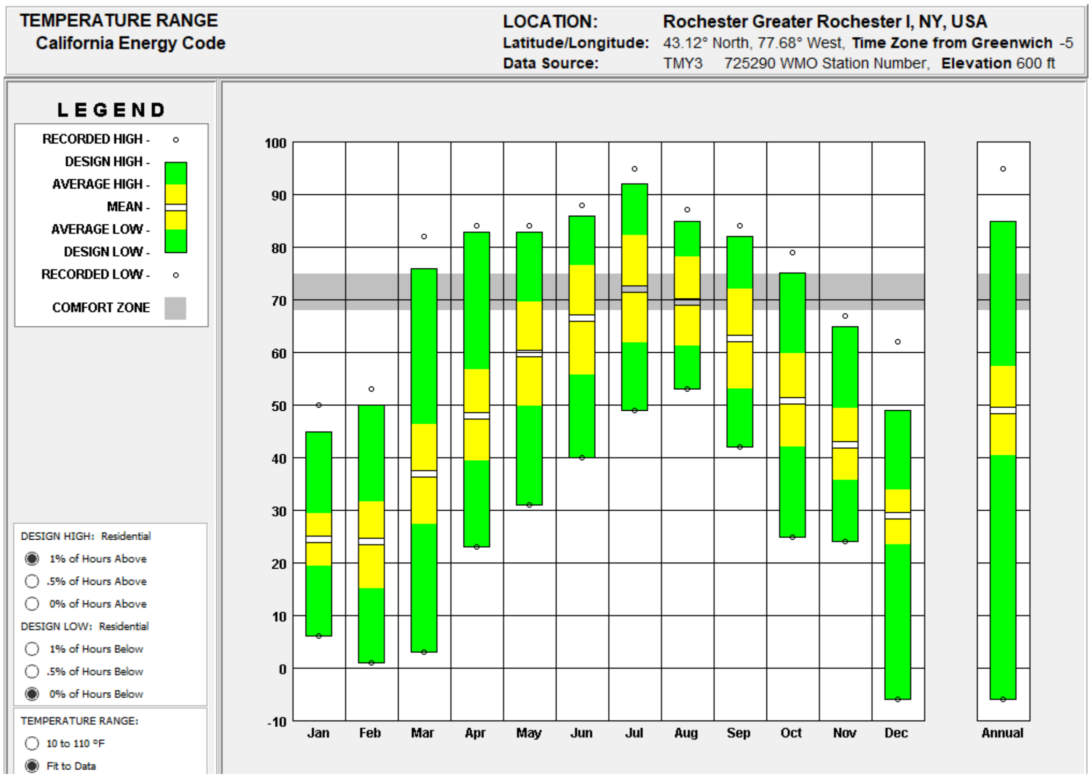

figure 1 average temperature in Rochester, NY – provided by climate consultant

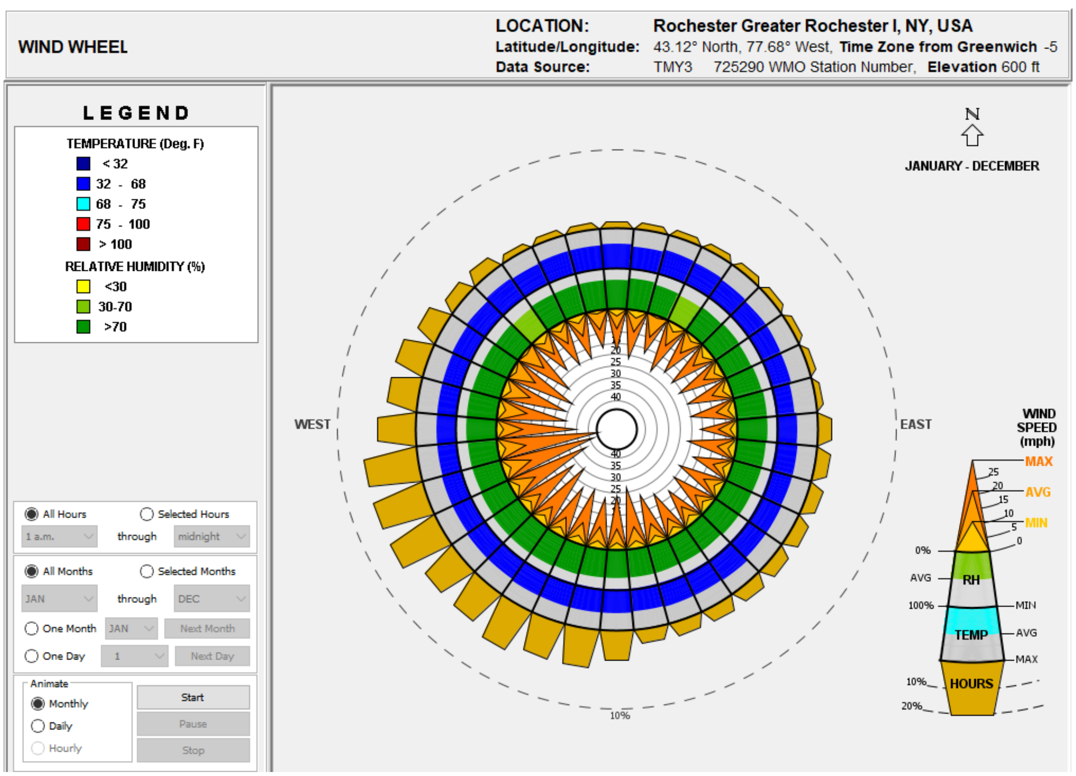

figure 2 wind rose in Rochester, NY – provided by climate consultant

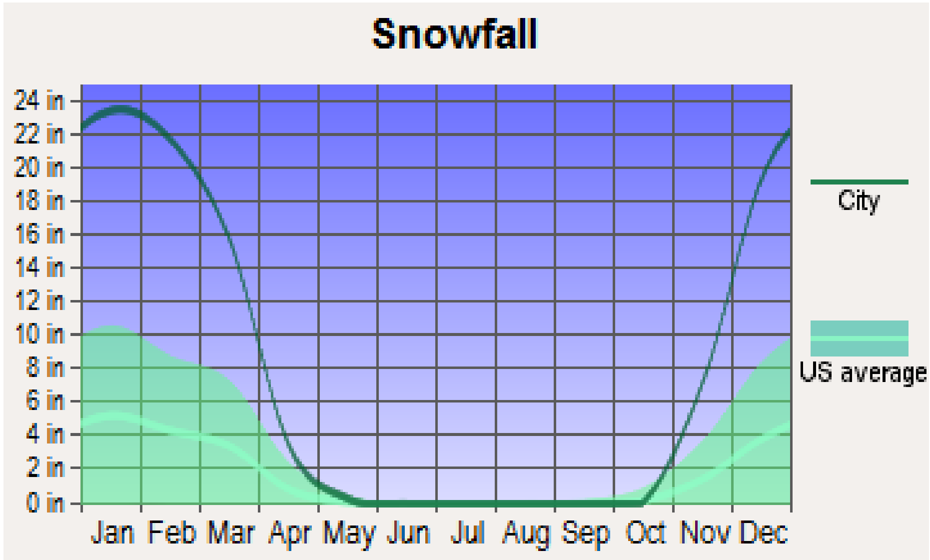

figure 3 annual snow fall in Rochester, NY – provided by city – data.com

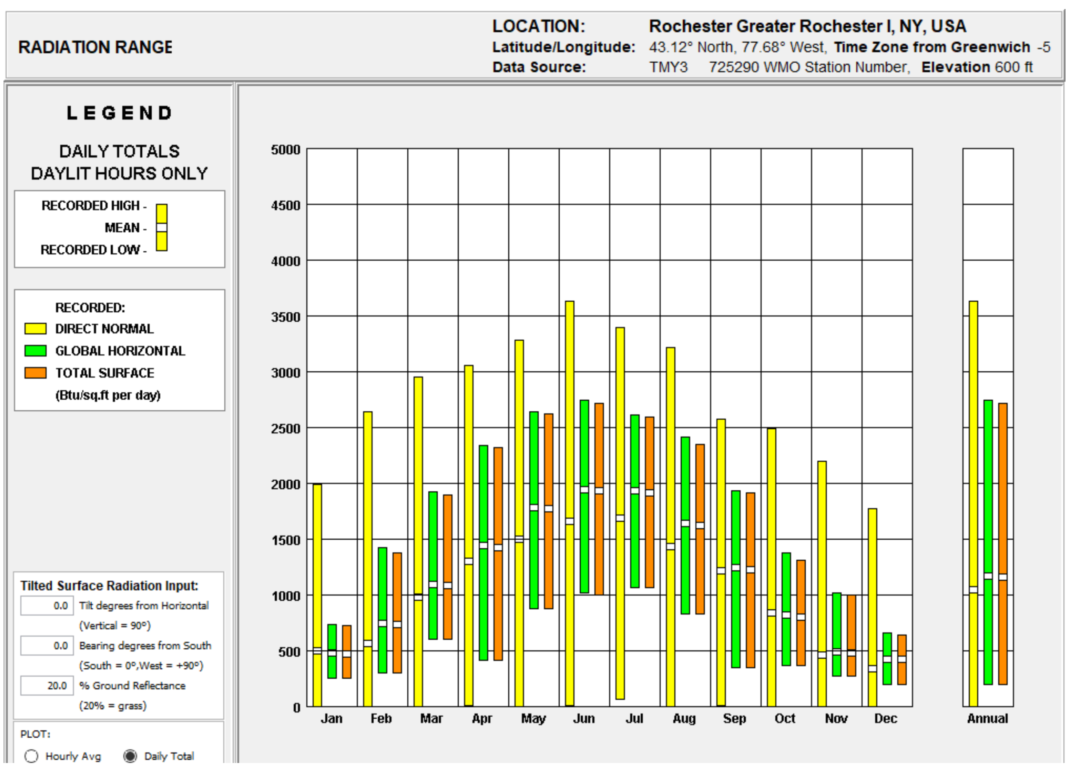

figure 4 daylighting in Rochester, NY – provided by climate consultant

1.3 Vertical Adaptive Reuse Design

The design will have to follow important rules to achieve the manifesto. This design thesis will consider the importance of balancing the past and present using present day technology. It has to emit sustainable strategies in some way to be balance. The design will be mutli-generational where the function of a new space will effortlessly change overtime based on what the socio-cultural needs of the day are. Lastly, it has to benefit not only the client/owner but the community as well.

1.4 Sustainable Strategies

In the world of Architecture sustainability seeks to lower the negative environmental impact of buildings by efficiency and moderation in the use of materials, energy, and development spaces. A delicate balance now needs to be made between a building's form, function and interactions with its surrounding environment to be considered sustainable development. Four main sustainable strategies will be focused. Preservation: what is being kept from the original structure. For example, existing stairs, interior walls, finishes, windows, and the list goes on. Sustainable Materials: Production of goods today are hyper focused on economics with little consideration of environmental impact. A key factor is to incorporate natural, local and reusable building materials. Nature and Permaculture: In a city, especially one made of brick, natural spaces can be far and few between. The proposed design will have green space directly into the building design. Green roof terraces that receive natural light, permaculture orchestrated to provide food, protection, utility cost savings, health improvements, and enjoyment. Building Systems: incorporate active systems to save energy and money. For example, lighting systems, water recovery systems, radiant flooring, low energy appliances etc.

1.5 Design strategies and influencers

Many architects design buildings for a specific purpose or for specific activities and programs. In reality no one knows what a structure will be used a hundred years from now. Churches are turned into movie houses, banks into restaurants, hat factories into studios, and subway terminals into nightclubs. Architects like Zaha Hadid design a structure by having an open floor plan, with no forced programs in it. They design not only for the present but for the future. Like the Vitra Fire Station the new design for this thesis will have an open floor plan to allow any function to change over time. An architect cannot foresee what events could actually occur in a given space (Zaha and Aaron 2017). Architecture is constantly subject to reinterpret it doesn't claim a permanent meaning.

Carlos Espinoza is a well-known accepted architect in Cuenca, Ecuador. Cuenca is a city where its historical buildings are very important to the community and not just any architect or person can build them. Carlos Espinoza has restored and built many structures alongside with his team that benefit not only the client but to the community of Cuenca. Like architect Espinoza, finding out what the client wants and what the community needs will be an important factor in making the proposed design a success.

