

## ISSUE PAPER#6.3 SUSTAINABILITY PRINCIPLES OF DESIGN

### **BACKGROUND**

Portland Public Schools (PPS) has worked to incorporate sustainable practices – ones that preserve resources and minimize environmental impact – in its daily operations and into future design plans. PPS is Portland’s second largest property-owner and one of the city’s largest employers. Heeding this, the Portland Public Schools Board of Education attends to the environmental, social and economic future of Portland as it sets policies and practice. These three pillars of sustainability shall be integrated into all facilities decisions.

### **RELEVANCE FOR FACILITIES PLAN**

Upholding these pillars begins by following the logic of the waste hierarchy: reduce, reuse, recycle. PPS practices this in regard to solid waste and materials, as well as towards energy usage through a methodology of: behavior adaptation, efficiency improvements and, finally, energy generation.

Pursuant to the school facility planning statute, ORS 195.110:

*(5)(a) The school facility plan must cover a period of at least 10 years and must include, but need not be limited to, the following elements:*

*C) Descriptions of physical improvements needed in existing schools to meet the minimum standards of the large school district.*

In future capital work, the district shall extend this thinking through the design, construction and operation of high performance buildings and educating building occupants on maximizing the

environmental performance of every PPS building. Whole building systems, the construction process, building materials and furnishings will be designed to conserve environmental and financial resources for the life of building projects. And, as with all district action, social equity interests will play a critical role in the successful implementation of these principles. PPS buildings serve the present and future; as such, all plans should take into account the resources available for at least seven generations<sup>1</sup>.

PPS needs to develop resource savings techniques that are easy to understand and operate. Systems must be simple and easy for teachers/staff/students to understand the resource-saving technique. Without this level of continual training of teachers, staff and students, the facilities team will be forced to address these improvements with either a “hands-on” approach, or remotely via technology. PPS is committed to involving students, families, teachers and community partners in all aspects of the following principles.

## 1. WHOLE SYSTEM DESIGN

### SUPERINSULATED, PASSIVE SCHOOLS

**Building designs will consider the integration of all building systems to increase passive building performance.**

- a) Integrate passive design elements with active building systems in the design of new or remodeled buildings, to the maximum extent feasible. Starting with optimal building orientation in new construction and well-insulated shells in all major work, buildings shall take advantage of natural ventilation, sunlight, shading and thermal masses to regulate interior temperatures and help maintain comfortable environments year-round. All spaces shall take advantage of daylighting opportunities.
- b) Use low-tech infrastructure that supports high-tech learning environments.
- c) Attain minimum LEED silver certification, or equivalent, for all major renovations; achieve minimum LEED gold certification, or equivalent, for new construction. Use the Living Building Challenge’s holistic approach as aspirational guidelines for all design and planning.

## 2. LONGEVITY

### DURABLE, PRACTICAL, HANDSOME MATERIALS

**Facilities will be designed to ensure long-term, effective performance.**

- a) Specify durable materials and systems that require minimal maintenance, non-toxic upkeep and are sensitive to the earth’s limited resources.
- b) Design building layout and building systems to provide flexibility for shifting populations and program needs throughout generations.
- c) Plan walls, load-bearing and otherwise, that consider the potential need for school reconfiguration or expansion in the future.
- d) Establish a culture of understanding and ownership for how users interact and relate with the building.

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<sup>1</sup> Clarkson, Linda, Vern Morrisette, and Gabriel Régallet. "Our Responsibility to the Seventh Generation." *IISD.org*. International Institute for Sustainable Development, 1992. Web. <[http://www.iisd.org/pdf/seventh\\_gen.pdf](http://www.iisd.org/pdf/seventh_gen.pdf)>.

### 3. CONSTRUCTION & DESIGN

#### LONG LIVES, GOOD INVESTMENTS

**The design process will use sustainable practices.**

- a) Collaborate with students, teachers and school communities during the design phase of each major renovation or modernization project. To the extent feasible, use the construction process as a learning laboratory for students.
- b) Before deconstruction, balance potential lifecycle savings of new construction with the embodied energy investment in existing buildings and the lifecycle savings of those buildings if renovated.
- c) Respect and preserve historic elements unique to neighborhoods.
- d) Use high-quality salvaged or reused materials, to the extent practical, in order to limit the use of virgin materials during construction.
- e) Utilize local materials, equipment and labor when possible to limit ecological footprints and help sustain local economies.
- f) Install materials in a way that makes repair minimally invasive and facilitates the ability to salvage them for future use or decommission them in an earth-conscious manner.

