

trim tab™

THE MAGAZINE FOR TRANSFORMATIVE PEOPLE + DESIGN



TRANSFORMATIONAL THOUGHT

A LIVING COMMUNITY ON EARTH

TRANSFORMATIONAL DESIGN

HOOD RIVER MIDDLE SCHOOL: NET-ZERO ENERGY THREE YEARS & RUNNING

TRANSFORMATIONAL ACTION

FOR OUR COMMUNITY— BY OUR COMMUNITY

TRANSFORMATIONAL PEOPLE

KAT TAYLOR

JULY 2014

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A LETTER FROM THE EDITOR

For the first time ever, the majority of the world's population lives in cities. Studies suggest that this proportion will continue to grow—by 2050, 7 out of 10 people will live in a city. There is no doubt that urbanization is on the rise. Climate change is moving too fast for the “one building at a time” mentality. Cities and urban settings should be at the core of the sustainability movement in order to create a future society that is resilient.

Within every city, there is a myriad of communities. Community can be defined in many ways—a neighborhood, school, church, or any group sharing something in common. Each community has different aspects that make it unique. And those specific aspects (demographics, history, culture, infrastructure, etc.) are what determine if a community is healthy, vibrant and thriving. What does it take to make a flourishing community?

We devoted this *Trim Tab* to an exploration of this question. In this issue, we tell stories of people who are dedicated to creating communities that are resilient and sustainable, and it became evident that there is no person too small or no dream too big to make this happen. Creating these communities is a critical endeavor in order to restore balance with nature for future generations to thrive. Like hundreds of birds moving together as one, people can come together collectively as one to transform a community.



JOANNA GANGI

International Living Future Institute
Editorial Director of *Trim Tab* magazine



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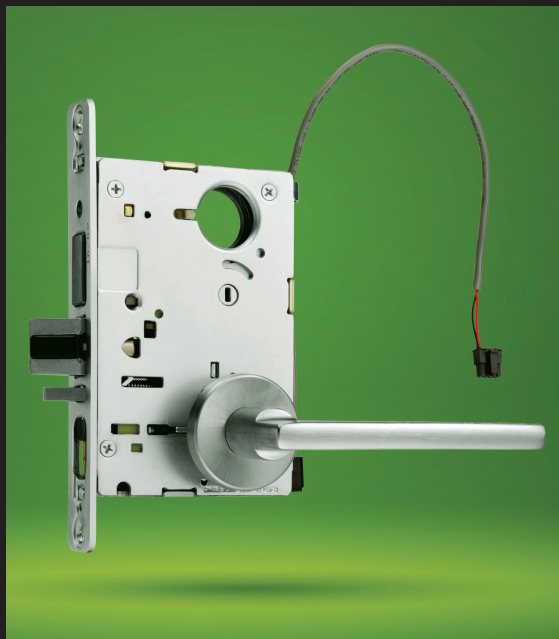
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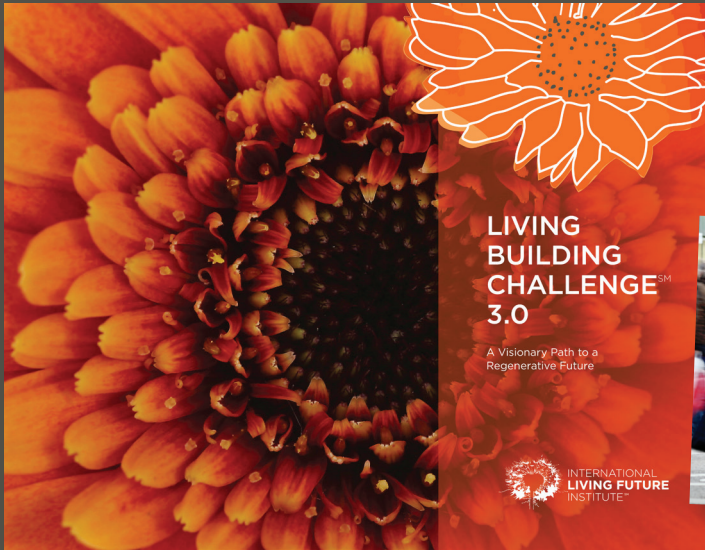
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BY OPSIS ARCHITECTURE & INTERFACE ENGINEERING