Designer Oki Sato believes that the idea is not about minimalism, the idea is to be simple. It should flow effortlessly and it should tell a story (British GQ 2019). The design will come from the rise and experience (telling a story) from the past to the present. Architect Bjarke Ingles believes that buildings are not just informed by the culture of a place, but also the climate they are built in. With advancements in technology, we are able to make the world environment to adopt to us rather than us adapting to the environment (Bjarke 2015). With this idea in mind, modern technology can help integrate new green spaces as well as solutions into the proposed design.

2. Goals – Literature Review

2.1 Balance

2.1.1 Casas del Cipres

Balance is balancing the old with the new. For many years people have been doing new construction by buying land that has not been touched. Land that has trees and water that benefits an existing ecosystem. Taking that away is not balance, the new has to respect the existing as much as possible. This includes both the existing structure and its vegetation. Many cities like Rochester have buildings or lots that are not being used today, creating a lost opportunity for a large space to benefit the city. ‘Normal” or ‘typical’ construction is not balance because it tends to demolish an existing building and rise a new one. Adaptive reuse is balance because it allows for redevelopment of forgotten structures. In order for a new redevelopment to be balance it has to bring in new innovative ideas and programs that can benefit both the community and client.

An example of a balanced project is the Casas del Cipres (located in the cliff along the Tomebamba river in Cuenca, Ecuador). What was once a nightclub is now a residential building that helps the city grow by allowing locals to stay (Ashley 2019). The redevelopment of this structure had three main strategies that helped create a design that’s balanced. Preservation, recycle, and densification seen on figure 5 below will be used within the proposed design of this thesis. The new redevelopment preserved the retaining wall that holds its beautiful gardens and existing fruit trees that attracts local birds. As for recycling the structure had pre-existing construction system that allowed for significant number of bricks to be reused. The site was densified by the addition of new community gardens and programs. New rooms/studios and office spaces to rent (Archivo BAQ 2020).

This thesis will have a site plan that will show the preservation of the existing vegetation and it will densify by adding new vegetation and green spaces within the new addition. This will allow plants and animals to flourish creating new ecosystems. The proposed floor plans will show what has been restored and what has been added. Like the study above, the chosen existing structure for this thesis will have a pre-existing construction system that will save and reuse most of its materials. Along with that the new addition will have new building systems that can save energy. For the proposed design to be balance, it has to preserve and recycle 100 percent of the existing vegetation and structure. It has to densify at least by 20 percent in order for it to be perfectly balanced.

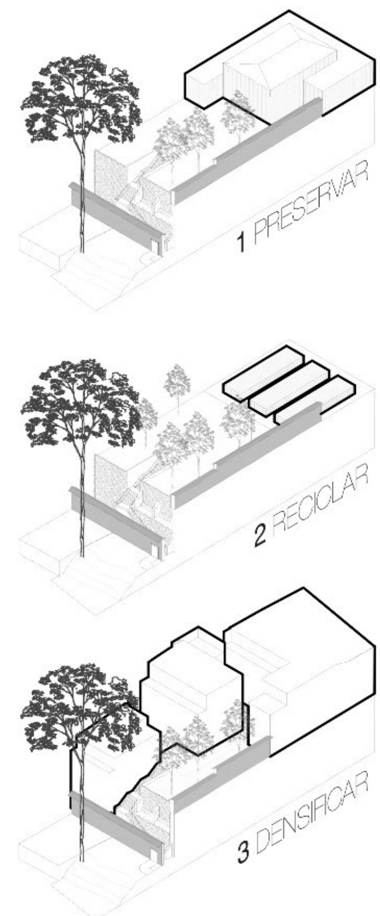

figure 5 casas del cipres diagram – provided by archivo BAQ

2.2 Vertical

2.2.1 192 Shoreham Street / Project Orange

Building vertical is for a new building to interact with an old one without stripping away its history or adding to its horizontal footprint in which could cause damage to its surrounding ecosystem. A vertical addition allows for new innovative technologies and styles to be formed without damaging the existing structure. Building upwards allows for a design of new spaces and activities without the need to take more ground space for the community. The vertical addition has to enhance the existing structure and become a striking landmark; a symbol both of the areas past and its aspirations for the future (Kritiana 2012).

