GREEN ROOF READY PLAN

Green Roofs are additional roofing materials and plants that are added to traditional roof finishes. By integrating a green roof design, our project achieves additional environmental, social and educational benefits.

A Green Roof is the most recognized form of green infrastructure designs, which is defined by the EPA as a set of approaches and technologies that infiltrate, evapotranspire, capture or reuse storm water to restore the natural hydrological regime of a land parcel. Green roofs are not a new approach; they've been around for centuries. Their recent popularity is due to our current demand for green infrastructure and its role for solving environmental and social problems that we face today. According to the National Roofing Contractors Association (NRCA) Green Roof Systems Manual , a green roof's components are a waterproofing membrane, protection course, root barrier, drainage layer, moisture resistant insulation, aeration layer, moisture retention layer, filter fabric and an engineered soil based growth medium with plants; however, they recommend adopting local professional design practices since the design can vary depending on different locations.

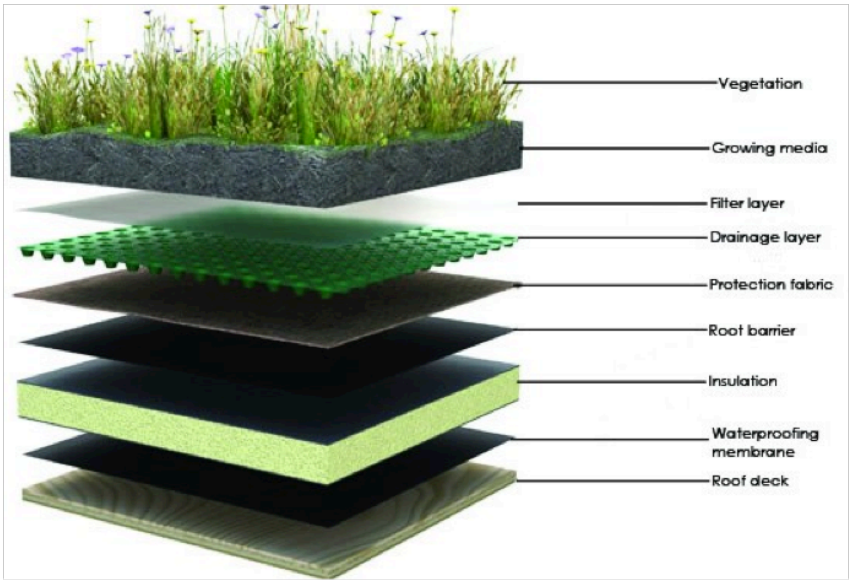

Figure 1: Green Roof Components[1]

GREEN ROOF BENEFITS [2]

ECONOMIC BENEFITS

- Reduced life cycle cost of the roof
- Decreased need for landfill space
- Increased property values
- Energy cost savings
- Sound Insulation
- Decreased need for storm water treatment cost

ENVIRONMENTAL BENEFITS

- Reduced urban heat island effect
- Reduced storm water run-off
- Improves water quality
- Improves air quality
- Wildlife habitat

ECONOMIC BENEFITS

- Education opportunities
- Space for food production
- Aesthetic appeal
- Additional green space
- New jobs and businesses

OUR GREEN ROOF PLAN

Because Montage Builders values innovative and green designs that can reduce the total environmental impact of our house while requiring little or no changes to the cost and design, we've incorporated a green roof ready plan. Although a green roof's cost-differential is small, our total construction budget was not sufficient enough to fully integrate a green roof; however, we have designed it as an add-on feature in response to our promising local, state or federal funding and grants for green infrastructure designs. Onondaga County's Green Improvement Fund (GIF)[2] , part of the *Save the Rain* campaign, specifically applies to our project neighborhood region to support the development of green infrastructure and storm water mitigation techniques on private property, so the builder of our house should apply for this funding.

Additionally, our green roof ready plan provides sufficient documents and supporting materials for the next owner to consider having his/her roof retrofitted with a green roof with his/her own additional budget with not much difficulty due to our original strong structural support design; however, if the builder or owner incorporates a green roof into their initial build, money and time will be saved.

