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East Portland Community Center Case Study

Project Description

“The East Portland Community Center Aquatics addition, which adds 22,000 sf to the existing community center [will] create a full service complex that provides all recreation needs for the citizens of East Portland. The addition will include a new 4,500 sf family leisure pool (with water slide, a lazy river, warm water lap lanes, and play features) as well as a spa and a 4-lane, 25 yard lap pool. As designed, the building will significantly reduce energy consumption. The project, which is targeting LEED Platinum certification, has documented exemplary performance in daylighting, energy efficiency, and material reuse.”¹

Architect: Sera Architects, Portland, OR
Landscape Architect: Mayer Reed, Portland, OR
Structural Engineer: ABHT Structural Engineers, Portland, OR
Civil Engineer: Roberts Consulting Engineers, Eugene, OR
MEP Engineer: Interface Engineering, Portland, OR
General Contractor: Lease Crutcher Lewis, Portland, OR
Green Consulting: Brightworks NW, Portland, OR
Aquatics: Water Technology Beaver Dam, WI

Project Data

Completion: December 2008
Cost: \$12,000,000 U.S. Dollars (2008)
Area: 22,000 ft²

Location

City: Portland, OR
Latitude: 45.31 North
Longitude: 122.33 West

*Climate*²

HDD65: 4522
CDD50: 2517
Annual Precipitation: 36.3”
Solar Radiation: 377 kBtu/sf/year

Energy Metrics

Energy Code: Oregon Non-Residential Energy Code
Predicted % Below Code: ~60%³
Measured EUI: Not Available

¹ From the SERA Architects website at www.serapdx.com

² From the National Oceanic and Atmospheric Administration website at www.noaa.gov

³ From the Portland Parks and Recreation Green Initiative Fund Application

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East Portland Community Center Narrative: Architects Lisa Petterson and Eric Ridenour

Getting the Project

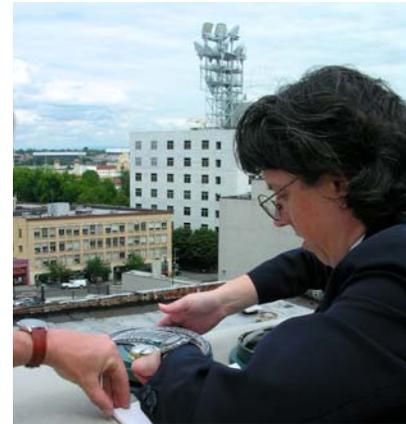
Lisa Petterson (LP): We got the project through an RFP¹ process. It was a publicly advertised project that we submitted for and were selected as the top candidate, without an interview. That was primarily because Kurt Schultz had done the existing building, which gave us an edge and knowledge of the existing infrastructure.

I was involved as the project architect at that time, Clark Brockman was project manager, and Kurt Schultz was principal-in-charge. Over time, I became the project manager and Eric Ridenour was added as the project architect. Clark stepped out of an active role on the project. The roles evolved as the project evolved.

Eric Ridenour (ER): We've continued those roles through the construction process as well. I've been doing the regular, daily contact with the contractor and Lisa has been the project manager of that component as well.

LP: It started in 2004. The levy was passed in 2002 and there was funding set aside for this particular project. EPCC was the biggest project that was part of the levy so it was put off until the end of the cycle. We did do some initial schematic sketches for them even as early as 2003. It was a long process. We did everything from working with a sports management group to figure out what the program amenities ought to be, including what the revenue would be and what they should be charging, to looking at the demographics of the area. Also we went through land use process that was fairly extensive..

LP: Neither Eric, nor I had previous experience with natatoriums, although I had a lot of experience as a swimmer and as a lifeguard.



Lisa Petterson, AIA, LEED AP, NCARB was both project Architect and project Manager for the EPCC.



Eric Ridenour, LEED AP, RA was the project architect for the EPCC. He was a founding member of the Cascadia Region Green Building Council.

¹ Request for Proposal is one process for hiring an architect.

Kurt and Clark both had previous experience working on the Mount Scott pool in Portland and the Osborne Aquatic Center in Corvallis. The initial team gelled with Clark staying on as our consultant for all things aquatic and to help the team out.

Selecting the Project Team

LP: Interface was selected because of their previous experience with Portland Parks and Recreation, because of their previous experience working on pools. Pools are very big energy hogs. We knew that the natatorium was going to be a pretty tough nut to crack in terms of its energy use. We wanted someone with previous experience, but also someone who was really well known for their cutting-edge design and Interface really fit the bill and they're local. We had done lots of work with Interface before; we had worked with them extensively.

ER: They were familiar in that we knew that they would be up to the challenge.

LP: Mark Heizer is was our main engineering contact. I hadn't had previous experience working with him but I had worked with Omid Nabipoor,² the principal-in-charge of the project. We have done ten projects together; we definitely trust him implicitly.

Water Technology is a pool design firm that we've worked with extensively. They're out of the Midwest. We knew, based on their experience with recreation facilities, that they would fit the bill from the Parks side.

Barbara Roberts of Roberts Consulting was our Civil Engineer; from Eugene. I had previous experience working with her when she was with Balzhiser Hubbard Engineers. We were looking for minority and women-owned businesses and she fit that bill, which was the same with Mayer Reed, our landscape architect. Again, it was the

² Omid Nabipoor, LEED AP is the president of Interface Engineering, a five-office multidiscipline consulting engineering firm.

combination of previous experience and the fact that they are woman-owned firms that led us to them.

APHT³ is an up-and-coming structural engineer. We had tried them on a previous project and had good success. They are also a minority-owned business. We were looking for a diverse team.

Brightworks⁴ was one of the consultants on the project. They helped with a lot of the nitty-gritty paperwork in the LEED process, as well as through their consulting and advice on different strategies. They were part of the team from the get-go. We have done LEED services probably more than a lot of architectural firms and we've done a lot of in-house documentation work, but they were instrumental in terms of keeping track and managing the LEED process.

