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Anne Elliott (Elly) Merica, RA, Integrated Framing and 2SCALE Architects, PC and speaker at the Sustainable Façade Design and Engineering summit, May 24-26 in NYC on The Cascade Effect: Systems Thinking in Building Design.

Sarah Bensimon (SB): Welcome, Anne and thank you for speaking with us today. Can you tell us what initially prompted your interest in sustainable design?

Anne Elliott Merica (AEM): I'm the child of a flower child. My mother was a plant geneticist and I was raised reading Silent Spring and Beautiful Swimmers. I had to hide my green streak in architecture school. It was the height of the PostModern period.

SB: Can you briefly explain the methodologies and drivers for implementing data transmission and distribution in sustainable façade design and engineering?

AEM: Well, let's address the drivers first. Integrated Framing is a method of collecting and distributing power and data wiring through the curtainwall or window framing in primarily commercial buildings. The concept started as a means of solving a common design problem- getting power to full height glazed walls such as those in a lobby.

The system is obviously well-suited to collecting power from thin film photovoltaic glazing, which is rapidly becoming more effective at converting even ambient light to usable power. And, since PV power is produced as direct current with relatively low voltage, it is ideally suited to powering solid state or LED lighting and signage.

It eventually became clear that providing power through the window framing essentially made a "Smart Grid" on the outside of the building. This allows the collection of real time weather data, for example, that can be used to fine tune the air conditioning for the building. Cooling based on actual need is much more efficient than cooling at maximum volume just because it is a certain time of year.

Once the possibilities became more clear, the methodology became to maximize the results of every system that could be provided on the building perimeter. By adding up the savings from each individual aspect,: the daylighting, reductions in heat gain, savings in wiring conduit and rough-in, material and schedule savings from pre-engineering and pre-manufacturing, savings in HVAC systems from sensors and controls, etc
the savings became significant, allowing us to consider PV glazing now, not ten years from now.

SB: How do natural energy and chain reactions fit into your framework?

AEM: Well, I like the term cascade more than chain reaction, because it illustrates how seemingly simple decisions can fan out into wildly different consequences.

We typically think of buildings as fixed objects. They really aren't. One of the best practices we can copy from nature is to treat buildings as organisms that need serve varying loads from both inside and outside. Weather conditions include wind loads, rain and snow which can cause infiltration, heat from direct sun or freezing cold ambient temperatures, and the stresses of wide variations in all of these conditions. Designing the building to respond to these conditions appropriately allows it to function much better as an environment for working or living or learning, etc.

We put a lot of internal pressures on a building too- wide ranges and changes in occupancy, seemingly constantly evolving technology, and ever increasing needs for power and connectivity while still allowing privacy and space to concentrate on special tasks. The best buildings allow for flexibility in all of these areas, or even better, provide immediate responsiveness to our demands.

Nature is supremely adept at providing this flexibility, and that, even more than just form, is what we should be copying. The main way that nature addresses these issues is for every component to serve several functions. A good analogy is a leaf- The top of the leaf surface maximizes the area for collecting the solar energy while the underside exchanges carbon dioxide for oxygen. Nature is way ahead of us on that- there is a species of weaver ant that builds its shelter using living leaves to maintain fresh air. We're trying to catch up. There are new coatings in development to do just that, which is very exciting.

The hollow tubular veins provide the structure to support the leaf surface and also carry the fluids that sustain the leaf and the rest of the plant. The various parts of the leaf aren't laid out by structural, electrical, mechanical or plumbing engineers, the system is ingeniously created and functions as a whole.

It should also be noted that the system is robust- it will function under far less than ideal conditions and can heal even if a substantial portion is damaged. It does this by distributing as many functions as possible.

This multi-functionality is the first aspect that IF tries to replicate, plus the distributed delivery of services. The goal of the system is to maximize and harmonize the functions performed by every piece, so the glazing acts as the weather enclosure, and also provides daylighting. The thin film provides a measure of glare control while also converting a range of the spectrum to useable power.

AEM, continued: By the beautiful laws of thermodynamics, any energy converted to electricity is by definition not contributing to the heat load on the building. Currently this efficiency is 20% at best, but rapid improvements are being made. The thin film also happens to converts heat and UV radiation into direct current low voltage power, which is ideal for use in solid state or LED lighting and signage. It is also the form most computers take, so we may eventually be able to avoid converting to line voltage and back and just power our equipment directly at the windows.

The aluminum framing is also protecting the wiring, so redundant conduit is not required. In fact, the system saves significant wiring costs by reducing or eliminating core electrical rooms and the need to rough-in and then finish work by electricians.

Preliminary budget numbers show the system saves over 8% of initial construction costs compared to traditional ribbon window and solid spandrel construction. This goes a long way toward making PV glazing an affordable alternative. The system is pre-engineered for ease of specification and construction, but it is designed with flexibility and accessibility for the types of data that may be required for future needs.

Plus, since the roof is free of traditional solar panels, a planted roof can be used to filter and harvest rainwater, making Net Zero Energy Buildings possible now, not ten years from now.

SB:What do you see for the future of sustainability?

AEM: think buildings are going to continue to become more responsive-both to external conditions and to our needs as occupants. One favorite example was suppose when we wanted to have a party we could grow a room by pressing a button? Eventually, we will be able to grow a building structure using calcium carbonate just like a shell, and our enclosures will be like jellyfish material-infinitely variable for transparency and light. But near term, sensors such as those in the grid formed by Integrated Framing, will allow us to automatically dim the lights and open the shades to make us take notice of a sunset view. One of the stated goals of ecological design is to make our use of energy and other resources readily visible so that we are conscious of how we are impacting our environment. My hope is that sustainable design will also be beautiful design that makes us appreciate our environment and want to protect it for our kids.