
CONSTRUCTION PROJECTS COMMITTEE
THURSDAY, APRIL 23, 2009
6:00 P.M.
NASHUA HIGH NORTH LECTURE HALL

A meeting of the Construction Projects Committee was held at Nashua High North on **Thursday, April 23, 2009**. Alderman McCarthy called the meeting to order at **6:10 p.m.**

Present: Alderman McCarthy, Alderman Tabacsko, Mr. Dowd, Mr. Hollowell

Also Present: Mr. Mealey, Mr. Smith, Mr. Vaughan, Mr. Haas, Alderman Teeboom
Jordan Institute

DISCUSSION: Jordan Institute Report

Mr. Smith

You should all have received a copy of the preliminary report from Jordan Institute. They'll be talking to that and maybe go a little bit more into the tasks, etc.

Gary O'Connell

I manage the Granite State Efficiency Program for the Jordan Institute. We've been working with many school districts and analyzing their buildings. We've been through the Fairgrounds School quite a bit in the last month or two. One of the things that we're adamant about it that we first have to address demand reduction before you look at the supply side of things. There are a lot of options on the sheet you have for heat and air conditioning the building. But we've spent a lot of time looking at the demand side of the building.

The building envelope assessment test has been completed. This is a process of mechanically depressurizing the building with large fans. It creates a vacuum or infiltration through existing cracks & voids in the building shell and basically sucks the air out of the building and watching where it's infiltrating into the building. Simultaneously we're filming that with an infra-red video camera. I have a DVD to leave with you with that process. It's very revealing. At the same time, we've got a meter reading the pressure of the building and how much infiltration. There is a lot of opportunity to seal up this building in the original wings. It could drop your load somewhere in the 25-30% range if done correctly.

Dick Henry

As far as we can tell there is no insulation in the wall proper. We've been thinking of how best to work with that shell situation. In the older part of the building there is more opportunity to insulate the interior part of the wall. But given the structure of the building, it probably makes more sense to insulate from the inside than from the outside and leave the veneer in place.

We've also done a lighting audit. The lighting auditor felt that a 40-50% reduction from lighting was possible. That would include reimbursements from PSNH. Overall that comes out to about 4 or 5% reduction in your total energy use. So that looks quite promising and there are probably additional savings to be had with motors as well.

Controls are an issue and we haven't gotten to that yet in our study, but will in the next month. As we go forward particularly in improving the shell of the older part of the building, we see some considerable potential for glazing improvement. In the older section there is so much window that the shades are pulled down most of the day. So the easiest and least expensive way to improve the thermal value of the shell in that part of the building is just to cover over the wall in the parts of the windows. We think that by eliminating the wall that is allowing light into the room you can go from an R2 to an R40 and still have plenty of light in the room.

Mr. O'Connell

When we looked at the daylight coming through the openings there were a lot of openings not allowing daylight. Some of the roof overhang shadows the glazing opening. Done correctly you could maybe eliminate flanking panels.

Mr. Henry

There is also potential doing something about the thermal losses through the slab. Onto energy recovery ventilations... one of the really key things here. There's no heat recovery in the old building or the new part. At least 15% of the air is seeping out of the building and taking the heat with it. As you seal up the building and make it air tight, you need a way to ensure that you get adequate air exchange and meet the air requirement. You're not even meeting code at the moment. So to have an energy recover ventilator that is sensitive to occupancy, you can allow these things to run at different levels. When it's occupied up run it at a higher level than when it's not. In addition, the energy recovery ventilators allow you to recover 70-80% of the heat in the discharge air. So you get two benefits from this... you meet code and you have 100% fresh air coming into the room at all times instead of 15%. And you're keeping 80% of the heat in the building in the building. We're looking at different ways to do that. We can do it on a classroom-by-classroom basis or with a wing.

Aldermen Teeboom

Incoming air is an issue. Would you bring the air in the window construction top?

Mr. Henry

That's one place. We'd also like to take out those glass blocks. You can either cut down the amount of fenestration there or put in a fairly high value cow wall so you still get the ambient light.

Alderman Teeboom

This was recommended before but all this ducting... is there enough piping and space?

Mr. Henry

You'll notice we raised the question, do you have any problem with exposed ducting?