LP: Eric is one of our premiere LEED people in the office.

ER: But it's been a very collaborative, iterative process where we're always bouncing ideas back and forth about different strategies and how they work.

LP: The Energy Studies in Buildings Laboratory⁵ was also consulted on the project and were involved early on. They did energy programming with us in the initial design phase and worked with us on daylight testing to see at how we could bring more daylight in the facility. Of course we did their usual checking of our drawings and that type of thing.

³ APHT Structural Engineers is located in Portland, Oregon.

⁴ Brightworks provides strategic and operational planning and facilitation for LEED programs. SERA worked with Brightworks Northwest located in Portland, Oregon.

⁵ Energy Studies in Building Laboratory (ESBL) at the University of Oregon provides design assistance in daylighting, natural ventilation, and energy efficiency.

Setting Goals for the Project

LP: The City of Portland has a LEED⁶ Gold Plus mandate now and we were actually the first project under the new mandate. In addition to mandating the LEED Gold, the City of Portland has said, "You must do these other five things as well."

ER: The mandate states that you need to perform 30% better than baseline standard and you need to have at least 30% stormwater management on site. It was a separate mandate to do 100%, in our case, because of the local infrastructure near the project, and then 30% water efficiency relative to the EPA, the Energy Policy Act of 2000. The energy policy had a baseline, which is the same baseline that LEED uses, and we needed to perform 30% better than those in addition to attaining the LEED Gold certification.

LP: The LEED Gold plus policy also mandates construction waste management recycling hit the 75% mark.

ER: The last one is that you need to get, is the commissioning credit under LEED. They said LEED Gold, but they micromanage which LEED credits you are required to get. It's LEED Gold plus those five categories. That's why they call it LEED Gold Plus.

LP: The concern from the transportation side is the facility really just for the neighborhood that it served. There's a real concern about being able to show that we weren't going to be over-parking the area and disturb the residents. From that extent, we needed to investigate what transportation strategies were already put in place because it is an addition to the existing community center. They already have a really good ride-share program. We looked at the bus lines and other similar options, but it wasn't really an active part

of our project as much as showing that we were providing adequate parking.

ER: Although, we did, in the end, wind up implementing a few strategies associated with the addition. Four of the parking spaces in the expanded parking lot will be dedicated to fuel-efficient vehicles, meaning that there's no LEED credit. It is for fuel-efficient vehicles that are on the ACEEE⁷ list: Hybrids plus the other really efficient cars on the market are allowed. When you are trying to do that you get into great discussions about how much signage to put. Do you put the whole list of cars out there? Or do you just put something general and educate people through other means? The intent is to encourage people to use more efficient vehicles.

LP: Another goal that was added after the project's inception, was an idea about having the project be photovoltaic-ready. We were looking at a third-party financing system to get a large, somewhere in the neighborhood of 80-85 kW, array on the edge of the building. We're still working on that and we're very, very close.

ER: We can definitely say we are delivering it PV-ready. It's very ready down to locating the roof clips, the right places to attach everything later, and adding electrical conduits to where you would want to punch through to actually wire in that PV later. It also means leaving space in the appropriate mechanical rooms for the inverters, or other meters or systems, that will need to go along with it. In our case, actually, our inverters could go on the roof, so it meant adding some additional steel to support them by looking at the inverters that are likely to be used. Structurally it means that, at a minimum, making sure that the basic roof structure is strong enough to support the loads. We've taken it beyond that to the point where we've told the roofing supplier exactly where to put the roof clips so that if we need to locate the clips that hold the panel directly above the clips that hold the roof on, we should be able to do that. We have it down to a fairly refined

⁶ Leadership in Energy and Environmental Design (LEED) Gold is a classification given by the United States Green Building Council representing that the project has earned sufficient points to satisfy Gold status.

⁷ American Council for an Energy-Efficient Economy.

level of detail. We had the benefit of talking to a third-party installer for the photovoltaic panels throughout this process. We could anticipate their design in a very detailed way.

Tracking Progress on the Project

LP: ESBL was instrumental for us to evaluate the daylighting design that we were proposing, to make changes, and to perfect it.

We relied, on our mechanical consultant, throughout the energy modeling process, to help us evaluate different items like the wall insulation. We ended up settling on two inches of rigid insulation. We modeled the energy savings for three inches of rigid insulation and did a cost-benefit analysis throughout the modeling and, ultimately, two inches is what we settled on.

We also looked at the building from an energy-programming standpoint because pools areas are high, in terms of the overall temperature. We looked at how we could best place openings relative to other spaces in the building to take advantage of that heat transfer. It turns out that, because we were doing an addition, we weren't able to use as much of the heat in that way as we would have liked to, so we re-directed it and, instead, are using the waste heat off the mechanical system to help heat the pool water. A lot of people ask, "Why aren't you using solar thermal for the pool?" It turns out it is not needed because we can essentially heat the majority of the pool water with the waste heat off of the mechanical system because there's just such high energy requirements. We are doing a little bit of solar thermal for the showers. In the overall scheme of what we were looking at it's just a small, little array of six panels that will provide most of the shower heat for the hot water.

ER: To make the bathers comfortable you want to do two things. First, you want to provide nice, warm air. It's about 86 degrees Fahrenheit so the people that are running around in bathing suits and are wet are going to be comfortable. That's a primary programmatic need. The second

programmatic need that is associated with this building type is fresh air. Think about the fact that these are chlorine-treated pools. Chlorines and other contaminants are going to build up in the air. You need a lot of air changes per hour. You have to consider what that means for energy-use when you're taking a lot of really warm air and trying to dump it out of the building. Working with Interface, we came up with the idea of capturing that heat and air as it is being exhausted and then using that to pre-heat the pool water. It does most of the heating of the pool water, really.