A green roof's cost varies depending on its design and location. Therefore, we reached out to local businesses and professionals including Motherplants, the green roof nursery located in Ithaca, NY, and the professionals from C&S Engineering Company in Syracuse, NY to have a better green roof plan that considers our unique weather conditions for its structural design and local market conditions for its cost.

Figure 2: Front Porch View [3]

DESIGN OF THE GREEN ROOF

We chose to locate our green roof on top of the front porch facing southwest where it looks over the road and isn't shaded by neighboring infrastructures. There it will receive plenty of sunlight during the day. The roof of the front porch is 150 sq. feet with 4:12 roof pitch, and all cost measurements and structural design are calculated accordingly.

STRUCTURAL CALCULATION

We chose to locate our green roof on top of the front porch facing southwest where it looks over the road and isn't shaded by neighboring infrastructures. There it will receive plenty of sunlight during the day. The roof of the front porch is 150 sq. feet with 4:12 roof pitch, and all cost measurements and structural design are calculated accordingly.

WATERPROOF MEMBRANE

The second most important part to consider is having a waterproof membrane on top of the structurally engineered wood deck. There are different types of waterproof membranes, so it is important to consider durability, environmental friendliness, strength, and root resistance while choosing the membrane. Therefore, our roof includes EPDM waterproof membrane as a part of a green roof ready plan.

MATERIALS AND COST

The general price estimate was based on the local roofing and construction companies such as J&B Installation, Inc. and Shaffer Building Services, Inc. in Syracuse, NY; And, specific product information prices were quoted by Greenroofsolutions, the green roof accessory manufacturer located on Glenview, IL. The plants and medium prices were quoted by Motherplants nursery in Ithaca, NY. The prices quoted by Shaffer Building Service, Inc and J&B installation were for new roof construction, while prices quoted by GreenRoofSolutions, Motherplants and NorthEast Green Building Consulting, LLC were for additional materials and labor cost required on top of our current living roof ready design as it is.

<u>Shaffer Building Service, Inc. Price Estimate for Our Green Roof Design[4]</u>

- $30-40 per sq ft or $4500-6000 total

J&B installation, Inc.[5]

- $50-60 per sq ft or $7500-9000 total

GreenRoofSolutions Product Specification and Prices[6]

- ExtenDuct Draining Layer (325sq ft.) = $220 or more
- GRS/MRM30 Retention layer = $225 total
- Aluminum edging (8 ft long) = $862 total
- Filter around the edges= $22.50 total
- Labor Cost = $1330
- Total Cost= $2660

Motherplants Price for Plants and Medium[7]

- $1-3 sq ft = $150-450 total

NorthEast Green Building Consulting, LLC

- $15-25 sq ft= $2250-3750 total

LOCAL BENEFITS

As we have mentioned above, there are many benefits of green roof systems, but they are different depending on the project's specifications. In our case, it is on top of our front porch with a total area of approximately 150 sq ft, so we gain environmental paybacks such as improved air quality and storm water runoff solutions. Below are more specific benefits to our project plan.

URBAN HEAT ISLAND REDUCTION

Since it is located on top of an unconditioned space, there wouldn't be any insulation value to save indoor energy cost; however, green roofs stay 40-50 degrees (F) cooler than conventional roofs, and that quality can reduce the urban heat island effect. According to the U.S. Department of Energy's Lawrence Berkeley National Laboratory (LBNL), cities can save up to six billion per year by reducing the temperature by just 5.4 degrees (F) or 3 degrees (C).

REDUCED LIFE CYCLE COST OF ROOF

Green Roofs extend the life cycle of a roof membrane by 2 to 3 times or 30 to 60 years. That can save a lot of cost that otherwise would be spent on roof replacement ranging from $10-30 sq ft.[8]

EDUCATIONAL VALUE

Having the green roof located on the front porch offers great exposure of green infrastructure design to our neighbors and community, and this will hopefully encourage and motivate people to also adopt one.

INCREASED PROPERTY VALUES

Its visually appealing aesthetic value can improve morale and productivity, and as a result, it can increase the marketability of our house.

Figure 4: Beautiful View from the Windows, The house is located in Syracuse, NY

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