NET-ZERO ENERGY: THREE YEARS AND RUNNING



The Music and Science Building is the latest addition to the Hood River Middle School (HRMS) campus in Hood River, Oregon. The facility has received much recognition, including a Top Ten Green Projects award from the AIA's Committee on the Environment, and it was recently recognized as the first Net-Zero Energy Certified public school. The building is home to a new music room, practice rooms and teacher offices. It also houses the school's remarkable Food and Conservation Science Program, with a science lab and greenhouse adjacent to the garden.





The interface between the building and its environmental and cultural landscape is particularly important at HRMS. A curriculum established around the ideas of permaculture was already in place—a creative process based on understanding the connections in all ecosystems and how as humans we can work with, rather than against nature. Science teacher Michael Becker, championed the Food and Conservation Science Program because of his belief that education is sustainability. He described the goals of the program as “not having school be a place where young people are held until they’re ready to go on to do something else. It’s a place where they start doing things with the information they’re working with. And they’re amazingly good at it.”

The path to a Net Zero Energy building begins with significantly lowering the building’s energy demands. The HRMS Music and Science Building uses a variety of passive and active energy conservation strategies. Many of the passive design features have been used for centuries: daylight as the primary light source, thermal mass, shading to control heat and light, natural ventilation and operable windows with individual control. Reducing the energy demand low enough to

achieve net zero depends on student participation and actions. A green light / red light indicates whether outside temperatures are favorable for natural ventilation, engaging the students in the operation of the windows and rooftop ventilators in order to induce cross-ventilation. The children grow deciduous vines on trellises to shade the south-facing windows during the summer but allow solar heat gain during the winter months. To raise the students’ awareness of daily and seasonal natural cycles, a sundial was placed above the south entry, helping to provide a connection between the building and its place.

The HRMS Music and Science Building and landscape are designed to support interactive learning through an immersion of project-based and place-based curriculum. Becker instills the ethical base of permaculture in his students: it’s about care of the earth, care of people, and care of redistribution. There is a progression of learning to move beyond the idea of sustainability so that we can get to regeneration—actually making places better over time. As Becker described it, “We can understand the parts. Then we can facilitate the relationships. And then, even better, if we’re going to start building these more productive systems, we have