LP: We have a site that is oriented incorrectly for daylighting. There is only one place on the site where we could put the addition. We looked and struggled with it and tried to see if there was any other way that we could achieve a better daylighting design for the natatorium from a strictly building-orientation stand point and we couldn't. Then we looked at building form and how it could inform the daylighting design when its orientation really wasn't going to be able to. That's where the shape with the clerestories, the lower-angled roof, and then the additional clerestory, came from; it came out of the process of trying to get light. We were designing, really, from the daylighting perspective and, after that we were looking at how we could integrate with the rest of the buildings and form the rest of the facility.

Project Tax credits and Incentives

LP: We are going to be looking at all of the funding that's available through the BETC⁸ program. One of the interesting things about our project is that we're going to be achieving LEED Platinum, or we hope so, through the addition of the solar array. There are separate tax credits provided from the solar side versus the LEED pathway so we'll essentially be applying for our LEED Gold target for the BETC money for the building itself and then we'll be looking at BETC

⁸ The Oregon Department of Energy offers the Business Energy Tax Credit to those who invest in energy conservation, recycling, renewable energy resources and less-polluting transportation fuels.

money for the solar array as separate funding. ETO⁹ is also providing a significant incentive because of the high energy savings that we are achieving. ESBL gave us a grant for parts of their work. We actually did win a City of Portland Green Investment Fund (GIF) grant but we ended up getting it too late in time to be able to implement it. We were going to install a spa water reclaim system, where we would use the spa water to flush toilets. We were not able to implement the idea as we did not receive approval until we were over half way through construction and the costs turned out to be too high, so we had to give the money back.

ER: When it's a public sector project using state tax credits, you have to take advantage of the pass-through option that the State of Oregon offers. They need to have a partner that can take the tax credits and give it ahead of a tax liability. There's a formula reached through the Energy Department for how much goes to the pass-through partner and how much goes to the project owner. It's part of the standard rules of the tax credit.

LP: One of the things that SERA has really been instrumental in is looking at how we can help clients understand that incentive process. In Oregon, we're uniquely situated and have really good funding sources with both Energy Trust and BETC. They incentivize different things; one is very broad and shallow and the other is very pointed and deep. Not all clients know how to take advantage of that so we try to help guide them through that process. We help them navigate through the process and decide on the track that will get them the best incentives. We often look at it in multiple different ways. For this project, because it already was mandated to go LEED, and the LEED track is generally the highest incentive, we knew from the get-go that we were going to follow that track.

Selecting Technologies for the Project

LP: At SERA, we're working on energy and water tools that were not developed for this particular project, but we retroactively used them to look at the spa water reclamation. At that point, though, we were already in construction and were just using it to figure out how big of a tank we would have needed to flush the toilets.

ER: It's worth going into a little more detail about the process, especially in the early stages. We have acquired a lot of basic tools that not every firm necessarily has, like a solar pathfinder, for example. Very early Lisa went on site with a solar pathfinder making sure that we knew when the sun was going to fall on different parts of the site to help with those early, early orientation decisions.

LP: It was interesting because ETO doesn't come out to check until we were actually already under construction. The walls were up and if we'd got it wrong, it would be too late.

ER: They had it down as perfect. It was south facing as much as you could ask for. Communicating our data and proving it, because we all have an intuitive level of understanding, becomes really important. When you pick up those tools it changes everything. Even an experienced designer will have little surprises on each project of exactly how the sun's moving in that particular site.

LP: I have been involved with the daylighting lab, for a long time and know the process. We made sure that testing was built-into the schedule and happened at the right times where we were still at the point where we could change the building form and adjust as needed. We also looked at the window U-value because it's so important; you need to worry about the interplay between daylight and heat loss when you're heating the air to 85.

ER: This was one of the earlier projects in our firm after we had made the firm-wide commitment to

⁹ Energy Trust of Oregon

use 3D modeling as our production software. We use Revit, which is a 3D modeling software tool that instead of developing 2D drawings, you are developing a 3D model. It has all kinds of benefits, but one of them in this projects was that it was very quick, since we already had the 3D model, to just add different solar arrays and, to some extent, test out different lighting options and see how they were going to work within the space. We didn't do a full lighting model of this electronically, but we did have the ability to test different openings in the clerestories as I mentioned and to test different PV arrays and to resize them because we had already invested in a 3D model. Since it was now part of our production approach, the added time of doing those quick studies wasn't that much.

Tracking Progress on the Project

LP: We had lots of meetings!

ER: One of the things that Parks and Recreation really did well in this project was bring the right people to the room at the design sessions. The head of maintenance was there for key decisions, and also the people who were going to and who currently operate this building as a community center, as well as the people who run aquatics programs for Parks. We had direct access to the right decision makers. In terms of our consultant team, there were lots of iterations, testing, and back and forth. They were often meetings with the big owner team and so the consultant team would bring in relevant consultants for the agenda.

LP: For this particular project, we didn't have a regular schedule of meetings other than our in-house team meeting, but we did have regular meetings that were set up. From the beginning of DD¹⁰ we said, "We are going to need these meetings," and we set them up. There were a couple that popped up that needed to happen that we didn't anticipate, but we kind of ran with it and gathered the meetings as we needed them.

ER: Whenever you are in construction there are unexpected surprises, of course, especially when you're connecting to an existing building and trying to do it on a site that has unpredictable soils.

Lessons Learned

LP: There's no question that this project has affected our process, particularly in any other natatorium projects that we would do. We would definitely be looking to this as a model. There are so many different things that we tried. One of the things that got brought to the table early on through our aquatics consultant was, when they heard that this was a LEED project, they said, "well, there's a new kind of filtration system that's out there that's called the Defender Filtration. The result from it is that it will end up saving about 1.5 million gallons of water a year. It is a different way of treating the pool water to get rid of the excess body oils and things that you normally need to filter from pool water.

