

Proposal

State College, PA



320 W. Student Apartments
Beaver Ave.

January 10,
2008

Kyle Macht

Construction Management

Faculty Consultant: Dr. Messner

Table of Contents

| | |
|---|---|
| Executive Summary | 2 |
| <i>Analysis 1: The Cost of Sustainability</i> | 2 |
| <i>Analysis 2: Green Roof</i> | 2 |
| <i>Analysis 3: Radiant Floor System</i> | 2 |
| Introduction | 3 |
| Analysis 1: The Cost of Sustainability | 4 |
| <i>Problem Statement</i> | 4 |
| <i>Goal</i> | 4 |
| <i>Research Steps</i> | 4 |
| <i>Expected Outcome</i> | 4 |
| Analysis 2: Green Roof | 5 |
| <i>Problem Statement</i> | 5 |
| <i>Goal</i> | 5 |
| <i>Research Steps</i> | 5 |
| <i>Expected Outcome</i> | 5 |
| Analysis 3: Radiant Floor System | 6 |
| <i>Problem Statement</i> | 6 |
| <i>Goal</i> | 6 |
| <i>Research Steps</i> | 6 |
| <i>Expected Outcome</i> | 6 |
| Weight Matrix | 7 |
| Summary | 7 |

Executive Summary

This proposal consists of research on how sustainability can save energy, as well as money and redesign ideas for 320 W. Beaver Ave can be a sustainable building, giving it a memorable image. Each analysis will consist of a problem statement, goal, research steps, expected outcomes, and a summary.

Analysis 1: The Cost of Sustainability

In depth research will be performed on projects that have successfully designed and built green buildings at minor additional cost, buildings that have short payback periods, and most importantly buildings that saved money by going green. This research will look particularly at design decisions that influence performance and cost, in an effective way for the project. The overall goal is to develop a system of classifying these green money savers, along with how and what they impact on the project.

Analysis 2: Green Roof

The implementation of an intensive green roof can provide a positive architectural image including usable space, which can increase the amount of interest in living in the building. A properly installed green roof could potentially increase the worth of the building and the rent.

Breadth 1, Structural: A redesign of the structure of 320 W Beaver Ave. in order to support the new intensive green roof.

Breadth 2, Architectural: A green roof design that allows the users quiet relaxing spaces while providing privacy for the residents. A design of a railing system that enhances the view of the vegetation from the street, that is affordable. A redesign of the 2nd floor will also be necessary to allow access to the green roof.

Analysis 3: Radiant Floor System

A comparison between the in place mechanical system and a hydronic radiant floor heating system allows for a simpler, more effective heating system. This permits for there to be one generation system of heat as opposed to several scattered around the building, which will reduce costs. A cost and construction analysis will be performed in order to understand what this type of system entails.

Introduction

320 W. Beaver Avenue is a multi-use building created on the edge of the downtown area in State College, Pennsylvania. 320 W. Beaver Ave. is a prime area for this type of building, located at the edge of downtown State College, only two blocks away from the Pennsylvania State University. 320 W. Beaver Ave. is a \$15,000,000.00, 7 story building containing: 3 levels of parking (2 of which are below grade), a small commercial space that can accommodate 2-3 small stores. The rest of the building, floors 2-7, are student apartments, 10 one bedroom and 55 two bedroom apartments.

320 W Beaver Ave. is constructed with cast in place concrete for the parking garage and the first floor, and then switches to CMU walls. All the floors are constructed of pre-manufactured planks, which allows for a shorter construction process. This is a very simple building except for the excavation which became difficult due to the soil conditions. The soil contains a great deal of rock, which required drilling and blasting.

There were two existing buildings on the property. One, 320 W. West Beaver Ave., a 15,791 SF building located on the west end of the site and 310 -314 W. Beaver Ave., an 8,080 SF building located at the east end of the site. Both of these buildings were demolished. 320 W. Beaver Ave. does not have much laydown area to store material. Therefore they are pulled from a crane, centered in the elevator shaft, just to the right of a delivery truck on Beaver Ave., shutting down one lane of traffic.

The mechanical system is split into a couple areas. There is a main mechanical room in the basement that contains two combustion water heaters connected to a hot water storage tank, which will be used for the domestic hot water. The commercial floor does not have a mechanical system implemented at the moment, but the system will be electric and decided upon tenant fit out. The corridors of the building are connected to two gas fired 3000 CFM air handling units housed on the upper roof. The upper roof also contains a 27.9 kW condensing unit for cooling and an Air conditioning unit. Each apartment has its own 5.4 kW heat pump, in the exterior porch closet, used to heat and cool the apartment, via forced air, which is controlled from a thermostat. Each apartment's bathroom has its own 0.75 kW wall heater. The bathrooms are directly vented to the outside.

320 W. Beaver Ave. is a design-bid-build project, which is owned by Blue Mountain Harmony, LLC, who wishes not to reveal any information about themselves.

Analysis 1: The Cost of Sustainability

Problem Statement

Many people think that 'being green' is too expensive, which was overheard numerous times at the AE carrier fair from Construction Managers and General Contractors. Many said that they were building green buildings because 'green' was in style or upon an owners request. Sustainability does in fact make sense economically and needs to happen to help combat Global Warming, along with the destruction of planet Earth by the human race. Whether or not Global Warming is truly that severe, green buildings are attempting to fight 1/3 of the U.S. energy problems while, making occupants healthier and happier.