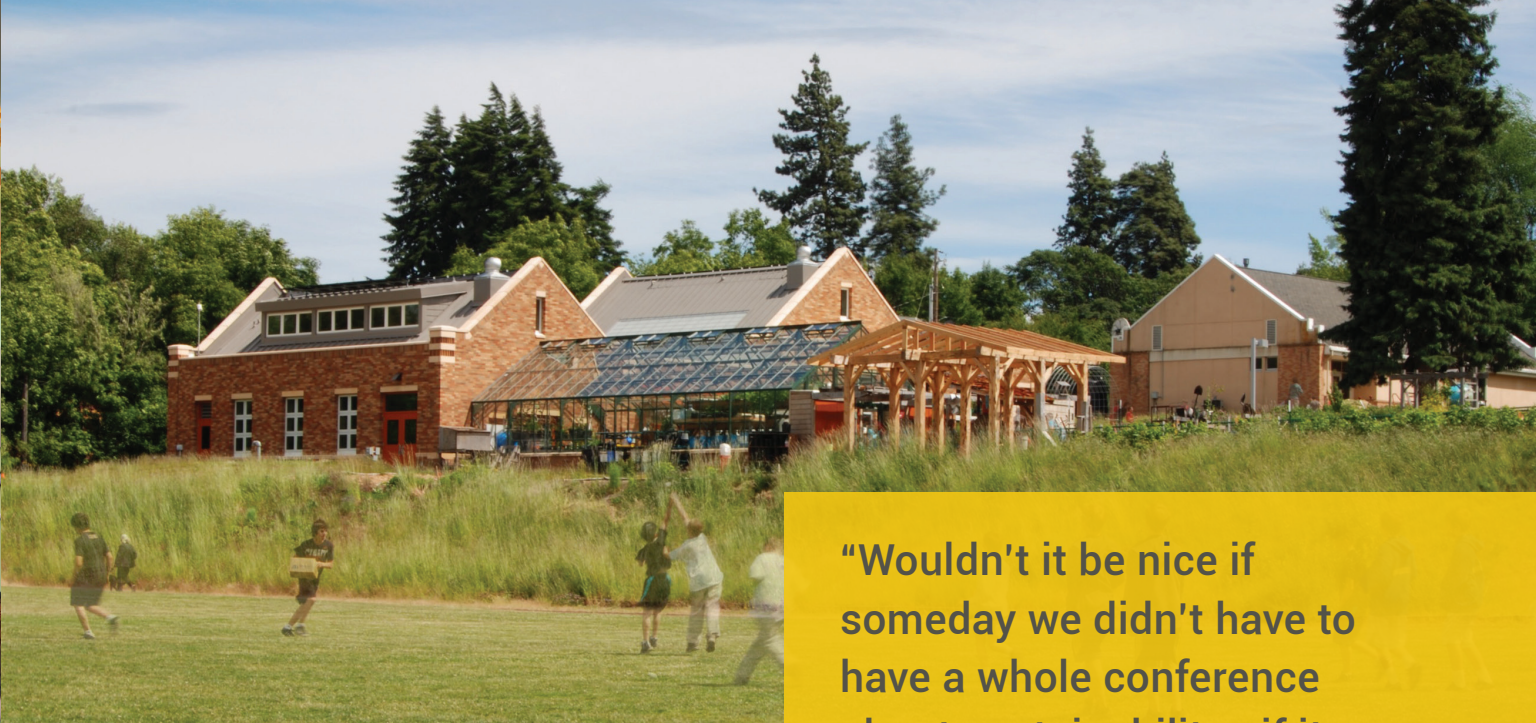
A curriculum established around the ideas of permaculture was already in place—a creative process based on understanding the connections in all ecosystems and how as humans we can work with, rather than against nature. Science teacher Michael Becker, championed the Food and Conservation Science Program because of his belief that education is sustainability.



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- The active systems used to heat and cool the building include a horizontal loop geo-exchange system buried 10 feet (3m) under the school's soccer field, which supplies the heating and cooling for the radiant concrete floors.
- Additional summertime cooling is provided by a nearby stream that is used to irrigate the soccer field. Before the water is used for irrigation, the cooler temperature of the water is extracted and fed into the radiant system.
- When it is too cold to bring in fresh air through the operable windows, the building is mechanically ventilated. In order to temper the incoming cool air, heat recovery ventilators transfer heat from the exhaust, and CO₂ sensors ensure that fresh air is only brought in when needed.



“Wouldn't it be nice if someday we didn't have to have a whole conference about sustainability—if it was just the way things were done?”

to accelerate succession.” He works with students when they enter the program in sixth grade, and follows them until their graduation and beyond. The permaculture principles learned by students became the design lens for the project—inspiring the creation of a Net Zero Energy and LEED Platinum certified building. “Zero” became a fundamental concept that grew out of the principle of balance. Recognizing that zero is a special number, far more comprehensible to children than a metric like “80% reduction,” led to the commitment to be truly net-zero.

Ten years ago, students started building a garden, a rain-water system and a small solar array to pump irrigation water. From this starting point, the team expanded the palette of natural elements used as teaching tools. Following, are several examples of Food and Conservation Science Program projects that students have completed:

A mixed native and edible plant area is located along the southwest border of the project site and reflects the school's permaculture curriculum. It utilizes plants that attract beneficial insects, provide mulch, balance nitrogen in the soil and provide an edible yield, all while providing a beautiful, place-appropriate environment for the building and students.

Students' growing and harvesting efforts also serve the larger community; every Thursday, students sell their produce in the Gorge Grown Farmer's Market that is hosted at the school site. A new amphitheater overlooking the greenhouse is accessible to the public and serves as an outdoor classroom. This setting also provides students with an opportunity to lead guided community tours of the building and to showcase their latest permaculture projects.