ER: In a nut shell, filtration systems either use a natural diatomaceous earth or a synthetic particle that's like diatomaceous earth. Water goes through it and it bonds and extracts as it filters. What that means operationally, with the conventional sand filter which is sort of the default technology, is that you have to run it through the sand filter and then, fairly often, you have to run that water backwards through the sand filter to effectively clean it. Of course, when you are running that backwards, you don't want to dump that into the pool so you have to dump it into a sanitary drain because it's pool water. In our case, with the added complexity of limited pipe capacity in the ground for the combined storm and sanitary sewer, we didn't have the option of directing that flow of water, that volume, in real time. We were looking at having to add a large storage tank that effectively takes the backwash water, stores it, and then releases it more slowly to the public sewer system.

¹⁰ Design Development is a phase in the architectural construction and design process.

By going to the Defender pool filter system¹¹ we did two things: one, we eliminated the need for that backwash water at all because the Defender, with the diatomaceous earth filter, doesn't need to be backwashed in that way and, two, we eliminated the capital cost of that large tank and the follow up that is involved, such as where to locate the tank.

It saved the project a lot of money and led to this 1.5 million gallon water savings. To clean itself all you need to do is turn a valve. It does periodically need to have clean water just run through it, but that doesn't return to the pool. Basically you self-clean with a much lower flow and it doesn't need to be backwashed. It has a cleaning cycle where, instead of directing the water coming out of the filter back to the pool, you direct it to the sanitary sewer, but it's a much, much lower quantity and it doesn't need to be in a big holding tank.

LP: It happens at a lower frequency, too. Parks has a high use of their pools and a high standard for filtration.

Typically, in the summer, they would do the backwash process maybe twice a week. We're predicting, based on our aquatics consultants experience that we will need to use the Defender system once every two weeks. Frequency is one huge benefit and then the fact that we're using about half the water each time. That's where the multiplication happens. We've actually been pretty conservative in our estimates and we're saying, "What if we use the same amount of time and just look at the water savings, how much do we actually save?" We're hopeful that we'll be increasing from our multiple of 5 gallons to even greater water savings.

ER: That's a nice annual number

LP: That's a success that we hope to document down the road. One of the great things about working with the Parks team is that they were willing to try the new technology. This is a technology that's out there, but it's not tried and true in a lot of different facilities. We were working with them to find as similar a facility as we could that had used this. I don't think they actually ended up going to see it, but they talked to some people that are using it and got testimonials.

ER: The City is open-minded and willing to build in a responsible way. They wanted to know that the system had been done somewhere else and in a pool that had similar use patterns. Just like their use of the Defender system, they didn't want to take just anyone's word for it. Here was a great system that they had never heard of before so they wanted to kick the tires. They were responsible in that way. There were times they said no to a system because they didn't get to that level of comfort but, in general, they were open-minded to test new ideas.

We also are employing a liquid pool cover which is another technology that you don't hear about very much. It's an alcohol-based solution that they put into the pool water and what it does is form a film on the top when the water isn't disturbed. So, when people are no longer splashing in the water, the alcohol rises up and it forms a film that stops a lot of the evaporation and, thus, heat loss. It's not as good as a pulled pool cover, but if you think about what these pool shapes are like, with the leisure pool, there's no way you could get a pool cover on. Again, Parks was willing to look into it. We had previous experience with another facility in Corvallis, so we hooked those people up together. We also had to work with the Building Department to make sure that that was an approved pool cover because it needed to meet a requirement of the Energy Code. To show them that this actually has worked in places, that is a relatively new piece of the energy code, was an additional requirement.

¹¹ Defender filter system is produced by Neptune-Benson, Inc. differs from a sand filter by utilizing depth filtration while the Defender functions with surface filtration and saves approximately 90-95% of waste water associated with sand filter backwashing.

Parks and Rec designs their buildings, or asks for their buildings, to be designed for very high demand. The term they use is “bather loads,” which are some of the highest loads they know of. Even though it’s a set of municipal pools, partly because of their strong standards and strong operational standards, they’re popular. If you look at Southwest,¹² or Mt. Scott,¹³ they all get a lot of interest. It’s because they have the big slides and family-friendly things, but they also have lap pools and swim lessons. They are planning for this pool to be very popular, very busy, but I don’t know that they could staff it, literally 24-7.¹⁴ I think that would be a constraint before the actual technology would.

LP: The hours of operation that we’re planning for are from 5:30 or 6 in the morning until 9 to 10 at night, seven days a week.

ER: One of the details that are very, very important in a building like this is how to protect the steel in a building that has a bunch of chlorine in the ambient air. There’s a term called, “high performance coatings,” that is basically paint that has some other kind of mineral added to it to keep the rust off the steel. Clark was a great resource, in-house, on those high performance coatings and how they can be specified correctly and he gets them chased through the whole construction process. That just came out of experience with these kinds of buildings.

LP: At the same time we were looking at the LEED criteria in terms of VOCs¹⁵ that are in a facility. What we were looking at is how we could achieve the high performance coatings without jeopardizing the VOC budget. That led to a more superior coating. We were applying it outside of the facility using a combination process that’s both dipping and spraying. All that will be left are some minor touch-ups.

ER: It was all done in Vancouver, WA and it was a lot more detailed than you would think. It was a very precise process where you have to sand blast the factory oils off and, within a matter of about four hours, you have to put the first level of coating on. There is a lot of process that needs to be managed both on our end and on the general contractor’s to make sure that all happens. If you have a bunch of factory oils and the coating doesn’t apply and you get voids, then you’ve got rust gaps and all the things that you were working so hard to avoid. What that translates into is building durability. The reason to do that is that you want a building that is going to be around for decades and decades, not just years and years.

LP: The ventilation and air quality has continued to be the most important driver of the mechanical system. We were, of course, looking at ASHRAE¹⁶ which publishes standards. The ASHRAE standard for air changes for a natatorium environment is really six to eight air changes per hour. Portland Parks felt that they had to be at the high end of that spectrum. Eight air changes per hour were what we were looking at meeting. They were also going to make sure that, as we were looking at this mechanical system, we were, at the same time, not sacrificing air quality. We had many, many discussions with the maintenance folks to make sure that we weren’t giving up comfort and people’s ability to enjoy a quality environment for our energy efficiency.