### 4. BUILDING ENVIRONMENTS

#### HEALTHY CLASSROOMS: INSIDE & OUT

**Buildings will provide healthy, productive learning environments that support education and curriculum, while facilitating the next generation's education on environmental stewardship.**

- a) Design for daylight opportunities with windows that not only minimize electric lighting requirements but give students a visual connection to nature.
- b) Select heating and air conditioning equipment that ensure good air quality and year-round comfort while minimizing acoustic impact.
- c) Incorporate acoustic standards into building designs to ensure acoustically neutral learning environments.
- d) Include low-cost features such as signage to support education about sustainable building features and resource conservation. Also consider Window Boxes incorporated throughout the building to provide students, employees and visitors a direct view of what is behind the walls, ceiling and floors with displays both audio and text explaining content, when feasible. In addition, use tracking displays that show how much actual resources or energy is being saved and/or used. Include information that describes past performance to give the new information more meaningful context. In addition to making details and information visible, also post questions that encourage students and teachers to consider, create and innovate regarding building environments and performance.
- e) Allow building occupants flexibility in the amount of lighting and visual distraction within each space.

## 5. ENERGY EFFICIENCY

### LOWER BILLS, LARGER SAVINGS

**Buildings will include capacity-appropriate, energy-efficient systems.**

- a) Choose HVAC systems influenced by long-term environmental and lifecycle costs.
- b) Minimize need for air-conditioning by maximizing cross-ventilating and night flush opportunities.
- c) Prioritize rehabilitation of original windows over replacement to reduce waste while recognizing embodied energy and historic value. Balance heating efficiency, daylighting, environmental impact and lifecycle cost when considering replacement windows; rehabilitate existing buildings to uphold the building's historic integrity.
- d) Design lighting plan and fixtures to provide sufficient direct and indirect lighting levels for the space's activity needs.
- e) Construct building envelopes that operate in tandem with the ventilation systems; insulate existing buildings in all locations targeted as both cost-effective and performance-enhancing. Balance the cost of insulation against lifecycle HVAC costs.
- f) Select electronic equipment that meets or exceeds Energy Star ratings, when applicable.

## 6. SITE IMPROVEMENTS

### MORE OUTDOORS

**Schools and their grounds will be interconnected to increase opportunities for learning indoors and out.**

- a) Provide access to outdoors including views to nature from the classroom, and outdoor learning opportunities through gardens, learning patios and covered play areas.
- b) Integrate biophilic design principles into school and campuses to encourage children's natural connection to nature and the outdoors.
- c) Select exterior lighting that is "night sky" and neighbor friendly.
- d) Eliminate unnecessary paved surfaces throughout school sites.

## 7. ENERGY GENERATION

### RENEWABLE INVESTMENTS

**Pursue and invest in renewable energy generation equipment when feasible and/or required.**

- a) Select renewable energy generation equipment based on the conditions appropriate for the site, in a manner that maximizes the energy produced for the amount invested.
- b) Pursue partnerships, tax credits and incentives to expand opportunities for energy generation on school grounds.
- c) Explore opportunities to partner with renewable energy manufacturers, designers, engineers and researchers to incorporate new technologies, materials and systems that both meet or exceed goals; and provide teachers and students' opportunities to experience and learn with cutting edge practices and technologies.

## 8. WATER AND WASTE

### CLEANER WATER TO THE RIVERS

**School facilities will incorporate water-conservation and waste-reducing infrastructure.**

- a) Identify opportunities to implement greywater reuse systems such as in toilets or for irrigation.
- b) Identify opportunities to manage stormwater on-site including reuse of stormwater as greywater.
- c) Select plants and landscaping that require low-upkeep and no irrigation after establishment.
- d) Install infrastructure that supports the reuse of materials (e.g. dishwashers to support reusable trays).
- e) Furnish buildings with consistent, easy-to-recognize recycling and compost receptacles.

## 9. TRANSPORTATION

### FEWER ENGINES RUNNING

**Minimize fossil fuel expenditures for student and staff commutes.**

- a) Encourage bicycle and pedestrian travel through grounds layout and building design.
- b) Site and building design should provide safer, more efficient pick-up and drop-off areas for students to minimize vehicle congestion and idling.
- c) Ensure students and staff have access to covered, well-lit bike parking.

## 10. INFORMATION FEEDBACK

### SMARTER BUILDINGS

**Building system performance will be effectively measured, monitored and modified.**

- a) Provide access to building performance data and the opportunity for classroom curriculum use in order to inform and educate users in resource use and conservation.
- b) Automate building use data for building managers to streamline maintenance and ensure optimal system performance.

## SUMMARY

High performance buildings is not only about conserving resources but also about maximizing the performance of the building occupants, our students. Portland Public Schools works to incorporate sustainable practices into the design of renovation projects, new schools and its daily operations. The three pillars of sustainability: environmental, social and economics are integrated into the design of our facilities.