

Creative Arts Facility Design Drawings
Questions posed by Steve Sorrells, Richard Lanning, and Bob Morris
October 16, 2009 Building and Grounds Informal Work Session

CATEGORY ONE: GENERAL CONSTRUCTION

1. Does the survey tape at the site of the facility indicate the footprint of the building? If not, can the footprint be visibly designated?
[A] The tape and red ribbons represent the building footprint.
2. On the ground floor of South Wing, woodworking area, there is what appears to be a 6' wide doorway off of a landing. Is the door accessible from the outside? Is it wide enough for moving equipment in and out? Can it be wider?
[A] The door is 6' wide and accessible from the loading. We had brought the width issue to Brian's attention and he approved the 6' width that is enough to move in/out equipment and ladders. If you desire to widen, please let us know. We can widen up to 8'-0" without a center mullion.
3. What is the plan for moving and installing heavy equipment? Are there accessible doorways, elevators? Provide plan.
[A] Moving equipment has been a critical issue that the design team has coordinated with Debbie, Chad and the faculty. HCC has provided the design team which equipment is to be moved and installed by the contractor or by the college. We confirmed that the computerized loom at Fiber is the largest machine and it could fit in the elevator. All equipment is listed on plan A1.31, A1.32 and A1.33 with an indication of who's responsible for the move and installation.
4. In regard to heavy loads on floors, specify the load capacity for all floors and especially for the labs where most heavy equipment will be placed.
[A] All slabs are designed for the loads from equipment. Floor dead load is 75 PSF, floor live load (Uniform Load) is 100 PSF, and floor live load (concentrated load) is 2000 lbs.
5. Provide access to the slides with the views of the building (internal and external) from different directions (shown at the meeting with I.D.). Specifically want a view of the building from Freedlander Drive. NOTE: i.D. = Innovative Design
[A]The PowerPoint file has been provided to Debbie. The file size is too large to e-mail. We will bring a CD-Rom to the next meeting.
6. Will I.D. provide a 3-D model of building on topographical display to get a better sense of the "fit" of the building on the site? When can this be available?
[A] The 3D models in the PowerPoint file is a working model built in Revit. We are producing the construction documents with Revit (Building Information Modeling by Autodesk) which is a 3-D building software. It does not take much effort to generate the views that you have seen in the PowerPoint because Revit generates them as we progress to the construction documents. However a high-end 3-D model with topographic display and real-texture materials would require a special 3-D rendering software and longer time. Innovative Design usually hires a 3-D rendering modeler if a high-end 3-D model is required by clients. If the college desires to have it, we will submit a proposal from a 3-D renderer and proceed.

7. What furniture and instructional equipment, if any, is included in the cost of the building? If included, will college or contractor purchase equipment? Will contractor or others be responsible for installing the equipment?

[A] Furniture is not included in the construction cost. Equipment varies depending on weight, mechanical and electrical needs. Please see question 3 above.

8. Architectural drawing shows rock and brick but the list of exterior finishes does not specify "brick" as a category. How much brick will be used and what is the cost?

[A] There is no brick in the project.

9. The landscaping plan lists a lot of plants (herbs) – are these for the dye garden or for some other purpose? Cost of landscaping appears to be more expensive than going market cost – why is it so expensive?

[A] Plants shown on landscaping drawings do not include dye garden plants. We were told by HCC that we provide the garden area up to the top soil and HCC would plant dye plants. (Note: This coordination was confirmed on 10/14/2009.) Cost estimate at DD phase usually includes some conservative consideration. Our cost estimate consultant takes average market value in the state and adds labor cost and other factors to be safe. It would be really helpful if the local market value can be provided to the design team. Is it an option that the horticultural department plants those plants on the landscape plan? This will save some costs.

10. What type of security system is planned for the facility? How will it be "tied into" rest of campus?

[A] The design team is currently working with the college staff regarding security system. A card reader system, surveillance cameras and emergency call posts (blue lights) are being considered.

11. The construction cost per sq. ft is higher than the average cost per sq. ft for a "nice educational" building (according to quote from a general contractor who constructs educational facilities). Why?

[A] During the Advance Planning process, we collected the cost of similar community college projects in North Carolina and it was \$250/SF. (Please see Advance Planning report page VII-2.) We had proposed 2% below the average cost which was \$244. As of the DD estimate, we are at \$247/SF with already identified shell modifications that can get that to the \$244 mark. This even includes the solar thermal panels, while the Advance Planning document suggested that the renewable energy system be treated as an additional funding source. Also please note that those "nice educational buildings" probably are more for classroom buildings (as you know, there is a lot of special equipment/needs associated with our facility) and they likely don't address any of the sustainable features that our building will have. To make my point, because of the large equipment load, the plug-loads in this building are several times greater than a normal classroom building. We are trying to achieve the best green building in the state within a similar cost range. We are still pursuing several funding options for solar and the construction cost would drop if the solar thermal is provided by a solar developer. (Please see responses below for solar systems.)

12. At one time there was discussion about capturing the heat of the kilns for another use? Is that in the plan? If so, provide specifics. If not, explain.