ER: We already talked about the specifics with the heat recovery system, but another aspect of that is how Interface laid out how the air was supposed to move through the space. Along one side of the building there are a whole bunch of return air louvers that go quite low down to the deck of the pool. What they do is to help pull the lowest air in the room across the floor and across the surface of the pool because chloramines, the chemicals they are trying to get out of the air, tend to sink and stay low in the space and not rise. You really want to pull that low air and keep it moving, but you

¹² Southwest Community Center & Pool is located in Gabriel Park at 6820 SW 45th Ave in Portland, Oregon.

¹³ Mt. Scott Community Center & Pool is located at 5530 SE 72nd Ave in Portland, Oregon

¹⁴ 24 hours a day, seven days a week.

¹⁵ Volatile Organic Compounds

¹⁶ American Society of Heating, Refrigerating, and Air-Conditioning Engineers

don't want it moving so fast that it becomes a comfort issue. There's a real design fire point there. Basically, the louvers are pulling all the air out of the room and it's being delivered high, dropping down from the ceiling, along both of the walls, and all the way around. The intent is to get the fresh air dropping down and to get the worst air moving off and do it at a low enough velocity and a high enough volume that you're balanced and not creating a wind storm, yet still moving eight air changes per hour out. That was energy modeling telling us what was happening and also basic mechanical design looking at ventilation rates and making sure there's not too much air speed.

Parks has a standard DDC, Direct Digital Control system. They actually have their own separate consultant that has been doing the Building Information System work. Part of our job has been to integrate their work with our general contractor's work. They have a standard across all their systems so that, in theory, most of their systems can be run off site from the main supervisor's office.

Hiring New Staff

LP: We're always looking for people with the right attitude and aptitude. You can always teach people skills, but what we're looking for is people who are curious, who want to explore, who have energy and who initiate; that's always important. We don't get many people who have Revit skills; that is our primary software. There just aren't qualified people out there, so that automatically takes places them in production right away. So we look for people with other qualities. It is really important to us to find the fit between the person and the firm. Typically, we'll do at least two interviews with each candidate and usually there are at least four or five of us who are participating in the round robin. I would say, also, it goes the other way. We want to make sure that the candidates feel comfortable at SERA. We try to make sure they understand the culture and the team process, and give people an idea of who we are.

ER: If we found someone who had a great set of aptitudes, was interested in the quality of work that we do, and had a very beginner's interest and curiosity about sustainability, I think we'd not care about LEED or NCARB. We like it when someone walks in and says they've heard about sustainability and they really don't know what that means, but it's one of the attractive things that about coming to SERA, to educate themselves.

LP: Most people that come to us either already have developed an interest or know that it is an interest of theirs because SERA is definitely associated with sustainability. I don't think we see a lot of people seeking us out that don't already have that curiosity. We're looking at people with that in mind even outside of the architectural discipline; we're looking at admin hires and people come to us that already have those interests and skills. It's amazing what can happen; Robin, our purchasing agent, found pens where the cartridge comes out and you can recycle it and then keep the casings. We dig through our trash to figure out what we are throwing away.

ER: We don't have trash cans at our desk, but we do have recycling. You have to work harder to throw something away then to recycle it. SERA is getting as many if not more commitments to our in-house practices and how we do our business as we have to how we run projects. It is partly because, when you make good projects, you can only go as far as your clients are willing to go, but when you are your own client or you are making your own decisions, you can go as far as your budget allows you.

LP: We really invest in the process of finding good people.

ER: And if we've done that, then we can invest in their software skills. Every business is going through new software, buying bases anyway, so there's always going to be training in this day and age. You kind of expect that you're going to need to train them, at some point, with specific tools.

Closing Thoughts

LP: We've been working a lot on the Living Building Challenge. I feel like we're at a point where we don't even know what we don't know yet. For example, in terms of the materials category, what are the toxic materials? Where do they show up? We need to incorporate research and many use university students to help us understand a lot more about what goes into our building materials and what the right choices are. We know already that vinyl flooring is probably going to be the next asbestos. What else is out there that we regularly put in buildings that we don't even think about in even our best green buildings?

ER: I think academia is well placed to do that because they aren't in the role of specifying those materials and needing to work with the realities of putting buildings together. You can take that slightly more distant view than practitioners can. Another place that that distance helps is in post occupancy studies. It's appropriate, but tough, for us to arrange our projects in a way that we can go in and do a POE,¹⁷ though it's not in client's budgets. There's a definite value in knowing what's actually working a year or two years down the road and doing it in an un-biased way so that you don't have to worry about if it was a SERA project or someone else's project. You can just say, "This is what's working," or, "this isn't working," and bring out all the realities.

For example, this was a public-sector project or it was a budget-constraint project or whatever it may be. That shapes the way that the sensitivities are met and focuses on the choices that had to be made in the real world of putting a project together. It would be helping the whole industry if, in a more objective way, you can understand what's working and what's maybe not the right place to spend as much energy.

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This narrative is based on an interview with architects Lisa Petterson and Eric Ridenour at the SERA office in Portland, Oregon on October 2, 2008. University of Oregon graduate student, Britni Jessup, transcribed a digital audio recording of the interview. The interview was conducted by University of Oregon Professor Alison G. Kwok.

The opinions expressed in this narrative are solely that of the interviewee and are not attributable to the case study editors. The interviewee and editors of this narrative make no representation or warranty, and assume no liability with respect to quality, safety, performance, or other aspect of any design, system, or appliance described in this document.