An excellent example of vertical adaptive reuse is the 192 Shoreham Street. It is a Victorian brick industrial building with a new rehabilitated design to raise the original building with a duplex structure. The upward extension of the existing building replaces the original pitched roof, having a powder-coated steel volume that both overlaps and bites through the original brick structure. The new roof creates the illusion of a different building being placed on top of the original structure (shown on figure 6 on the right). The new construction consists of a lightweight steel frame with composite concrete/steel 'Ambideck' floor decks. This steel frame is able to support the extension and restrain the original brick walls.

figure 6 192 shoreham exterior facade – provided by arch daily.com

Like the study above, this design thesis will have an abstract and contemporary addition that will stand out from surrounding structures, making it the new landmark of the city. A wall section of the addition will show a lightweight steel frame that allows support for the new extension and restrain from the original walls. A green roof diagram, and an energy performance analysis will show how much energy and money the client will save by comparing it to LEED standards for new construction (LEED v4).

2.3 Multigenerational

2.3.1 Burgos Railway station

Multigenerational is when a function can change within a space depending on what the social needs of different generations at differing times both of the day and seasonally. Even though the function could be different, its history cannot be not forgotten and the present should be intact. The importance of it being multigenerational is for the structure to be used for people over the age of 50 and kids from the ages of 13 to 17.

An example of multigenerational is the Burgos Railway station project. The station was significant for the city of Burgos, but over the years the building was being forgotten until total abandonment. The reconstruction would accommodate a recreational and leisure program for the youth as well as serving other generations in the years to come (Archilovers.com 2017). Clear pathways allow for easy to different spaces within and keeping the large windows bring the space fresh air and natural sunlight that is keen to human health especially for the older generations.

figure 7 interior of the burgos station – provided by archdaily.com

Adapting the construction and keeping existing materials were key factors to the new intended use. This is shown on figure 7 on the right. New structural porches are generated according to the rhythm of the existing walls in order to support the new slabs and aisles roofs. All the existing interior linings are removed, exposing the brickworks and stoneworks. This was necessary for the rehabilitation of the walls to allow the viewer to clearly differentiate the existing parts of the building from the new ones (Rayen 2017). What makes this building multigenerational is not just from it combining two architectural styles but from it serving a different function from what it was originally built for. The community at the moment were in need for a recreational program for the youth but over time it might need a new activity and its open floor plan allows for the structure to have multiple uses. Figure 8 located below is the first floor of the station where the open spaces are used as hang out spots for the youth or it could be used as a senior center. These spaces will turn from hang out spots for the youth into spaces for the elderly to eat and interact with others who do not wish to eat alone in their home.

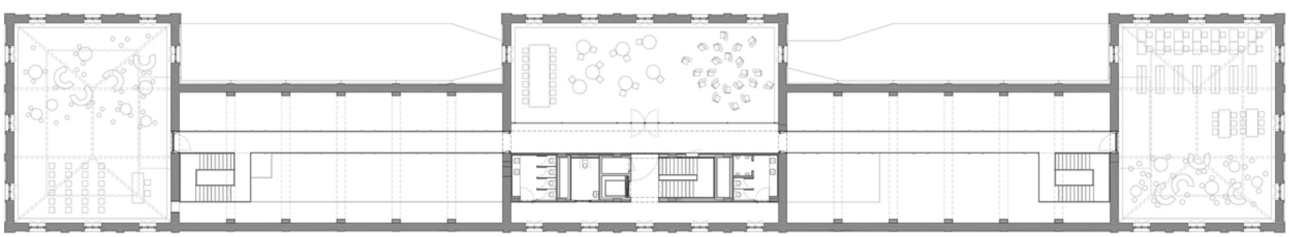

figure 8 floor plan of the burgos station – provided by archdaily.com

For this thesis to be multigenerational it cannot serve for only one function, it has to have the flexibility to become anything depending on the needs of the community and client. At least 50 percent of new community space has to be added into the design. Each new space will show at least 2 different functions of what it could serve. The function of each space has to serve both the community or client.

3. **Building & Site Selection**

3.1 Eastman Dental Dispensary

The structure needed to apply certain criteria, it had to be located in a dense area, be able to build up, and be able to reconstruct in a safe and affordable manner. The decision was easy especially since the structure was chosen as one of five to revive in the Landmark society. The Eastman Dental was built in 1917 by George Eastman of the Eastman Kodak Company. It was a former dental hospital and school of the University of Rochester. George Eastman contributed significantly to the improvement of dental hygiene in America and Europe, and was also the first school in the United States licensed to train dental hygienists, thus creating a new profession for women (Mary 2019). The Eastman Dental Dispensary (now called Eastman Gardens) is prominently located on a major gateway into downtown and features a unique design patterned on Italian Renaissance palazzos, with a symmetrical U-shape plan around a central court (Christinne 2016). The three-story west wing was added in 1964. The existing building materials include brick, bronze detailing, art tile mosaics, and Venetian marble trim.

figure 9 exterior façade of Eastman gardens – provided by homeleasing.net

3.2 Dream Tank & Urban Footprint

The Eastman Dental Dispensary has been vacant since 1977, when a new dental school was constructed at the University of Rochester medical campus. Before the structure became a residential project for middle-and high-income seniors, the community had many disputes on deciding on what the structure could become. The concept ‘Dream Tank’ sprung to make it a mixed-use facility that helps struggling young people. It did not pass because on August 2013, the Home Leasing LLC and [WWW]Edgemere Development Inc. announced that they plan to redevelop the space into 57 apartments for middle-and high-income seniors. This project was completed in 2016 and is now called Eastman Gardens.

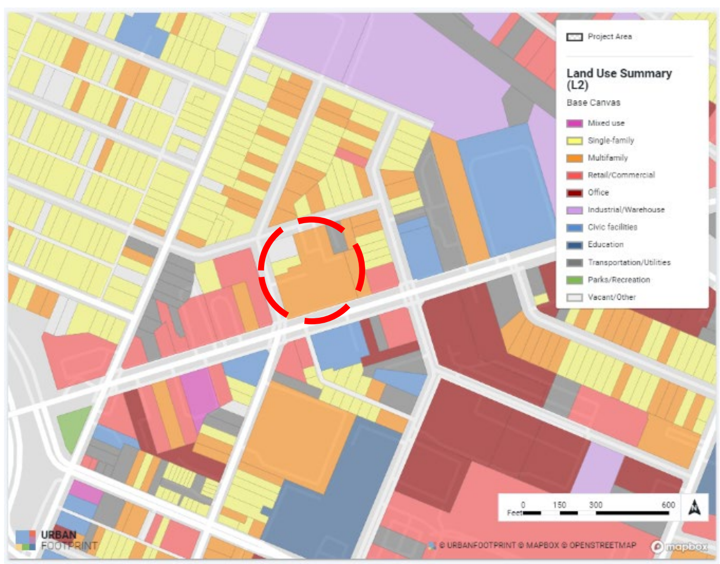

figure 10 land use – provided by urbanfootprint.com

Websites and resources like urban footprint, the city of Rochester Zoning Map, and ecode 360 demonstrated that Eastman Gardens is located in a C-2 community center district. Since the addition is added on top and nothing is being added on ground level, there is no need to follow lot and yard requirements. Surrounding the structure are buildings that have more than three stories that also are in a C-2 district, therefore building up is not a problem. As seen on figure 10 located above, the selected site is surrounded by many retail/commercial, single-family homes, one park, two churches, and one mixed-use. It has off-street parking, guest parking, and a walking distance to local library, park, post office, pharmacy, shops, and restaurants. What it doesn't have is a community center. This shows the potential of a new design to create a mixed-use building using both concepts – housing for seniors and a recreation center to keep struggling teens occupied. With the development of a new vertical addition to the building, it will show that it can be more than just a new residential building. It can be turned into a multi-complex serving both the community and the client.