[A] We are pursuing three approaches to addressing the excessive heat given off by kilns.

- a. Find the most energy-efficient kiln that minimizes electricity consumption and heat loss.
- b. Specify blanket insulation around any older kilns that would be retained.
- c. Provide a room exhaust system and reclaim the heat through an air-to-water heat exchanger. The heated water from the heat exchanger runs through the coil at the VAV box in the clay studio and used to heat the space.

CATEGORY TWO: SOLAR SYSTEMS

NOTE: Committee members desire more information on solar systems so that they have a baseline of understanding about operations, advantages, disadvantages, and primary considerations. They are more knowledgeable of solar thermal but have less knowledge and experience with solar photovoltaic.

[A] I can appreciate everyone's desire to gain more information and I am very willing to do what is needed to get everyone's comfort level up. I recognize that the solar developer deals appear "to good to be true." My suggestions are as follows:

- a. I could provide additional (articles would likely be the best) information on similar systems.
- b. I could additionally make a special presentation on the technologies to those interested.
- c. Let's go ahead with the November 9th session where we will bring in three separate NC solar developer companies that have already expressed interest in making proposals to HCC on your thermal and photovoltaic systems. They will be able to show you examples of other NC projects where each of them has implemented projects with similar technologies.

Southern Energy Management
101 Kitty Hawk Drive, Morrisville, NC 27560
Phone: 919 836 0330 Fax: 919 836 0305 Cell: 919 815 5345
Contact: Bob Kingery
bkingery@southern-energy.com
www.southern-energy.com

Carolina Solar Energy
400 West Main, Durham, NC 27701
Contact: Richard Harkrader
Phone: 919 682 6822, 919 489 1656 Fax: 919 321 1351 Cell: 919 218 7390
rharkrader@carolinasolarenergy.com
www.carolinasolarenergy.com

FLS Energy
400 Eastside Drive, Black Mountain, NC 28711
Contact: Michael Shore
Phone: 828 582 3141 Fax: 828 669 5046 Cell: 828 582 3141
Michael@flsenergy.com
www.flsenergy.com

Keep in mind that, if we pursue a solar developer approach, we would have the selected solar developer install, maintain, and finance the systems until around seven years, at which time the cash flow for the College would allow you to take over ownership and make a profit.

Please remember that Innovative Design has implemented literally hundreds of solar thermal and PV systems over the years.

13. Committee members would like access to the power point presentation that I.D. did at the college during the initial stages of development that described sustainable design. (Describes purpose of solar systems, etc.)

[A] Sure. But I can also present more detailed information to those interested if you would like.

14. Is it possible to secure Mike (and others) to do a seminar through the college for residential and commercial contractors – present the basics about the different solar systems and things contractors need to consider? (Rose has since talked to the Haywood Builders' Assoc. about potential of co-sponsoring this event with college.) The HCC Board members would attend.

[A] That would be great. We have developed a 2 hour presentation on k-12 solar options that I have presented several times to school architects and engineers in Ohio and New York. It would have to be modified but it would be a good start.

I also have, for years, worked with Bill Guiney at Johnson Controls who has a very in depth installers workshop for residential plumbing contractors. Bill use to work at the Florida Solar Energy Center, where he developed a lot of his training materials. Bill and I taught some of the classes together in Ohio.

15. Is there a building comparable to the creative arts facility that I.D. has constructed with same or similar solar systems (thermal and photovoltaic) that can be toured/viewed by the committee?

[A] I believe that you will want to concentrate on the projects completed by the solar developers since it is likely that one of them could end up with the project (if that is the direction that you choose to go). The closest (distance wise) PV system that is similar to the one we are suggesting is at the NC Zoo. I am certain that on Nov 9, Richard Harkrader will be showing you photos of it. All three of the firms have implemented solar developer deals with utility power and REC purchase agreements.

Michael Shore will be showing you photos of some of his solar thermal projects that are pretty close to you. Michael is based out of Black Mountain.

All three companies have done projects much larger than the one that we are proposing on HCC's

Creative Arts Building.

16. What kind of maintenance is required for solar photovoltaic? For solar thermal? How often performed? Projected cost of maintenance over period of time?

[A] The PV modules have very little maintenance. In systems that employ batteries, the maintenance is greater but that is not what we are proposing. All of the electricity will be inverted from DC to AC and then put into the main electrical grid. There will need to be periodic checks on the system but the maintenance will not be significant. See below the anticipated cash flow in various years before and after the 7 year predicted buy-out period.

One option, like we have arranged in other contracts is that if you go the solar developer route, you could insert a clause in the contract that could extend just you maintenance agreement at a predetermined rate.

Even if you do not go the solar developer route, you could include in the bid requirements that maintenance will be (could be) provided for "x" number of years.

The solar thermal panel maintenance will also be low. There will need to be periodic antifreeze solution added to the collection loop and pump seals will likely need replacing like other pumps.

Once the controls for operating correctly they won't require too much attention.

Like the PV system, maintenance on the solar thermal system could be insured in the same optional ways.