Alderman McCarthy

The issue that was raised when we discussed it before was not so much the exposed ducting, but the noise that would be generated.

Mr. Henry

One of the ideas we're exploring is having individual ERV's for each room. So you might even have the units outside, but in an insulated space. We were going to split it between 2 systems so that they would both be running at lower velocities.

Mr. O'Connell

The key is to keep the units as small as possible from a noise point of view. The other key is that you're not sharing duct work. You make sure you have 2 isolated units that are separate from each other.

Alderman McCarthy

I think when we're up to that it would be useful to prototype it.

Mr. Henry

You took the words right out of my mouth. We would prototype it in 2-3 classrooms. The other thing we want to talk about is the mechanical alternatives. But we thought it would be useful to go through the questions on page 2 about whether there are some avenues that we don't need to go down because they're already off the table.

What percentage of the school do you think will need air conditioning? And if it's not the whole building, which rooms?

Mr. Smith

The main office and the computer lab are currently air conditioned, and that's it. I would like to see the media centers, libraries air conditioned. After that it probably becomes a question for the BOE. We use these schools for summer school, but only until noon.

Alderman McCarthy

My perspective is that in the past we've tried to do the air conditioning as wide spread as possible. Not just for comfort, but for mold and moisture control.

Mr. Henry

How do you see the gym and cafeteria spaces being used? Do you have evening basketball or weekend programs for the community going on?

Mr. Smith

Most of the basketball is in the winter time. The cafeteria gets a fair amount of use year round in the evening and during the day.

Mr. Dowd

More and more emphasis is being put on extending the school year. Even now there are days when the heat is unbearable in the schools. And if you extended school for a month or more it's going to be an issue. I'd rather do these schools projects serially rather than doing them parallel.

Mr. Vaughan

The big unknown is in 5 years or so, are we going to have longer school years? And we as a community are trying to use these buildings more to their maximum. It's a tough call, but it seems like having air conditioning would give maximum flexibility.

Mr. Smith

I think we're all going to be seeing the results of our access reports soon, with a policy that was put together. Most of these classrooms have doors and teachers all want to keep their doors and windows open without air conditioning. That does become a security issue for lock downs, etc. That would steer us towards air conditioning.

Mr. Henry

You could also look at good dehumidification because without humidity you can tolerate higher temperatures.

Alderman McCarthy

I think we'd like to know the additional cost for dehumidification and for air conditioning both in the areas Mr. Smith mentioned and all areas.

Mr. Henry

So I'd like to go through the alternative now with the pros and cons and see if anything is off the table. The geothermal alternative, if you have the right load profile has some real potential in terms of operating costs and can be very efficient. The big down side is the insulation costs, particularly the well... drilling and installation. If you don't have an adequate cooling load that initial up front cost can be a real issue too. If you can give us an idea of what your projected costs on the geothermal work you've done so far, that would be helpful to us. I have the alternative fuel sources with the costs of fuel both at its highest last July as well as the data as of the beginning of this month. I will say that natural gas dropped below \$3.50 today per million BTU's, which is the lowest figure in over 6 years for natural gas. Oil seems to be holding pretty well. If you go down to the bottom of this chart, at current electric prices, we're looking at about \$16 per million BTU's. And that's comparing with Tier II natural gas right now at about \$12.60.

Alderman Teeboom

But that requires a very tightly sealed building.

Mr. Henry

You're right. In either case, whether you go geothermal or air source heat pumps, or really any of the other fuel solutions, the most cost effective way to lower your demand is to tighten up the building. And it's well worth it to put your money into that. We think putting your money into the envelope makes the most sense and is the most cost effective way to reduce your overall demand.

Mr. O'Connell

One of the things to think about in terms of life cycle costing... it's a one time shot. There's no operation cost to tighten up your building. There's no fuel needed to support that.

Mr. Henry

Last time I talked about wood chip and wood pellet boilers. On the wood chip side you can see it's by far the cheapest fuel of all the alternatives. It has a very high up front cost and I would say this building is too small for a wood chip system to be cost effective. Six months ago I would have pushed you towards wood pellets, but you can see now it's right at the same price as geothermal or air sources and is considerably more expensive than gas. The beauty of geothermal and air source heat pumps and gas is that you don't have delivery issues. Then there are neighborhood issues... problems with stacks, etc. At this stage it would help us to know if you want us to pursue the numbers on the wood alternatives or if they're essentially off the table.