3.3 Site Analysis

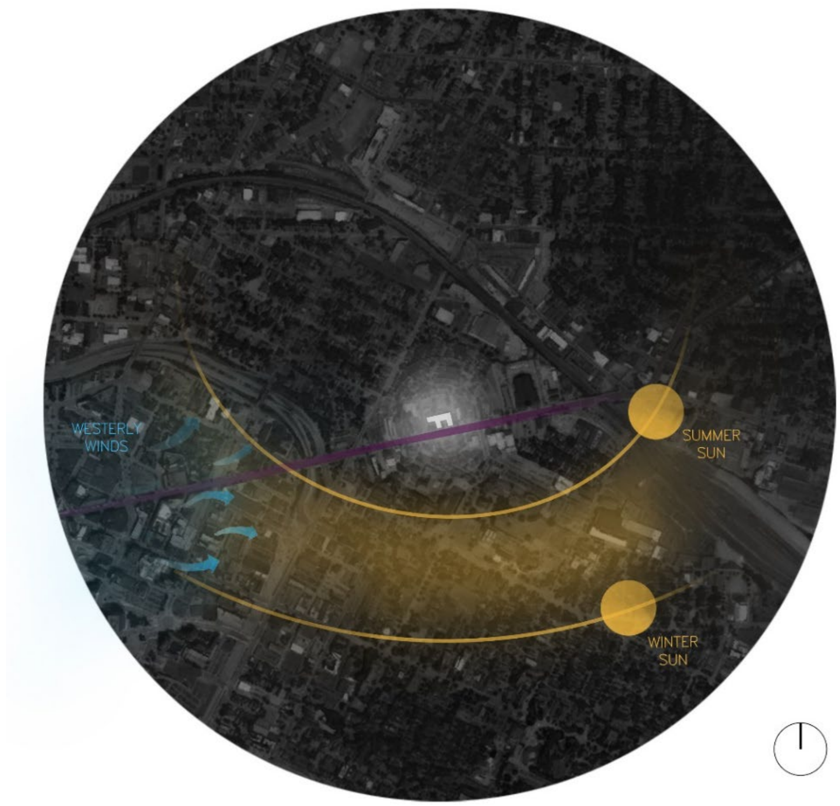

figure 11 site analysis – provided by author

Figure 11 located above helped understand the site's environment and its constraints to come up with a functional design for the new addition. Knowing the sun's path and prevailing winds help determine window placement, the shape of the new roof, the materials being used, and building systems to incorporate. Improperly fitted or old openings can allow undesired airflow to enter the structure during high winds. This can result in air pressure that negatively impacts the roof and moisture accumulation. High efficiency, double-paned shatter resistant windows and highly insulated doors were selected that will maintain a complete seal when closed. During the high winds of storms, roofs can often become damaged due to uplift forces affecting poor designs. A flat top roof is impervious to uplift as it forms one uniform body with the structure. Additionally, the solar panels that's going to be placed on top of the new roof are designed and oriented to handle high winds from any direction. Winds have the potential to inflict structural damage on a building and therefore the structure must be made of resilient materials. The exterior facade should be either easy to dry or waterproof to deter mold and mildew growth which could impact the structural integrity. The steel beams through the interior of the envelope wall provide a heavy, durable base that will resist storm damage.

4. Proposed Project Design 4.1

4.1.1 Site plan – Connection to Nature

figure 12 site plan – provided by author

Balance can be seen on figure 12 located above showing the following five zones of permaculture. These five zones of permaculture will show what is being preserved and what is being added. Zone 1 are the green roofs and terraces that provide a relaxing and calming nature environment. Zone 2 are gardens/growing spaces to encourage occupants to grow food either for themselves or for the community. Zone 3 is the introduction of native flowers and edible plants which once again provides a food source but also serves as a habitat for pollinators and other beneficial creatures. Zone 4 is the location of solar panels to minimize unnecessary energy usage during peak hours. Zone 5 is the existing vegetation that will remain untouched. The main entrance is at the north façade and there are two existing parking lots at the south façade that residents and visitors are able to park. If more parking is needed visitors are able to park along the whole strip that is across the existing structure on East Main Street.

In conclusion, the new design is balance because 100 percent of the existing landscape that surrounds the structure is saved. There was no need to touch on what is existing since the new addition is on top of the existing structure. The new addition of green spaces densified the existing structure by more than 20 %. A total of 7,400 square feet of new green space was added, allowing plants and animals to flourish creating new ecosystems as well as saving existing ones. We have now balanced the ecosystems with human needs.

4.2 Floor Plans

4.2.1 Restored & New

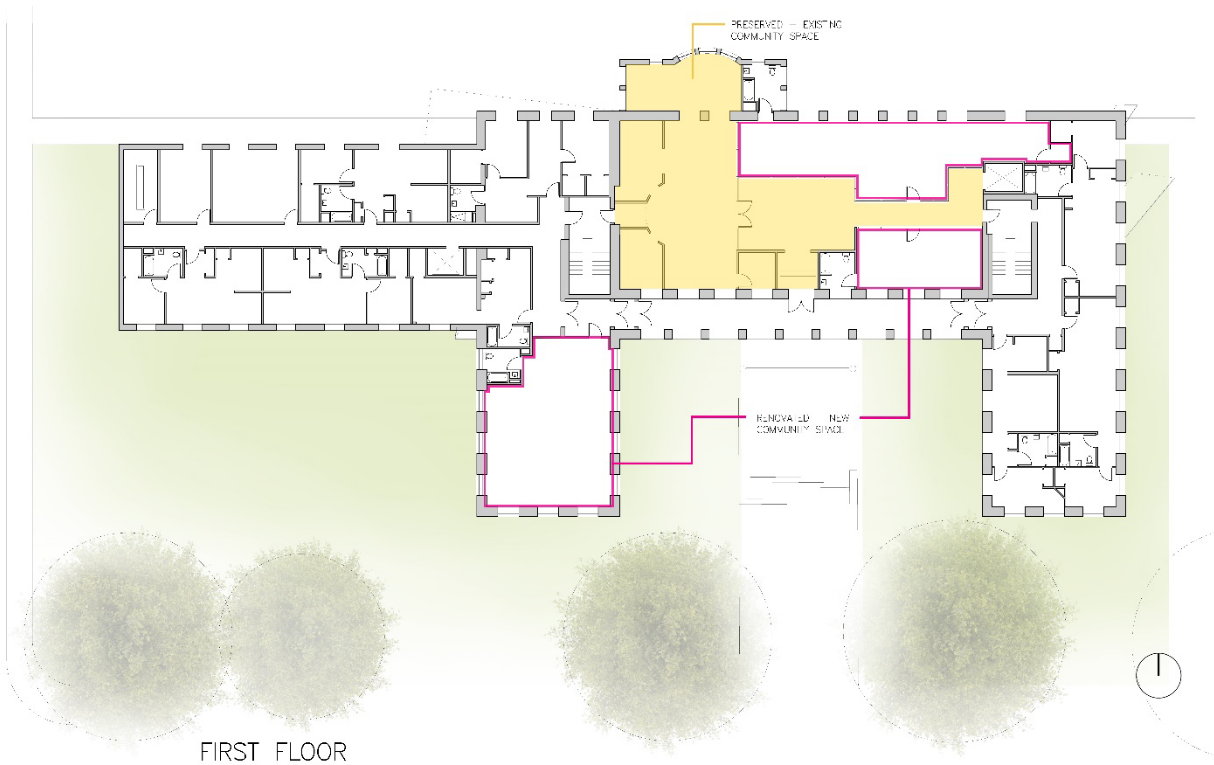

figure 13 existing first floor renovated – provided by author

Since the abandoned Eastman Dental dispensary is now a residential project called Eastman Gardens the existing levels is up to date with the New York State building codes and regulations, therefore little to no changes had to be made. The first level seen above is the existing floor plan that shows balance on what is being preserved and what is renovated. Spaces like the fitness room and laundry room that is on the existing first level will be moved onto the existing upper floors to create more community space. A total of 5,000 square feet in the first floor will be for the community. What is outlined in purple is the new community spaces and what is in yellow is the existing community space.

The modification is multigenerational having large open spaces to allow for different types of workshops to be established. Inside the East Main Street entrance, is an existing community room with a kitchenette that will remain the same as well as the adjacent library and lunge that is adorned with replicated murals and woodcarvings. The existing stairs and elevators will remain as is, leading up to the upper floors onto the new addition.

In conclusion, the design is not 100 percent balance but it did preserve more than 80 percent of the existing structure. The first floor had to be modified in order to create a large space for the concept of helping struggling young teens. The modification of the existing floor allowed for 5,000 square feet of new community space to be established onto the existing first floor serving a variety of activities. The other existing levels will remain untouched in the exception in modifying one apartment to become a laundry room and a fitness room for the floor.