¹⁷ Post-Occupancy Evaluation

ALISON G. KWOK
BRITNI L. JESSUP
NICHOLAS B. RAJKOVICH

East Portland Community Center Narrative: Engineer Mark Heizer

Getting the Project

We were a part of the design phase and were selected as a part of the design team with SERA,¹ the architects for the project. We had been doing a lot of work with the City of Portland Parks and Recreation,² including a few pools, but this was the first time we partnered with SERA on a project of this size.

We had worked well with SERA on a few smaller projects, and we were familiar with Parks work. SERA was very good at doing recreation projects and has a good reputation for sustainable design. We also showed an interest in sustainability with that building type so it was a natural partnership.

Selecting the Project Team

On this project, we took a design group from Interface who had previously worked on a Parks projects or had already worked on an indoor swimming pool. We tried to get a group that was familiar with the quirks, and pitfalls of a pool project. Of the four design teams in the office, I was on the team that was selected. I had done a bit of work for the Parks so I wound up being the “pool person” in the office.

The swimming pool building type has a lot of challenges since the pool itself is a big energy hog. The HVAC³ becomes a critical part of the design, along with some of the plumbing and lighting. This includes meeting safety regulations without overlighting the space.



Mark Heizer, PE, LEED AP is an associate with Interface Engineering. He has experience with multiple LEED projects including the recently completed East Portland Community Center with SERA Architects.

¹ SERA Architects are located in Portland, Oregon.

² Referred to as “Parks” in the rest of the narrative.

³ Heating, Ventilation and Air-conditioning.

Setting Goals for the Project

Our goals were to try and lower the energy use as much as possible. The biggest challenge was working with an owner that was very comfortable with "tried and true" methods that were commonplace when energy costs were much lower. New methods and materials had to pass multiple reviews by the owner's staff. That approach would waste a lot of energy.

My personal goal on all pools is that when you walk into a building, you shouldn't know that there is a pool. You shouldn't smell chlorine when you enter the building. That's a challenge to do without wasting a lot of energy. You can overdo ventilation in a place, but to have optimal indoor air quality conditions and still save energy, that's a challenge.

There's so much energy that's wasted all the time in pools. We knew that we were going to reduce our loads as much as possible and we knew that there were areas that could be cut. We knew that there was a huge opportunity there. We didn't know where it was going to wind up on the scale of 20, 30, 40, or 50 percent better than code.

There's also a need to control humidity from the pool water evaporation, which is taking energy from the pool. All of that energy must then be put back into the pool to keep it warm. At the same time you don't want that humidity in the building any more. It's a never-ending cycle to find ways to take heat from point A to point B and do it in a creative, energy-efficient way.

Tracking Progress on the Project

We did a preliminary estimate of the actual amount of energy savings, but some of the things that we were doing were new and very difficult to model. We had to find a method that everyone would accept and believe.

We were looking at ways to improve the envelope, the lighting, and the daylighting. We weren't only looking at the HVAC system, but also the rest of

the building. We were going back and forth with some of the energy measures and not only saying, "What is the payback?" but also working with the client to show them that it's not just one strategy that can save you money.

It's going beyond payback and not just looking at the dollar savings, or the costs of an individual measure. It's difficult to explain to clients that saving \$5,000 a year might initially cost \$20,000. Some people say, "Well, it costs \$20,000, what do I get for it?"

This project was different because there were many different decision-makers. The maintenance crews didn't want anything new, so we tried to make things familiar for them. Even after presenting them with many iterations, showing how simple it is to use, describing that it costs less and is easier to maintain, and showing them existing installation locations, they were still resistant to change.

Sometimes it is a matter of getting them together with an owner that is using it and showing them that we're not making this up. It was also a challenge because the people at the top wanted to make this a green, energy-saving building, but didn't want to spend money on the energy savings.

Selecting Technologies for the Project

On past projects, we came across a new way of doing pool projects in our Pacific Northwest climate.

Typically, pools in this region control humidity through compressor-based refrigeration systems and the re-circulation of air to reduce energy use. Another method is to use a varying amount of outdoor air to control the humidity. You then recover that energy with a heat wheel or flat plate heat exchanger. The owner didn't want to have anything to do with compressor based technology. They just said, "No, it doesn't work, we tried one of those 15 years ago and it failed and we'll never

use one again.” They didn’t understand that the technology has improved in the last 15 years.

So what this technology did was to take a standard heat exchanger that varied the amount of outdoor air to control humidity, and coupled it with an exhaust air stream and a refrigeration coil. We have to try to get that moisture out of the building because it is damaging. The exhaust air still has a lot of the latent water that has evaporated out of the pool in it.

That exhaust air has loads of embodied energy in it. This compressor we specified essentially refrigerates that air to wring out the moisture and puts the additional energy back from the other side of the compressor into the pool water itself; it’s above and beyond basic code requirements to recover the moisture and warm the pool simultaneously. It’s really just a heat pump.

It takes very little compressor energy to heat the pool water; it’s a very simple and easy heat pump, and there’s an amazing amount of energy that you can get back out of both sides of the system. At first glance, it’s like you’re creating energy because you’re using both sides of the compression cycle.

We talked with a few manufacturers about the product. One of them said that they wouldn’t sell us anything other than this particular system. We looked into it and compared it to every other way of doing this building, and it was head and shoulders beyond anything else we could have done. We were fortunate to have the right climate, because we couldn’t have gotten to the level of energy savings if this building was in Atlanta, Minnesota, or Poughkeepsie.

We were fortunate that we came across something that was a little new. But we also looked at all the other systems, such as the windows and the pool filtration system. We had to be sure that all the systems could work together.

The whole process was collaborative and it kept building on itself. We kept coming up with something else that we could save on, and, finally,

we came up with where we’d really like to be with the project.

We would have liked to go with triple or quad-glazed windows since it’s a building who’s interior temperature is kept 10 -15 degrees warmer than the average building, 24-hours a day, 365-days a year. When people in the building are wet, the evaporative cooling has a cooling effect on their skin. We knew that having a better radiant feel within the building would be truly important and the glazing would have helped, but in the end the glazing didn’t make it in the project.

