

John Paul

From: Colley Burrow <colley@fennellpurifoy.com>
Sent: Tuesday, April 05, 2016 9:22 AM
To: John Paul
Cc: msmith@ecologicaldg.com; Baxter Reecer
Subject: FW: Cross County Library - Utility Rates

John Paul,

We have attached the utility cost summary as requested for your review. As mentioned below, there are a lot of factors that are involved here. The main difference in your existing hvac system and a new system for the renovated building will be the current fresh air requirements (will add utility cost to the new facility). These requirements were not required in your existing facility. Please let us know if you have additional comments or questions.

Thanks

Colley

Colley Burrow, AIA

FENNELLPURIFOY
ARCHITECTS

100 Morgan Keegan Drive, Suite. 320
Little Rock, Arkansas 72202
P. 501.372.6734
F. 501.372.6736

www.fennellpurifoy.com

From: Alex Trulove [mailto:atrulove@brownengineers.net]
Sent: Tuesday, April 05, 2016 8:25 AM
To: Colley Burrow
Subject: Cross County Library - Utility Rates

Good morning Colley,

Based on our conversation and the information provided, I've outlined a short summary of our findings and explanations of how we got there. Unfortunately, due to the complexity and many drivers that determine a utility bill, this can only be labeled as an approximation of what may happen given the library's existing conditions and their renovations plans as you have conveyed them. If any of the assumptions below differ from what I've listed, please let me know and I can make the appropriate changes.

Assumptions:

Unchanging Energy Consumption Factors:

- * Library operating hours
- * Operating characteristics (Thermostat set points, heating/cooling seasons, lighting usage, water usage, etc)

- * Utility usages (For example, gas is used for heating at existing site and is available/will be used at new site)
- * Utility rates and providers
- * Plug Loads
- * Weather

Changing Energy Consumption Factors:

- * Lighting (Fluorescent in existing building, LED in new)
- * HVAC (Dated in-efficient in existing, energy efficient in new)
- * Building envelope (better insulation and windows in new building. This can really fall under HVAC because it directly affects the HVAC system's energy consumption)
- * Area (8,587 SF existing, 11, 588 new)

Based up on the bills provided, \$16,630.50 was spent on water, gas, and electricity in 2017. If we could assume that all factors were constant except the increase in area, then the new building annual cost would be:

$$\$16,630.50 \times \% \text{Area Increase } (11,588 \text{ SF} / 8,587 \text{ SF}) = \$22,442 \text{ (an increase of 35\%)}$$

Now we can look at how each "Changing Factor" might affect the utility bills.

Depending on building type, lighting can make up somewhere around 25% of the building's energy consumption. LED lights are approximately 20% more efficient than a standard T8, therefore the new building annual bills adjusted for LED use would be:

$$\$22,442 - (\$22,442 \times 25\% \times 20\%) = \$21,319.90$$

Now here's the tricky part, which is more discussion than math. From what I could gather on the existing building, it looks like they use standard residential type split systems for heating/cooling. Additionally, from the age of the building, images I found on google earth, and images on the library's website, it appears they do not have conditioned fresh outside air in their existing building. This will pose a problem to their energy savings they might see from an upgraded HVAC system as it only takes about 125 cfm of conditioned outside air to add 1 ton of load to the HVAC system. Based upon current code requirements, the new building will need around 2,000 cfm of outside air, thus adding about 16 tons of load that is not accounted for in the existing building (and consequentially their current energy costs). While a more efficient HVAC system along side improvements to the envelope insulation and fenestration will work in favor of reducing the HVAC energy demand, the addition of outside air tonnage may negate, if not more than off-set, any of these savings. Unfortunately we won't be able to make an accurate estimation here without doing a fully involved energy model.

In summary, it looks like the building's utility costs should grow proportionally with the buildings square footage, if not be slightly less due to the energy efficient measures that will be taken with the lighting, HVAC, and building envelope systems. We can say that their utility bills would certainly exceed a proportional growth if no energy efficient measures were taken due to more stringent code requirements concerning ventilation air.

A few additional thoughts:

Some of the easiest energy saving measures to achieve can come from habit modification, i.e.: making sure lights are turned off when rooms are empty, using hvac set-backs during unoccupied hours, shutting off computers during unoccupied hours, etc. I don't know how the library is currently operated, but I would assume they try to control these manually. One thing we can look at for the new project are controls that automate these processes (occupancy sensors, photo-sensors for daylight harvesting, control systems for HVAC scheduling, etc). Depending on the situation, implementing these measures to better control the building can be more beneficial than utilizing energy efficient lighting and HVAC systems. We haven't had a chance to talk about the full scope and project budget yet, but these are just a few more options to consider.

Let me know if you have any questions/comments. Additionally, I know this is a complex issue that we are attacking with broad brush strokes at this point, so don't hesitate to give me a call or set up a meeting if we need to talk through any of this in more detail.

Very best,

Alex

[Brown Engineers]<<http://www.browngineers.net/>>

Alex Trulove, Project Engineer

Brown Engineers, LLC<<http://www.browngineers.net/>>

Little Rock, Arkansas<<http://www.browngineers.net/>>

501-993-7149<tel:501-993-7149> M (Primary)

501-448-0100<tel:501-448-0100> O