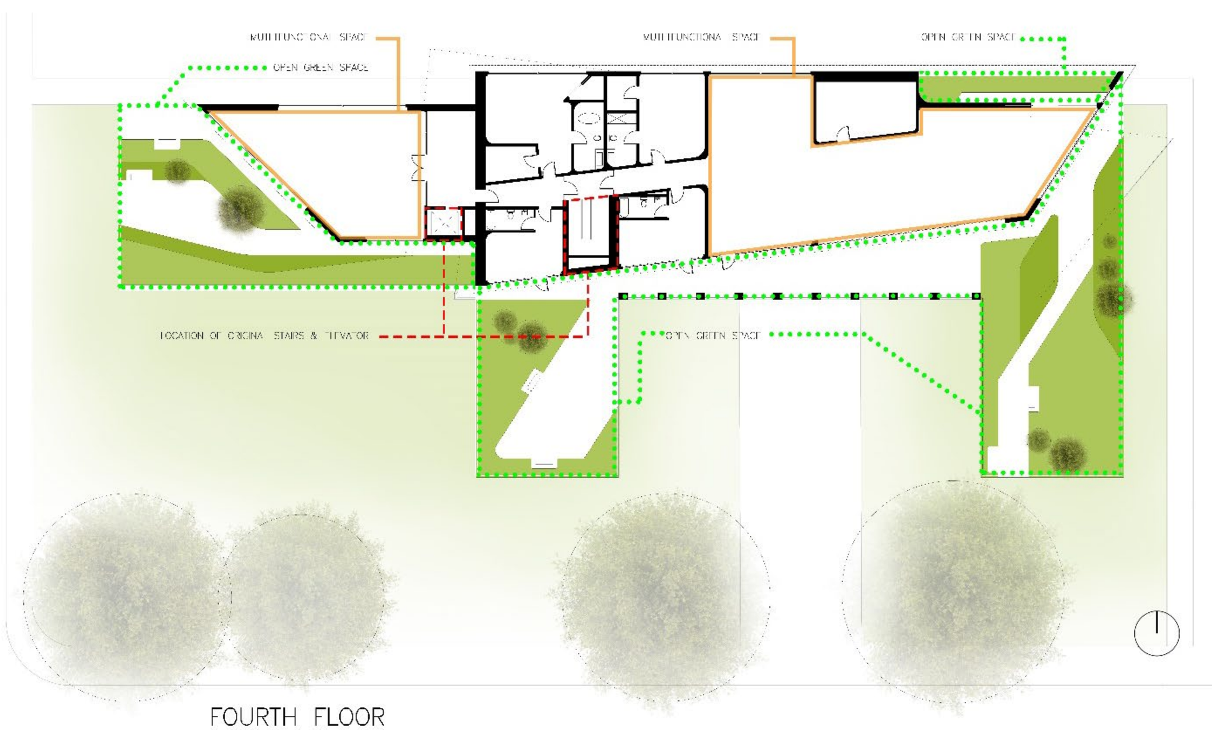

figure 14 fourth floor new addition – provided by author

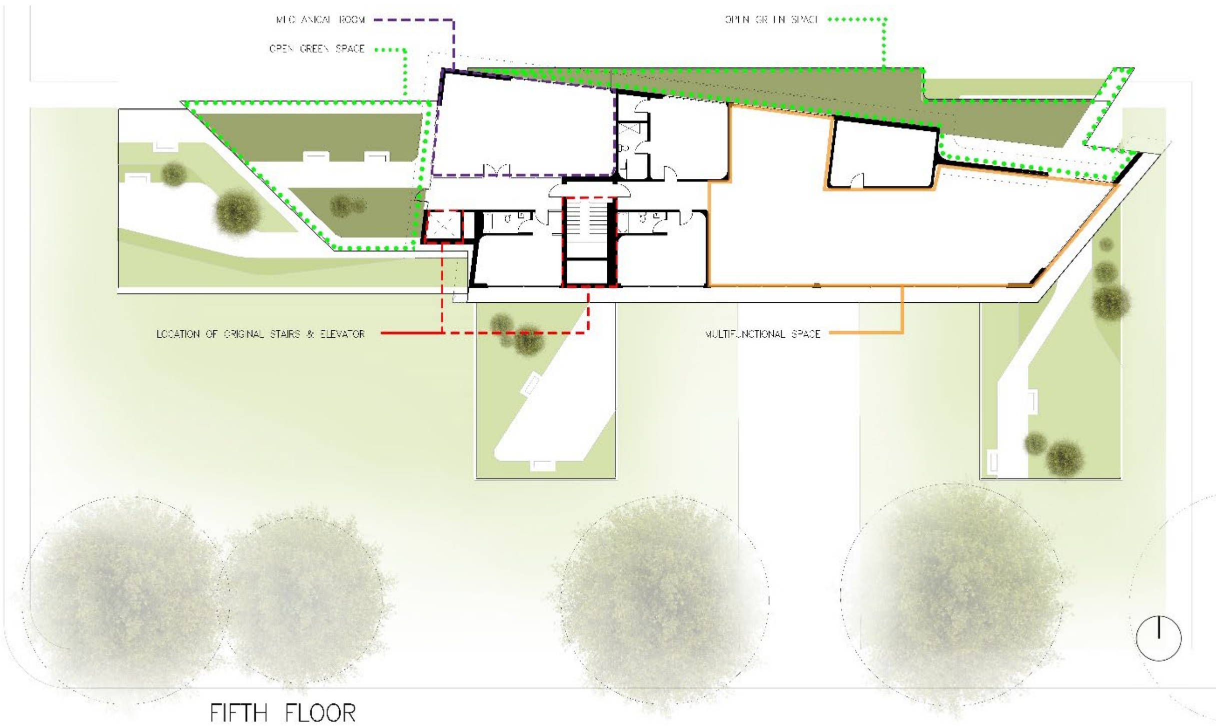

figure 15 fifth floor new addition – provided by author

The new vertical addition seen on figure 14 and 15 located above will have an open floor plan on both floors to allow a function to change effortlessly overtime based on what the socio-cultural needs of the day are. The new stairs and elevator that lead up to these floors will be at the same location as the existing stairs and elevator. The new open spaces can be used for residents as apartments or for the community depending on what they need. A total of 6,000 square-feet of space within the 4th level of the structure is for community whether it becomes an exhibition, offices, gym, club, or restaurant and 2,900 square feet of new community green space. On the fifth level 4,000 square-feet can be used for the community as well as 1,400 square feet of green space. The concept of the shape came from it being rectangular floor plan slashed with these sharp edges to allow unique spaces within the structure as well as adding more green space on the outside. The interior of the new addition is the opposite of the exterior façade since it uses these soft curved walls to give the spaces a more comfortable feel.

In conclusion, the overall design of this thesis became really close to being 100 percent balance and multigenerational. Although the existing structure is not 100 percent preserved 5,000 square feet of new community space is added onto the first floor with an open layout that is multifunctional. The new addition is 100 percent multigenerational and balance by adding a total of 10,00 square feet of new community space not adding the 7,400 square feet of new green space that can also be used for the community.

4.2.2 Function Effortlessly Changing

figure 16 existing laundry room – provided by homeleasing.net

Figures 16 located above is the existing 1,100 square foot laundry room located at the first floor that was turned into one of the community spaces. Figure 18 located below is the same space but turned into a playroom for young teens to relax and socialize with one another.

figure 17 community playroom – provided by author

figure 18 apartment living room – provided by author

figure 19 coffee shop – provided by author

figure 20 fitness room – provided by author

figure 21 art exhibition – provided by author

The renderings above are activities that can be established within the new addition. Figure 18 is a rendering of a living room for potential residents with amazing views of the city. Figure 19 is a rendering of the same space but instead of it being a living room it is now serving the community as a coffee shop. Figure 20 is a different space within the addition that can be used as a fitness room. Figure 21 is turned from a fitness room to an exhibition room for local artists to display their art and new pieces.

In conclusion, the new addition and modification of the first floor are considered multigenerational since more than 50 percent of community was added into the structure. 5,000 square feet of new community space is added onto the first floor with an open layout that is multifunctional. The new addition added 10,00 square feet of new community space and 7,400 square feet of new green space that can also be used for the community. The renderings generated show how each space has the flexibility in changing functions. It is impossible to know what a space can be in the future, therefore designing a flexible floor plan allows for different functions to change effortlessly.