Goal

In depth research will be performed on projects that have successfully designed and built green buildings at minor additional cost, buildings that have short payback periods, and most importantly buildings that saved money by going green. This research will look particularly at design decisions that influenced the performance and cost, in an effective way for the project. The overall goal is to develop a system of classifying these green money savers, how and what they impact on the project.

Research Steps

- Interview designers, owners, and contractors about the success of green projects.
- Examine case studies of sustainable buildings and how they succeeded.
- Develop a spreadsheet of sustainable ideas, how efficient they are, and how much money they save in terms of payback.
- Develop a spreadsheet of what systems and parts of building impact others and the amount they cost as well as the amount of energy they use.
- Present the spreadsheets with industry members and professors and acquire feedback.
- Make any necessary changes and record all steps.

Expected Outcomes

It is expected to find ways to save money when designing and building through sustainability, as well as things that will be more expensive to implement. If enough information is found, hopefully designers, builders, and owners could read this research and it to change their mind about sustainability with respect to cost.

Analysis 2: Green Roof

Problem Statement

In 320 W. Beaver Ave., above the commercial space, is a large standard flat roof with some HVAC equipment on it. This is a potential eye sore to buildings in close proximity that would look down onto it, along with the students in the above apartments. Where, this area has the potential to be a defining characteristic of the building. This will cost more, but hopefully add enough value to the building. It could possibly attribute additional value, if it was usable space by apartment owners.

Goal

The implementation of an intensive green roof to this space can provide a positive architectural image and usable space. **Breadth 1**, perform calculations and redesign the structure of 320 W Beaver Ave. in order to support the new intensive green roof. **Breadth 2**, design the green roof and implement a railing system that allows the public to see the vegetation from the street. A redesign of the 2nd floor will also be necessary to allow access to the green roof.

Research Steps

- Research intensive green roofs and how they are constructed.
- Study buildings that implemented them and how much they are used.
- Develop a survey to find out how much people would be willing to pay monthly to have that space available to them.
- **Breadth 1**, perform calculations and redesign the structure of 320 W Beaver Ave. in order to support the new intensive green roof.
- **Breadth 2**,
 - Design the layout of the green roof vegetation and the space.
 - Implement a railing system that allows the public to see the vegetation from the street.
 - A redesign of the 2nd floor will also be necessary to allow access to the green roof.

Expected Outcomes

The addition of this intensive green roof should allow 320 W. Beaver Ave. to grow in popularity and makes this building a hot spot to live. This will permit the owner increase rent. Hopefully the space will be used as well.

Analysis 3: Radiant Floor Heating

Problem Statement

In 320 W. Beaver Ave. there are many different mechanical systems throughout the building. The commercial spaces each will have their own heating and cooling upon tenant fit out. Each apartment has its own heat pump for heating and cooling; additionally each bathroom has an additional electric wall heater. The corridors will also have their own cooling and heating system and the same is true with the parking garage. Cost could be reduced if some of these systems were combined; this would allow for one larger piece of equipment rather than many smaller pieces units. This could also decrease the time of installation, as long as the distribution does not have many further challenges due to the consolidation.

Goal

Implement a radiant floor system. Combining all of the heating of the building into one system allows for a simpler, more effective heating system that is more energy efficient. This allows for there to be one generation system of heat as opposed to several scattered around the building. A cost and construction analysis will be performed in order to understand what this type of system entails.

Research Steps

- Interview mechanical designers and contractors about radiant floor heating.
- Examine case studies of radiant floor heating and find the benefits.
- Talk to the mechanical contractor for 320 W. Beaver Ave. and determine how much energy the building requires at its current state.
- Perform analyzes comparing the current system and the radiant floor system.
- Determine how this fits into the project schedule.
- Determine how it would be built.

Expected Outcomes

The radiant floor system will be more expensive upfront, but its efficiency and how it's distributed will eventually save energy and money. Therefore if the owner plays their cards right they can include the cost of heating in the monthly bills and they can reap the benefits of this change.

Weight Matrix

The table below, [Table 1: Weight Matrix](#), demonstrates how my time and effort will be dispersed throughout the next semester.

Table 1: Weight Matrix

| Description | Research | Value Engineering | Construction Review | Schedule Reduction | Total |
|------------------------|----------|-------------------|---------------------|--------------------|-------|
| Cost of Sustainability | 25% | ---- | ---- | ---- | 25% |
| Green Roof | ---- | 25% | 5% | 5% | 35% |
| Radiant Floor Heating | 5% | 20% | 10% | 5% | 40% |
| Total | 30% | 45% | 15% | 10% | 100% |

Summary

Through sustainability 320 W. Beaver Ave. could help make a statement for State College, for the better. An intensive green roof that, is visible to the public and useful for the residents, can assist in making this statement. In order for this to be possible a structural redesign needs to be compiled for the commercial space and the parking garage below, to support the weight of the heavier roof. An architectural redesign of the second floor is also necessary for the second floor, to allow for access to the new desirable space.

A radiant floor system will add comfort and efficiency to 320 W. Beaver Ave, allowing for a consolidated heating system throughout the entire building. By doing this, many of the other systems can be downsized and/or removed. Hopefully, this will save the project money in the long run. In order for this to be done, a comparison between this new system and the designed mechanical system will be conducted. The analysis will look specifically at cost benefits and a payback period, the difficulty of installation, and the impact on the project schedule.

These changes to 320 W. Beaver Ave. should add invaluable appeal to the project.