We used eQUEST⁴ as our DOE-2⁵ modeling software for this project.

The control schemes for the primary HVAC system for the pool are proprietary and are the manufacturer’s control scheme. Getting that information from the manufacturer took a lot of negotiation and a lot of time. Every manufacturer can claim that their unit will perform a certain way, but we have to find a way to model it accurately.

We went through the same thing with some of the new refrigerant systems. The manufacturer gave us a housing development, as an example, and told us what they expected the efficiency of the units to be. That doesn’t work for every building. It depends on the building type.

We had to ask for more information, in order to fit it with our building. We can’t just say that it has an energy efficiency ratio of 17, or a heat pump COP⁶ of 4 and leave it at that! We have to see how it’s really working. Since it’s not something that

⁴ eQuest is an building energy use analysis tool used to compare building design and technologies and uses a DOE-2 engine to run the building energy use simulation program.

⁵ DOE-2 is a widely used freeware building energy analysis program sponsored by the U.S. Department of Energy (USCOE) that can predict the energy use and cost for many types of buildings.

⁶ COP stands for the coefficient of performance and describes the ratio of useful heat movement to total work done by the system.

has been modeled before, it took some digging on our part too.

Our models on some of these previous projects reflected pretty closely what happened in the field. Some of our assumptions were clever work-arounds because of the limitations of the software. Swimming pools aren't something that is easily modeled.

Shawn Henry, our energy modeler for this project he did a great job figuring out ways to work through it. We kept trying to be conservative on our energy modeling decisions. We pulled back a little bit from what we thought could happen and made it so that we were not over-shooting what could be expected.

This project followed our standard project flow. There were a few more steps we took during SD⁷ and DD⁸ phases that we normally do on any LEED project, including going through basics of design, looking at the owner's requirements, and trying to reconcile the requests of the owner. The Parks Department management wanted an extremely efficient building. The maintenance department, who had very strong influence, didn't want anything new. Working through that was a challenge.

The capital expense group of the Parks Department was another team with input on this project. We had to make sure that we were on target and on budget. If we did something innovative with the electrical or mechanical systems, would we actually save on the building construction cost? We tried to get the whole budget to work together. It's a matter of looking beyond the price tag for only one piece of equipment.

This project started looking as if it was going to be a much higher-level LEED project, and as people

were seeing that we might get to a higher goal, and it could bring in additional incentive funds, the DD phase became more intense than normal. We asked ourselves, "If we could get to the next level, what would the compromises be?"

There was a lot of give and take. A few of the things that we were given the go-ahead on were later retracted. There were times when we heard, "We did agree on that during a previous meeting, but now we don't want to go in that direction." So, we pulled back and discussed things. It takes following through and showing what the impacts are for their employees in order to get a sign-off from all of the decision-makers.

It is a big challenge even to have the right people there. On projects where the people that make the decisions are at the meetings, the decisions are final. It works a lot smoother. You have to look at how your client is set up.

EPCC⁹ was one where we had a lot more decision-makers to answer to than the typical project. When you've got a focal point on the owner's side it really helps to have definitive answers and responses, "Give me what I need to take back to my people so we can make an informed decision." It is a challenge and it requires a lot more documentation, especially when you are tracking a LEED certification.

Expectations are different in a building that will potentially save 50 percent on energy. We have to do things a little differently than we do today. As a society, we have come to expect a specific temperature at any time. We expect the lights to be exactly how we want them, not how the person sitting next to us wants them. We expect certain things of how the air moves and how plumbing systems should operate.

A lot of what we're moving towards in sustainable design is what our grandparents and great-grandparents did as a matter of course. In some ways it's as if we're taking the step back in time.

⁷ "SD" is an acronym for Schematic Development, a phase of the architectural design process.

⁸ "DD" is an acronym for Schematic Development, a phase of the architectural design process.

⁹ East Portland Community Center

Project Tax Credits and Incentives

The owners are applying for State incentives for the overall energy savings on the building. They have an energy program based on the LEED¹⁰ scorecard that they are going through with the Energy Trust of Oregon.¹¹ Those incentives helped the owner to look at some of the things they normally wouldn't have looked at.

The owner looked at incentives for the 70-85 kW¹² solar PV¹³ panels on the south-facing roof slope. It's a huge array on a big recreational pool on a perfectly sloped, south-facing roof. This was done through creative secondary financing, as a lease-to-purchase model. It's really outside of the budget for the building project, but we took into account the energy as part of the overall energy savings for the building.

Lessons Learned

We would definitely use the HVAC technology again, because payback is just so quick on the heat recovery system. For buildings that run continuously, we need to take advantage of that. The return is not as quick if you just use the latest pool cover to cut down on the evaporation during the night. You have to put the heat back into the water somehow.

The new pool filtration technology was unbelievable. It was presented to the owners and they were debating implementing it. Using the old sand filter technology they had to backwash their filters twice a week, dumping 7,000 gallons of water down the drain each time. The new pool filtration system probably would need backwashing only once every two weeks and

loses only 500 gallons per backwash cycle. That adds up very quickly and the new, fresh, cold water doesn't have to be heated up to 82 or 84 degrees every time the water comes in.

We received other benefits from looking at this new system. The site was overloaded in terms of the amount of water discharge that the sewers can take at any given time. They can't take high flows, so this filtration system allowed us to reduce the amount of water used on-site and eliminated the need for storage.

There were a lot of meetings to determine which filtration system they wanted to use. It was a collaborative effort in researching who has done it and talk with people around the country to see if they are happy with it. We had to find out if this was going to be something that our technicians could actually work on and if there was local service available. Getting over those hurdles with the client took a bit of work and time upfront. There was a lot of time during the DD and SD phase of going through these options and looking into them. Some went through, some might have gone through, and some didn't go through.