4.3 Building Systems

4.3.1 LEED v4.1 New Building & Construction

LEED v4.1 BD+C
Project Checklist

Project Name: 800 EAST M
Date:

Y	?	N			
			Credit	Integrative Process	1

0	0	0	Location and Transportation		16
			Credit	LEED for Neighborhood Development Location	16
			Credit	Sensitive Land Protection	1
			Credit	High Priority Site and Equitable Development	2
			Credit	Surrounding Density and Diverse Uses	5
			Credit	Access to Quality Transit	5
			Credit	Bicycle Facilities	1
			Credit	Reduced Parking Footprint	1
			Credit	Electric Vehicles	1

0	0	0	Sustainable Sites		10
Y			Prereq	Construction Activity Pollution Prevention	Required
			Credit	Site Assessment	1
			Credit	Protect or Restore Habitat	2
			Credit	Open Space	1
			Credit	Rainwater Management	3
			Credit	Heat Island Reduction	2
			Credit	Light Pollution Reduction	1

0	0	0	Water Efficiency		11
Y			Prereq	Outdoor Water Use Reduction	Required
Y			Prereq	Indoor Water Use Reduction	Required
Y			Prereq	Building-Level Water Metering	Required
			Credit	Outdoor Water Use Reduction	2
			Credit	Indoor Water Use Reduction	6
			Credit	Optimize Process Water Use	2
			Credit	Water Metering	1

0	0	0	Energy and Atmosphere		33
Y			Prereq	Fundamental Commissioning and Verification	Required
Y			Prereq	Minimum Energy Performance	Required
Y			Prereq	Building-Level Energy Metering	Required
Y			Prereq	Fundamental Refrigerant Management	Required
			Credit	Enhanced Commissioning	6
			Credit	Optimize Energy Performance	18
			Credit	Advanced Energy Metering	1
			Credit	Grid Harmonization	2
			Credit	Renewable Energy	5
			Credit	Enhanced Refrigerant Management	1

0	0	0	Materials and Resources		13
Y			Prereq	Storage and Collection of Recyclables	Required
			Credit	Building Life-Cycle Impact Reduction	5
			Credit	Environmental Product Declarations	2
			Credit	Sourcing of Raw Materials	2
			Credit	Material Ingredients	2
			Credit	Construction and Demolition Waste Management	2

0	0	0	Indoor Environmental Quality		16
Y			Prereq	Minimum Indoor Air Quality Performance	Required
Y			Prereq	Environmental Tobacco Smoke Control	Required
			Credit	Enhanced Indoor Air Quality Strategies	2
			Credit	Low-Emitting Materials	3
			Credit	Construction Indoor Air Quality Management Plan	1
			Credit	Indoor Air Quality Assessment	2
			Credit	Thermal Comfort	1
			Credit	Interior Lighting	2
			Credit	Daylight	3
			Credit	Quality Views	1
			Credit	Acoustic Performance	1

0	0	0	Innovation		6
			Credit	Innovation	5
			Credit	LEED Accredited Professional	1

0	0	0	Regional Priority		4
			Credit	Regional Priority: Specific Credit	1
			Credit	Regional Priority: Specific Credit	1
			Credit	Regional Priority: Specific Credit	1
			Credit	Regional Priority: Specific Credit	1

0	0	0	TOTALS	Possible Points:	110

Certified: 40 to 49 points, **Silver:** 50 to 59 points, **Gold:** 60 to 79 points, **Platinum:** 80 to 110

table 1 LEED v4.1 project checklist – provided by usgbc.org

Sustainability is balance by nature. Figure 23 above is a LEED v4.1 BD+C check list that will help determine if this design is LEED certified (balance). Before the use of modern-day building systems, the site chosen (Eastman Gardens) was named as one of the five to revive in the landmark society and implementing a vertical adaptive reuse design alone gave a total of 23 LEED credited points.

4.3.2 Green Roof

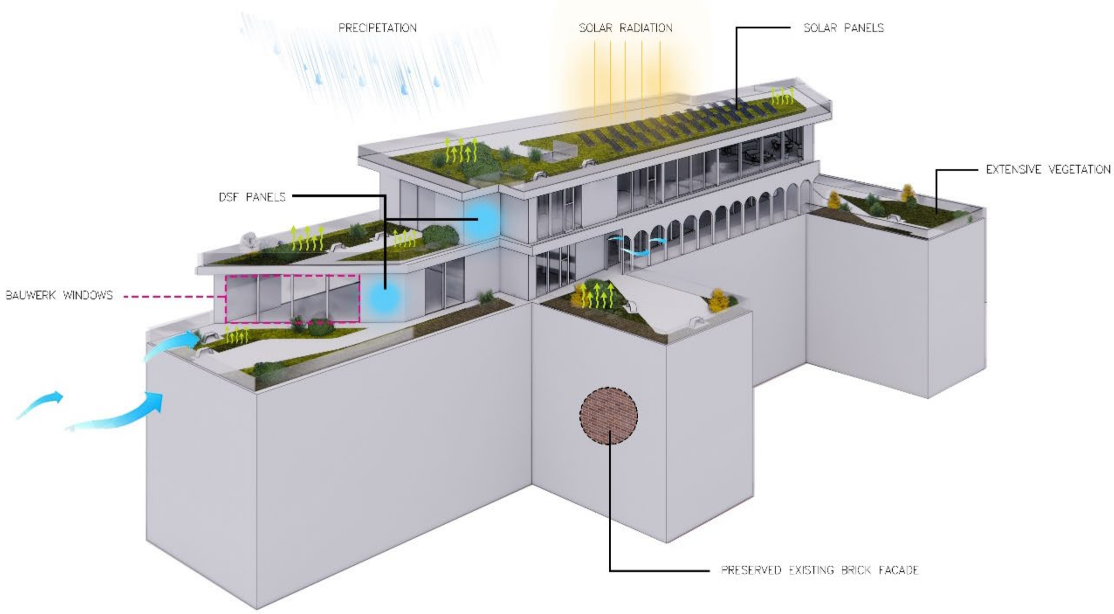

figure 22 building systems diagram – provided author

The implementation of a green roof helped preserve and add new vegetation, as well as heat island reduction, and rainwater management, giving the design another 16 points. The green spaces on terraces and large glazed doors/windows invite visitors or occupants to circulate easily within the structure as well as the nature that surrounds it. The large sliding glass doors and operable Bauwerk European windows allows for easy access and natural ventilation to flow within the structure. They enhance security, are better quality than normal windows, have a superior thermal efficiency and exceptional durability (4 points were given).

The green roofs offer many benefits in terms of sustainability. The vegetation converts CO2 into oxygen and filters particulate matter from the air. This is better for the climate and for health. In urban areas in particular, green roofs can significantly improve air quality. A green roof significantly reduces the need for air conditioning in summer and provides insulation in the winter. Insulation in the summer is the greatest, because the layers are dry and therefore reflect the heat effectively. Due to the reduced need for air conditioning in the summer and less heating in the winter, a green roof significantly reduces energy consumption. A green roof also has a longer life span than a regular roof, because it shields the roofing material from the harmful influence of sun, wind and rain (Sempergreen 2022).

The green roof serves as a gray water system, because it holds the excess water from heavy rainfall or melted snow and releases this gradually to the sewage system. This allows for minimizing water usage throughout the day, prevents flooding and ensures a lower ambient temperature through evaporation. The water retrieved from laundry, sinks and showers are considered gray water and it is stored and filtered on site. The gray water travels to a holding tank, where it is filtered using a mixture of natural rocks and sands and is then released in the green spaces for use in irrigating plants (Peter 2008).

In conclusion, a green roof not only serves for its occupants and is good for the structure but it provides scope for biodiversity to develop. A typical green roof will absorb, filter, retain and store up to 75% of the annual precipitation of 33 inches of rainfall in Rochester, NY with an area of 25 x 25 feet is around 11,688 gallons of water. A total of 8,766 gallons of water is retain. This water retention, in effect, means that over half of the annual rainfall on a typical green roof stays on the roof until it is evaporated back into the air, thus never entering the stormwater system (Peter 2008).