Alderman McCarthy

I'm a real fan of keep it simple. And if gas and other fuels are approximately the same price per BTU... we have 16 other schools with gas and have had good experiences with it. So there would have to be some substantial savings to consider going with pellets instead in my opinion.

Alderman Tabacsko

I concur.

Mr. Dowd

There are also no regulations for wood chips, etc.

Mr. Henry

Oil and wood are not regulated. There would be the potential for some emissions issues. The building is really too small to consider chips and the pellets have a much better emissions. So is everybody comfortable with us taking wood off the table?

Alderman McCarthy

Yes.

Mr. Henry

Natural gas is a real bargain right now. Replacing the distribution system and the piping is another issue. You have run some preliminary numbers on that. We now think the valance system is probably not going to work. There are advantages that I see in the hot water distribution system, and we'll keep looking at that option.

Mr. Smith

When looking at the building shelves did you include the roof? We have a lot of heat loss through the roof. And did you look at putting in a suspended ceiling where we have the cathedral ceilings?

Mr. Henry

My understanding is that in the older building you have not done much with the roof, but there is some insulation in the roof and walls of the newer one. Is that true?

Mr. Smith

It's a mixed bag.

Mr. O'Connell

Of all the buildings we've been through the span on these trusses is not great. I think added insulation on the roof is definitely an option. It would be great if it could coincide with a roofing project you're planning. I'm not sure the numbers would warrant tearing off a good roof just to get some insulation under there. But if you have roofing projects on the drawing board in the next 4-5 years, most certainly insulation should be incorporated. We could spray from below, but I'm not so sure that's the solution.

Mr. Smith

We do have a roofing consultant that we use.

Mr. Henry

The tax credits are all over the place right now. It's a little unclear how they apply to non-profits and if you can pass them on to contractors. When you have PV in place, you have a known upside cost of your electric generation. And it matches nicely your demand for cooling. There are storage issues of course.

Alderman McCarthy

Both on this and the next item, I'm reluctant to go to places where we have essentially non-market influences on electric rates. Because that's more variable than fuel prices in the next administration.

Mr. Henry

I agree and I think it's something that may be available to you down the road, but is not going to play a big role in your energy demand at the moment.

Alderman McCarthy

We don't want to be in the electric business. I think we want to minimize our participation in the energy consumption business. I would invest in closing up the building envelope and going to a really efficient heat reclamation supplemented by a natural gas / hot water system.

Mr. Henry

Good. And we've taken a look at the CHP. You don't have a very high cooling load in the summer and no place to dump the heat. We've run numbers and looks like the electric cost to you even at low gas prices is about twice what you can buy it off the grid now. So we don't think that would work in this application.

So that brings us to air source heat pumps as the last alternative. It is essentially the same technology as the geothermal system, using a heat pump. But it has a much lower initial capital costs. It has a great deal of flexibility in the distribution system. And probably similar to the geothermal application, we would recommend an electric resistance backup for the few winter days when the heat pump is not going to be adequate for the load. To put in a whole gas backup system for 10-15 days a year doesn't seem like a good economic approach. We are quite excited about the air sources heat pumps. The technology has gotten much, much better on this. You can a less expensive high efficiency heat pump that doesn't have a low temperature capability. The COP's on these systems are excellent.

Alderman McCarthy

What is the outdoor component of one of these?

Mr. O'Connell

At Fairgrounds it looks like we would have 7 heat pumps around the building. The pipe system is fit into each room and there is a wall mounted air handler in each room (more in the cafeteria). They produce both heat and cooling and each room has its own thermostat. So there is individual comfort control in each space.

Alderman McCarthy

That may or may not be a desirable thing from Mr. Smith's perspective. How big is the heat exchanger outside for each of the 7 pumps?

Mr. O'Connell

It's not big. It's about 4 x 4 x 5. You can roof mount them, but they're often on a concrete pad outside.