On sustainable projects things are a little different. Our role in the various parts of a project, for example: owner expectations, owner requirements, how to develop a better picture for that owner, what the end product will be, and knowing that they understand what that end product will be, is shifting. Our job is to really make sure that from the very beginning clients understand what the give and take will be to deliver a more sustainable building.

We know that the more everyone gets involved the more opportunities that you may be able to find out there. Giving the client more information opens up possibilities and opportunities.

¹⁰ Leadership in Energy and Environmental Design is a designation given by the United States Green Building Council.

¹¹ The Energy Trust of Oregon is charged by the Oregon Public Utility Commission (OPUC) with investing in cost-effective energy conservation, helping to pay the above-market costs of renewable energy resources, and encouraging energy market transformation in Oregon.

¹² "kW" is the basic unit of electric power equal to 1000 Watts.

¹³ Photovoltaics (or PVs) are a technology that converts solar energy into electricity.

Hiring New Staff

We've been looking for people who appear to have a passion to do new design, people that show a passion for wanting to save energy, a passion for sustainability, people who want something more than earning a paycheck. We are looking for people who want to feel good about the product and results. That can make a difference in how much energy a building uses and what the impact is for future generations. We're seeing that fire in the people who want to work for us. And the people we've hired still have it today.

Closing Thoughts

Something that will need to shift is client expectations about space temperature. In Portland I am an advocate of our design temperature being 92 to 95 for summer. We can keep a well-designed, naturally ventilated building just barely within the acceptable temperature range, if you're dressed appropriately and can use a fan.

Why not create the equivalent of a snow day when it hits 105? It reaches those temperatures now and then; on those days we should go home early or work from home that day. You're already going to be running your air conditioner at home, so we shouldn't be running it here at work, too. Why come here and be miserable when you can stay at home and be miserable?

It's all about getting clients to understand that a sustainable building is going to have different temperature swings. In winter and in summer occupants will need to wear layers and understand that if it is going to get extremely hot they shouldn't run the building. Tell their employees not to come in or understand that it's shorts and t-shirts day for everybody.

The one portion of the building energy pie that's not getting any smaller is glazing. I see that as a challenge for everyone. There aren't systems out there that are affordable and meet client and

architect expectations for appearance that aren't horrible insulators. Technology is not keeping up.

Highly insulated glazing is only being seen in the most northern climates like Minnesota, North Dakota, or upstate Maine. Those are some of the few spots where you're seeing people purchase this technology. Those aren't exactly the population centers that can start to influence design.

The early mantra of the USGBC¹⁴ was about changing the way people do business, making it part of a market transformation. They have done a lot toward that, but to get down to a 50percent reduction in energy for your average building and to head toward net zero, the glazing business is the one that has miles to go. Until they come up with that, whether it's the air gel glazing that doesn't distort vision, or something else, you're looking at heading beyond double pane glazing.

Somehow that last little bit of market transformation needs to start happening so that contractors are familiar with it. Then manufacturers can start bringing down their costs so that the window systems are acceptable and don't short circuit the efficiencies of the building.

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This narrative is based on an interview with engineer Mark Heizer on February 18, 2009 at the office of Interface Engineering in Portland, Oregon. University of Oregon graduate student, Britni Jessup, transcribed a digital audio recording of the interview. The interview was conducted by Nicholas Rajkovich of Pacific Gas and Electric Company (PG&E).

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¹⁴ USGBC = United States Green Building Council

Exhibit 1: East Portland Community Center



Fig. 1. The exterior of the East Portland Community Center addition with the original center visible in the distance



Fig. 2. The exterior of the East Portland Community Center aquatics addition

This exhibit, part of a larger case study describing the East Portland Community Center, was supported by a 2007 AIA Upjohn Research Initiative Grant. University of Oregon Professor Alison G. Kwok and Britni Jessup with Nicholas B. Rajkovich, Pacific Gas and Electric Company (PG&E), prepared the associated narrative. © 2009 University of Oregon. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means without the permission of the authors.



Fig. 3. Outdoor courtyard



Fig. 4. Exterior of pool addition



Fig. 5. Exterior of pool addition



Fig. 6. Original East Portland Community Center



Fig. 7. Daylit interior view of pool



Fig. 8. Daylit interior view of pool



Fig. 9. Daylit interior view of pool and clerestory

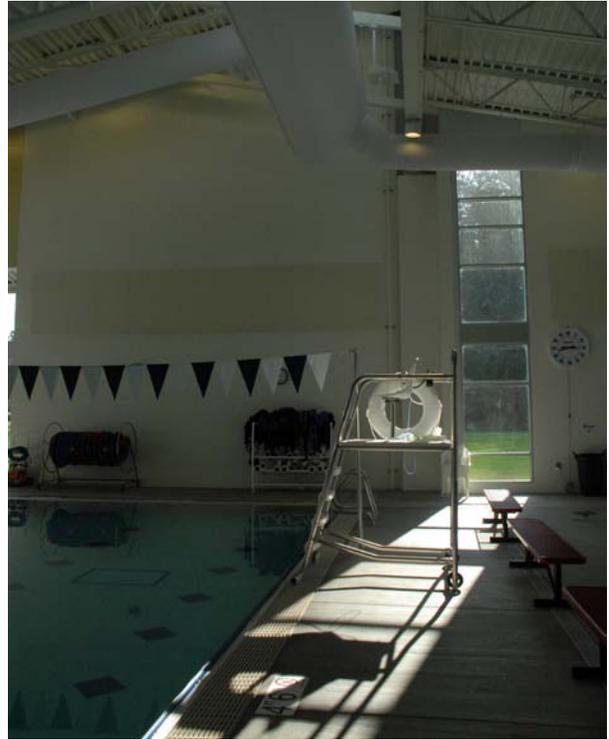


Fig.10. Daylit interior view of pool and sidelighting



Fig. 11. Daylit interior of pool and clerestory



Fig. 12. Daylit hallway



Fig. 13. Daylit interior