4.3.3 Sustainable Materials - Control Layers

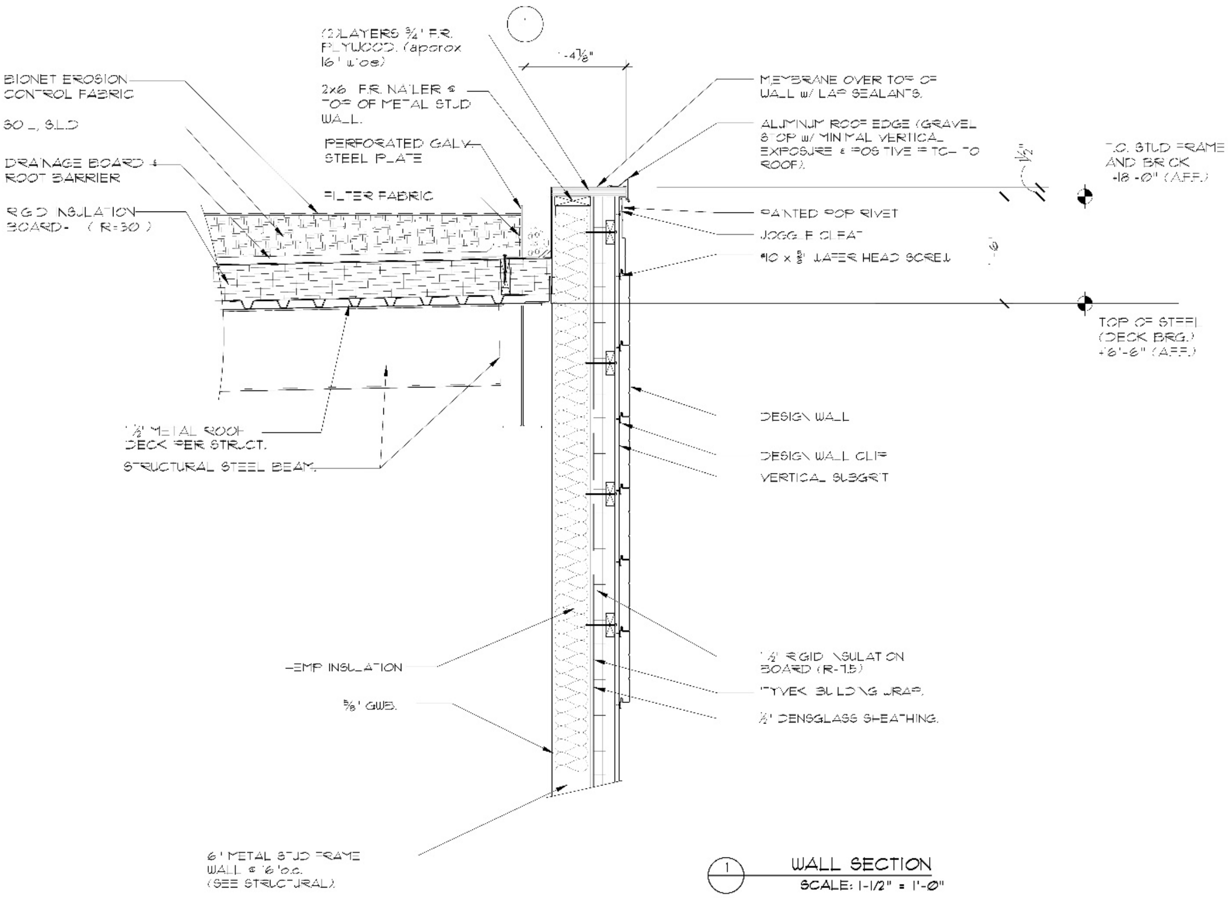

figure 23 wall section – provided by author

Figure 23 above is a detailed wall section of the new addition. Knowing what goes inside the wall and how it connects to the existing structure is essential for a design to be comfortable, durable, and sustainable. Four points were given by using low-Emitting materials like Hemp insulation.

Hemp is biodegradable (it can decompose without any environmental consequences), non - toxic, reduces sound transmission, and it is resistant to pests. It comes from waste straw that is left at the end of the hemp seed harvest. Hemp's thermal mass is relatively high meaning that it can retain heat and helps regulate thermal performance for optimum indoor comfort. This allows buildings to stay warm in winters and it doesn't allow overheating in summers. It has a low U-value of 0.040 which is around the same U-value of an 8 inch of fiberglass insulation (John 2011). The lower the U-value the better the material insulates.

The new construction consists of a lightweight steel frame with composite concrete/steel 'Ambideck' floor decks. The steel frame is able to support the extension and restrain the original brick walls. For the new wall to be durable it has to have four control layers (water control, air control, vapor control, and thermal control). Water control; to eliminate the possibility of weakening due to moisture damage, the cladding to the extension is a Design Wall™ System of DSF panels that serves as a rain screen. The facade chosen is long lasting and simple to replace if needed for the end of the structure's lifecycle. Structural materials like recyclable steel were selected with longevity as a major consideration and all are expected to have a lifespan of at least 50 years without need for substantial maintenance, repairs, or replacement. The most arduous being the brick façade from the historic structure should be resealed every 10 to 15 years to ensure an airtight envelope.

4.3.4 Energy Performance

The average electricity bill in Rochester, NY according to energysage is around 103 dollars per month. Solar panels will be added to the roof of the new addition to save as much money and energy as possible. Using the GOOGLE Project Sunroof Tool will helped determine an estimate of how many solar panels the design needs and how much money the client will spend and save comparing it to not having solar panels. Figure 24 & the table below shows the total estimate.

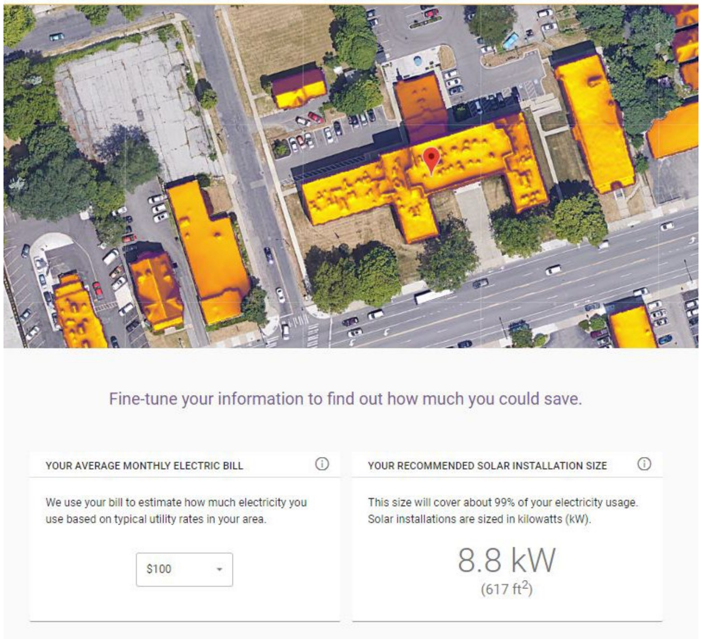

figure 24 solar roof analysis – provided by GOOGLE project sun roof

LEARN HOW TO FINANCE YOUR SOLAR PANELS

BUY | LEASE / PPA | LOAN

Pay up front, largest lifetime savings. You pay the full cost up front and own the solar system without any additional payments over time. As the outright owner, you may claim any local, state, or federal incentives.

$13,000	$26,000	$10,000
UPFRONT COST AFTER INCENTIVES	20-YEAR BENEFITS	TOTAL 20-YEAR SAVINGS

10
YEARS UNTIL PAYBACK

HIDE DETAILED ESTIMATES

Up-front cost of installation Based on a 8.75 kW installation.	$27,298
Total payments over 20 years $0 : Modern solar arrays use micro-inverters and should require no maintenance during their first 20 years. $5,671 : Remaining utility bills assuming 2.2% annual price increases.	$5,671
State and Federal Incentives $5,391 : Federal Investment Tax Credit (ITC). $5,000 : State tax credit.	-$16,953
Total 20-year cost with solar Includes above costs and incentives.	$19,079
Total 20-year cost without solar Assumes 2.2% annual increase in electricity prices.	$28,985
Total 20-year savings Net present value at 4% discount rate: $5,420.	$9,906

table 2 solar roof savings & cost – provided by GOOGLE project sun roof

The total 20-year cost with solar will be $19,079 while the total 20-year cost without solar will be $28,985 meaning that the client will have a total 20-year savings of $9,906. This solar energy will then be implemented into the new LED lighting system.