Alderman McCarthy

We may want to put them on the roof where they're safe. I'm having trouble getting my arms around how we get the same amount of heat exchange out of air based exchange in a small cube as we're getting out of a 900 ft. deep well with geothermal.

Mr. O'Connell

It's an amazing technology and has been in Europe for a very long time become coming to this country. They're using them in big, large commercial applications. We're quite pleased that it's come to the US. We're looking at these kinds of systems compared to geothermal, compared to natural gas heat... The natural gas heat component doesn't give a cooling factor at all. And because cooling is becoming more important for everyone in all districts, both ground source and air sources are becoming very important configurations. So we're now them in financial models running side by side to see how they look. It depends on lots of things.

Mr. O'Connell

The typical 900 sq. ft. room would probably have a wall or ceiling mount with a fan coil in it. The other advantage to it is that you're dealing with one vendor. The vendor is putting in all aspects of the unit from the heat pump outside to the ducting, piping and individual distribution system.

Alderman Teeboom

Why would you exchange it on the roof? Why not on the pad?

Alderman McCarthy

Because our experience is that kids like to break them open and you can get considerable damage.

Mr. Smith

We have definitely had vandalism with these. They do also get on the roofs. We'd probably be better off if we could find a room with an exterior room and do it that way... just keep them inside.

Mr. Hallowell

So it's seven 4 x 4 x 5 units. Or is it the total size?

Mr. O'Connell

They'll vary a little bit because one will be servicing the gym for instance and may be a little larger. They're really designed very specifically for what they're serving.

Mr. Hallowell

The electric backup... the advantage I see there is that if in 5-8 years down the road there is another way to generate electricity we could just switch our electricity source, which is not possible with natural gas.

Mr. Henry

You don't have any backup generation on the site at the moment, do you?

Alderman McCarthy

No, we don't.

Mr. Henry

Is there any possibility that this could be a homeland security site?

Mr. Smith

We have a good number of schools already designated for that. The two high schools... we have emergency generator hookups at 4 other schools.

Mr. Henry

And are they all gas fired?

Mr. Smith

Yes

Mr. O'Connell

And are you doing any demand response with those units?

Mr. Smith

Demand response?

Mr. O'Connell

We can talk about demand response. But given that you have gas fired generators at the moment, there's another income potential there by entering into demand response contracts.

Mr. Smith

Yes, in fact I was just talking to PSNH about that today. I'm investing that as we speak.

Mr. Henry

So where that leaves us, is that we'll continue to go forward looking at the geothermal, the natural gas and the air source heat pumps as the 3 alternatives that make the most sense to work up numbers on.

Mr. O'Connell

We can concentrate now on those 3 systems to do comparative data on.

Alderman Teeboom

We have enough time to do studies on the 3 systems?

Mr. Henry

Yes.

Alderman McCarthy

I'm not sure... I mean I think we need to still look at geothermal, but I think we've pretty much convinced ourselves that it's not going to be as effective as the envelope changes. I would concentrate on the air source heat pump and the natural gas.

Mr. Hallowell

But we do already have numbers that we spent a fair amount of money to generate. And if they're going to have a model, I would certainly be willing to have them take the time to put those numbers into their model to see where everything fits.

Mr. Henry

If you're willing to share those numbers with us, that would save us a lot of time.

Mr. Hallowell

I thought we already had.

Mr. Smith

We actually sent them the preliminary report, but there was a lot of number crunching after the fact that we can send them.

Mr. O'Connell

One of the things we do with geothermal is that we degrade the output numbers based on the experience we've had with geothermal to try to more accurately predict what the outcome of geothermal will be vs. what the advertised output is. We have never seen a system work the way it was designed to work.

Alderman McCarthy

Under "Other" on our agenda, I would ask for a motion to approve invoices from Turner Building Science and The Jordan Institute.

MR. HALLOWELL MOVED TO APPROVE PAYMENT TO TURNER BUILDING SCIENCE & DESIGN, LLC IN THE AMOUNT OF \$305.43 AND TO THE JORDAN INSTITUTE IN THE AMOUNT OF \$2,300 AND \$7,833.

SO VOTED.

Mr. Hallowell moved to adjourn. **So voted at 7:30 p.m.**

Submitted by Jacki Waters