Proposal

State College, PA

The Palmerton

Student Apartments

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Executive Summary

This proposal consists of research on how sustainability can save energy, as well as money and redesign ideas for The Palmerton 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: Sustainable College Apartment Buildings

Making student apartment buildings green could be a major upgrade to their current view. The main issue to consider is of course cost. If employed properly throughout the design and construction of a building as well as the inhabiting the building, a green student apartment building could be a win-win situation. The goal is to take The Palmerton, and implement green design but not increase the cost of the building over 10 years. There are 2 main factors that play into these costs. The first is the actual design and implementation of sustainability into the building. The second will look into what the owner can do in order to rearrange these costs to allow green student apartment building to work.

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 The Palmerton in order to support the new intensive 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.

> **Breadth 2, Mechanical:** A redesign of the heating system of The Palmerton could reduce upfront costs, while increasing efficiency and appeal of the apartment spaces.

Introduction

The Palmerton is a multi-use building created on the edge of the downtown area in State College, Pennsylvania. The Palmerton 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. The Palmerton 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.

The Palmerton 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 The Palmerton, 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.

The Palmerton is a design-bid-build project, which is owned by Blue Mountain Harmony, LLC, who wishes not to reveal any information about them.

Analysis 1: Sustainable College Apartment Buildings

Problem Statement

Many think that 'being green' is too expensive, which was overheard numerous times at the AE carrier fair. Many said that they were building green buildings, but it was because 'green' was in style or because an owner requested it. Sustainability can make sense economically if implemented correctly. This also 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, this is an attempt to fight 1/3 of the U.S. energy problems, become less dependent oil, all while making occupants healthier and happier.

College students seem not to care as much about how nice their apartments are, rather how little they can spend for a place to sleep. From an owners perspective this creates a challenge, they need to create a building that fits these needs. Essentially spending as little as possible with inefficient systems and then transferring the penalties of those inefficiencies over to the students, by making students pay for electricity, heating, and cooling. Owners are not making money on this interaction but are not investing in it as well.

Goal

By making student apartment buildings green, this could be a major upgrade to their current view. The issue of course is how much will it cost. If done right throughout the design and the implementation of a building as well as the use of, a green student apartment building could be a win-win situation. The goal is to take The Palmerton, and implement green design but not increase the cost of the building over 10 years. There are 2 main factors that play into these costs. The first is the actual design and implementation of sustainability into the building. The second will look into what the owner can do in order to rearrange these costs to allow green student apartment building to work.

Research Steps

- Interview designers, owners, and contractors about the success of green projects.
- Examine case studies of sustainable buildings and how they succeeded.
- Talk to the owner to find rates for the apartments and how the money is distributed.
- Consolidate these findings and create a way to distribute these costs differently.
- Present this information to the right advisors and industry members for feedback

Expected Outcomes

It is expected to find ways to save money for The Palmerton when designing and building through sustainability. As well as distributing these cost in a more effective manner.

Analysis 2: Green Roof

Problem Statement

In The Palmerton 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 that could bring money in for the owner if implemented correctly. There are three main things to make this possible, the first, **Breadth 1**, perform calculations and redesign the structure of The Palmerton in order to support the new intensive green roof. Secondly, design a layout and access to the roof. Thirdly, look at ways to have this space make money for the owner to offset the cost.

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, possibly on Facebook.
- Research ways this space could be used to make money.
    - The commercial space being a café or restaurant and using it as a dining area.
    - Renting the space out for parties or concerts.
- **Breadth 1**, perform calculations and redesign the structure of 320 W Beaver Ave. in order to support the new intensive green roof.
- 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 simple redesign of the 2nd floor will be necessary to allow access to the green roof.

Expected Outcomes

The addition of this intensive green roof should allow The Palmerton 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: Mechanical Redesign

Problem Statement

The Palmerton has 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 for comfort. The corridors will also have their own cooling and heating system and the same is true with the parking garage.

Operation cost could be reduced if some of these systems were combined and utilized energy recovery. 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.

In the current system all the fresh air comes directly from the outside and is the same temperature while the stale air is dumped outside. This is a great deal of heat that may have the potential to be recovered, which in turn will reduce energy costs.

Goal

Running a water loop through the building and allowing smaller water to air heat pumps to exchange heat with this can allow for some energy savings. The temperature of the water loop would be maintained from a roof top boiler and condenser. Additionally allowing the fresh air and the stale air to exchange heat before they leave or enter the building will allow for a great deal of savings in operation costs.

Research Steps

- Interview mechanical designers and contractors about energy recovery.
- Examine case studies of different heating and cooling systems.
- Talk to the mechanical contractor for The Palmerton and determine how much energy the building requires at its current state.
- Perform an analysis comparing the current system and the new system.
- Determine how this fits into the project schedule.
- Determine how it would be built.
- Determine how much it costs

Expected Outcomes

This system will cost more upfront, but will provide significant energy savings, that will save the owner a great deal of money over time.

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
Green Student Apartment Buildings	25%	----	----	----	25%
Green Roof	10%	20%	5%	5%	40%
Mechanical Redesign	----	20%	10%	5%	35%
Total	35%	40%	15%	10%	100%

Summary

Through sustainability The Palmerton 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 mechanical system that is more energy efficient will allow for 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 current 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 The Palmerton should add invaluable appeal to the project.