Large glass windows and doors are located on each side to provide light for interior spaces throughout the day. Low emitting recessed LED lights will supplement light in darker, less populated areas of the building and throughout the night. LED lights are environmentally friendly, have a longer life span (approximately 34 years compared to an incandescent light bulb that only has 1.4 years), and they reduce energy usage (Lighting tutor 2022). Daylight Integrated LED Recessed lights will be placed throughout the unit to provide all task and ambient lighting needs. The open floor plan allows for easy coverage with minimal lights. Purposefully placed lights will be along the new stairwell to ensure proper lighting and safety for all occupants. Smart switches with motion sensors throughout the unit ensure convenience for residents or visitors. These switches can be accessed through smart phones and tablets, enabling users to control the light from anywhere within the unit. This feature also mitigates unnecessary energy use.

Considering the average electricity rate of $13.31 per kWh, the tables below show the life span and cost to run one LED light for eight hours per day compared to the cost of using one incandescent light for the same number of hours per day (Lighting tutor 2022). One can save up to $1.64 per month or $20.02 per year if LED lighting is chosen instead of incandescent light bulbs. The amount of money can also vary depending on how many lights are used and how many hours per day they are used.

	8.5-Watt LED Light (60W Equivalent	**60-Watt Incandescent Light**
Energy usage for 8 hours per day	68 Watts	480 Watts
Energy usage in kWh	68/1000 = .068 kWh	480/1000 = 0.48 kWh
Cost per day ($.1331 per kWh)	$.009	$.06
Cost per month	$.009 x 30 = **$.27**	$.06 x 30 = **$1.91**
Cost per year	$.009 x 365 = **$3.30**	$.06 x 365 = **$23.32**

table 3 energy use LED vs incandescent – provided by lightingtutor.com

	LEDs	**Incandescent**	**Halogen**	**CFLs**
Lumens per Watt	72	15	25	60
Energy usage for 800 lumens	10W	60W	43W	14W
Heat emission	20%	90%	80%	30%
Lifespan	Approximately 34 years	1.4 years	4.2 years	14 years

table 4 life span LED vs incandescent – provided by lightingtutor.com

LEED v4.1 BD+C
Project Checklist

Project Name: 800 EAST M
Date:

Y	?	N			
			Credit	Integrative Process	1
0	**19**	**0**		**Location and Transportation**	**16**
	16		Credit	LEED for Neighborhood Development Location	16
	1		Credit	Sensitive Land Protection	1
	2		Credit	High Priority Site and Equitable Development	2
			Credit	Surrounding Density and Diverse Uses	5
			Credit	Access to Quality Transit	5
			Credit	Bicycle Facilities	1
			Credit	Reduced Parking Footprint	1
			Credit	Electric Vehicles	1
0	**8**	**0**		**Sustainable Sites**	**10**
Y			Prereq	Construction Activity Pollution Prevention	Required
			Credit	Site Assessment	1
	2		Credit	Protect or Restore Habitat	2
	1		Credit	Open Space	1
	3		Credit	Rainwater Management	3
	2		Credit	Heat Island Reduction	2
			Credit	Light Pollution Reduction	1
0	**8**	**0**		**Water Efficiency**	**11**
Y			Prereq	Outdoor Water Use Reduction	Required
Y			Prereq	Indoor Water Use Reduction	Required
Y			Prereq	Building-Level Water Metering	Required
	2		Credit	Outdoor Water Use Reduction	2
	6		Credit	Indoor Water Use Reduction	6
			Credit	Optimize Process Water Use	2
			Credit	Water Metering	1
0	**6**	**0**		**Energy and Atmosphere**	**33**
Y			Prereq	Fundamental Commissioning and Verification	Required
Y			Prereq	Minimum Energy Performance	Required
Y			Prereq	Building-Level Energy Metering	Required
Y			Prereq	Fundamental Refrigerant Management	Required
			Credit	Enhanced Commissioning	6
			Credit	Optimize Energy Performance	18
	1		Credit	Advanced Energy Metering	1
			Credit	Grid Harmonization	2
	5		Credit	Renewable Energy	5
			Credit	Enhanced Refrigerant Management	1

Y	?	N			
0	**9**	**0**		**Materials and Resources**	**13**
Y			Prereq	Storage and Collection of Recyclables	Required
	5		Credit	Building Life-Cycle Impact Reduction	5
	2		Credit	Environmental Product Declarations	2
			Credit	Sourcing of Raw Materials	2
			Credit	Material Ingredients	2
	2		Credit	Construction and Demolition Waste Management	2
0	**11**	**0**		**Indoor Environmental Quality**	**16**
Y			Prereq	Minimum Indoor Air Quality Performance	Required
Y			Prereq	Environmental Tobacco Smoke Control	Required
			Credit	Enhanced Indoor Air Quality Strategies	2
	3		Credit	Low-Emitting Materials	3
			Credit	Construction Indoor Air Quality Management Plan	1
			Credit	Indoor Air Quality Assessment	2
	1		Credit	Thermal Comfort	1
	2		Credit	Interior Lighting	2
	3		Credit	Daylight	3
	1		Credit	Quality Views	1
	1		Credit	Acoustic Performance	1
0	**0**	**0**		**Innovation**	**6**
			Credit	Innovation	5
			Credit	LEED Accredited Professional	1
0	**0**	**0**		**Regional Priority**	**4**
			Credit	Regional Priority: Specific Credit	1
			Credit	Regional Priority: Specific Credit	1
			Credit	Regional Priority: Specific Credit	1
			Credit	Regional Priority: Specific Credit	1
0	**61**	**0**		**TOTALS** Possible Points:	**110**

Certified: 40 to 49 points, **Silver:** 50 to 59 points, **Gold:** 60 to 79 points, **Platinum:** 80 to 110

table 5 LEED v4.1 project checklist updated – provided by usgbc.org

In conclusion, using LEED v4.1 BD+C project checklist located above is filled out depending on what has been incorporated into this thesis design. An estimate of 61 points making it LEED Gold certified. An estimate total of 8,766 gallons of water will be retained and reused in a green roof that also serves as a water management system. The client will save $9,906 in 20 years with the implementation of solar panels comparing it without solar panels. The new LED lighting will help save $20.02 or more per year comparing it to a regular lighting system.

5 Final Concept – 800 E

5.1 Past, Present, and Future

figure 25 Rochester dental dispensary 1930's – provided by urmc.rochester.edu

figure 26 present day Eastman gardens – provided by homeleasing.net

figure 27 front façade of new addition – provided by author

The new extension is contemporary and abstract in theory. The sharp edges on the exterior shows the building more of a dominant structure to really call the attention and give the illusion of a different building being placed on top of the original structure. The focus was to revive the structure by bringing in a new addition using modern day technology and materials while respecting the building's historic character and its place in Rochester's cultural memory. Thus, getting the attention of any person passing by either on car, walking, or by bicycle from its main road leading to the downtown area.

figure 28 summer time at green roof – provided by author

figure 29 winter time at green roof – provided by author

6 Measure to Success

6.1 Conclusion

In conclusion, this thesis was fairly close on being 100% balance, vertical, and multigenerational. It preserved and recycled 100% of the existing vegetation and more than 80% of the existing structure. It did not preserve 100% in order achieve both concepts on creating housing for the elderly and the dream tank concept on helping young teens. With this, the design did in fact add 5,000 square feet of new community space onto the existing first floor with an open layout that is multifunctional. The new addition implemented a total of 10,00 square feet of new multifunctional community space and around 7,400 square feet of new green space. It is LEED Gold certified by emitting sustainable strategies like green roofs with infiltration systems, a design wall system serving as a rainscreen, hemp insulation, solar panels, and a LED lighting system. An estimate total of 8,766 gallons of water is retained and reused in a green roof that also serves as a water management system. It will save $9,906 in 20 years with the implementation of solar panels comparing and the new LED lighting will help save an estimate of $20.02 or more per year. This design considered the importance of the past as well as giving the viewer a representation the use of modern-day technology while helping the community and client.

In recognition

Hermes Sarmiento

Jenny Bermeo

Andy Sarmiento

Abita y Pito

Tia Mary

Tia Angie

Familia Sarmiento

Familia Guzman

To all my friends and their families who have supported me from a young age

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