What does require some different level on maintenance will be the absorption cooling mechanical system. A bit separated from the solar but certainly linked, this system is the same type that was used for decades back in the 70s and 80s when it was solely driven by a gas/oil boiler. It was the central cooling system for most of NC State (and many other buildings across the country) when I went there. But, it isn't used today as much as before. The Carriers and Tranes s still rep/sell these systems and absorption is having a comeback since solar thermal collectors can now achieve much higher temperature (and are now able to provide 180F temperatures).

My suggestion is that, regardless of whether a solar developer or a normal sub-contractor installs the absorption system, that it is rolled into an overall maintenance package that can, at least for several years, be handled by the installer.

Remember, that while there will be maintenance, there will also be cash flow advantages to HCC.

The following represents one of the scenarios that we have calculated to indicate what the cash flow for HCC might look like. The final negotiated with either Greenco or Progress will certainly be different but this should give you a feel for the magnitude of the income versus maintenance costs. One of the real advantages of the solar developer approach is that they do the maintenance for at least 7 years, which takes this cost away from you and then, when you take over, the income far exceeds the maintenance. What other traditional mechanical system approach can do that?

| | Maintenance | Net to HCC paid by HCC | after maintenance |
|---------|-------------|---------------------------|-------------------|
| Thermal | years 1-7 | none | lease income |
| | Year 8 | 5,178 | 29,385 |
| | Year 10 | 5,256 | 31,741 |
| | Year 20 | 5,497 | 46,071 |
| | Cumulative | \$69,366 | \$484,121 |
| PV | years 1-7 | none | |
| | Year 8 | 2,684 | 30,779 |
| | Year 10 | 2,711 | 33,183 |
| | Year 20 | 2,850 | 47,197 |
| | Cumulative | \$35,959 | \$501,923 |

17. What is expected life of the solar photovoltaic and solar thermal systems and related equipment?
What repairs/replacements should the college expect over a period of time?

[A] I believe the PV should be expected to last 30 to 35 years, the solar thermal panels about 30 years. The pumps in the solar thermal system will likely be replaced (or at least new seals) every 15 years. These costs should be made a part of the maintenance agreements that, in turn, should be easily covered by the cash flow from energy savings and REC sales.

18. When solar photovoltaic system or roof on which system is placed needs to be replaced, how is that done? What primary factors need to be considered during replacement?

[A] When I started out in solar back in the seventies photovoltaic energy was being produced for \$2.70/kilowatt-hour. Just a couple of years ago PV modules were selling for \$10,000/kw. Today the price is \$3,500/kw. In thirty or thirty-five years, when your roof and PV goes, what you replace your PV modules with will be something that is radically different, perhaps a paint product or perhaps it will be embedded in the roofing material finish.

If for some reason you did want to remove a PV module or thermal collector, they are pretty easy to take off. They are mounted, with a clip that attaches to the raised part of the standing seam roof. They don't actually penetrate the roof.

19. Is it viable to place the solar panels on the ground vs on the roof?

[A] For several reasons this wouldn't be a good idea. The mounting of solar, when racks and bracing is used to tilt them up, costs about 40% more than just using the simple clips.

Because we are trying to save as many trees as possible, the roof mounting is ideal. The solar thermal modules store the captured heat in a large tank that is located at the southwest corner of the building. The further the collectors away from the tank, the more energy it takes to circulate the fluid. The same argument could be made on the PV. The more distance from the building, the more losses and added cost in wiring.

Land value should also be considered.

20. Would like to see a sample of a contract for selling solar units (with solar developer and electric companies).

[A] I can provide you one that is similar (have to take out all the exact terms to protect confidentiality) to the one we are using for Raleigh's deals. It will answer a lot of questions.

21. There is a flat solar panel that fits between the raised roof seams. Why is that not suggested over the one that connects to the raised seam?

[A] I am very familiar with the product. First, to get the same amount of electricity, it cost more than the module approach that we are proposing. This product uses a thin-film PV product and it is 50% less efficient than monocrystalline PV products. This product is also laminated directly on to the roofing and the surface temperature can get higher than the PV panels mounted on the standing seam, and its efficiency is reduced further with the high surface temperature. By the fact that it is mounted onto the roofing panel it would be necessary to implement the PV at the same time the roof goes on. Since we can't afford the PV part of the solar strategy unless we do have solar developers, and the solar developers will only be interested in implementing the solar (and not the roof) it is not a feasible option. But I like the thought process.

22. Is there a back-up system for the thermal floor heating system? What happens if need repairs, etc. or if it stops working?

[A] Both of the solar systems (pv and thermal) have backups.

On the solar thermal side (that primarily provides the heat for the radiant floor piping system, if the sun isn't producing, a boiler automatically kicks in that will provide the heat to the floor.

The radiant floor system should be thought of in a little different way. Once installed and commissioned, the floor piping system is extremely reliable. There is currently no back-up for the floor piping. Putting in a back up for this component of the system isn't prudent use of money. It would be like putting in two sets of ductwork just in case one goes bad. This is not likely.

23. At next meeting with I.D. (or at the public presentation), committee members would like for Mike, an engineer, and individual who installs and maintains solar panels to attend/participate. Can we make this happen?

[A] Happening on Nov 9.