The students have constructed a wood-fired cob oven, which is guarded by a sculpture of a panther—the school mascot. The oven is sheltered by a student-designed and student-built shed roof that is decorated with painted flower vines. Opsi Architecture designed a commercial kitchen (located in the main building) where the students prepare their produce and cob oven recipes.

Students grow plants using water from a self-contained “biological filter.” Rainwater is used to fill several tanks, which also house fish. The fish fertilize the water, which is then filtered by cycling through a hydroponic growing medium where a variety of edible plants are grown.



PROJECT TEAM

Owner: Hood River County School District

Owner's Rep: Brent Emmons, *Principal, Hood River Middle School*, Dan Goldman, *Superintendent of Schools*

Architectural: Opsis Architecture, LLP

Mechanical: Interface Engineering

Electrical: Interface Engineering

Plumbing: Interface Engineering

Lighting Design: Interface Engineering

Geotechnical: PSI

Civil: KPFF Consulting Engineers

Landscape: Green Works PC

Structural: KPFF Consulting Engineers

Interior Design: Opsis Architecture, LLP

Contractor: Kirby Nagelhout Construction Company

Commissioning: McKinstry

SPECIALTY CONSULTANTS

Acoustical and Technology Engineers:
Listen Acoustics

Graphics Consultant: Anderson Krygier, Inc

Recently, students built a “climate battery” to regulate the temperature in their greenhouse. The challenge with a greenhouse is that it can get too hot during the day and too cool at night. The students’ climate battery stores excess heat during the day in a high-mass material (the students used gravel in their design) and releases it at night to even out temperature swings.

The Music and Science Building achieved Net Zero Energy Building Certification during the period analyzed, although it accomplished this in a manner that differed from the original energy model results. In general, the original energy model under-predicted the amount of heating energy needed in the building but over-predicted the energy needed for plug loads and cooling. Several factors contributed to a higher heating energy, including colder ground loop temperatures, lower heat pump efficiencies and longer operational hours of the radiant slab pumps. Conversely, on the cooling side, the free cooling provided by the irrigation water essentially eliminated the need to operate the geo-exchange system during the summer, which was not anticipated by the model. And the actual building used substantially less energy for plug loads and computer equipment than had been predicted by the original energy model.

For the renewable energy systems, the photovoltaic array generated 16% more energy than predicted, which indicates that the solar income in Hood River is higher than the Portland, OR, weather file used in the original calculations. The



original energy model was calibrated based on the post-occupancy measurement and verification process and was brought to within 4% of the actual energy performance. Going forward, this calibrated model could be used to help troubleshoot any energy discrepancies monitored or predict potential energy savings from other measures.

Over the past three years, Opsis and Interface have continued to check in with HRMS about the evolution of the building and the performance of the sustainable systems in place. Interviews with the staff indicated that at times classroom temperatures became too warm. If the heating set point for the radiant slab was lowered, the efficiency of the ground source heating pumps would improve while they operate in heating mode. Another potential improvement could be shutting off the radiant slab pumps during a block of hours when the building is unoccupied, such as the weekends. If the thermal lag could be determined in the system, then the radiant slab pumps could be shut off at the end of occupancy on a Friday afternoon and enabled again on Sunday evening or early Monday morning to bring the building back up to temperature.

Hood River Middle School is an example of how, with the right space, tools, leadership, and support, we can actually make places better and more productive. Based on performance data, the team expects that the Music

and Science Building will continue to operate at net zero energy and could potentially produce even more energy with some of the suggestions above being implemented.

Becker and his students have teamed up with Opsis and Interface Engineering to present the evolution of HRMS' Food and Conservation Science Program to the international design community at two recent Living Future unConferences. The Council for Educational Facility Planners International will also feature presentations about and tours of the Music and Science Building as part of their October 2014 conference. At the May 2014 Living Future unConference, Becker inspired the audience with his vision of real change, asking, "Wouldn't it be nice if someday we didn't have to have a whole conference about sustainability—if it was just the way things were done?"



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