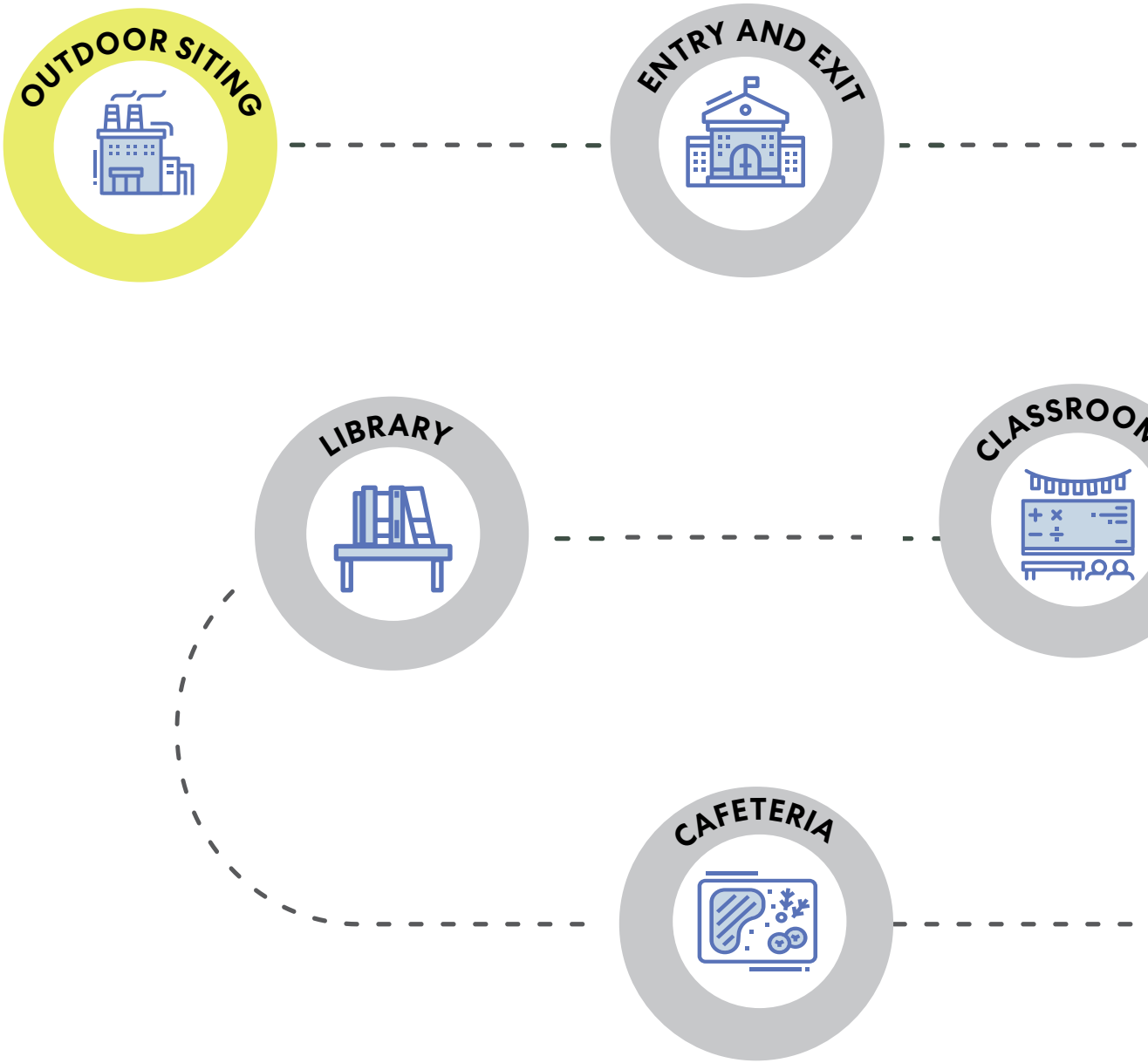
# Outdoors and Siting

**Healthy Schools by Design**

**2021**

Perkins&Will

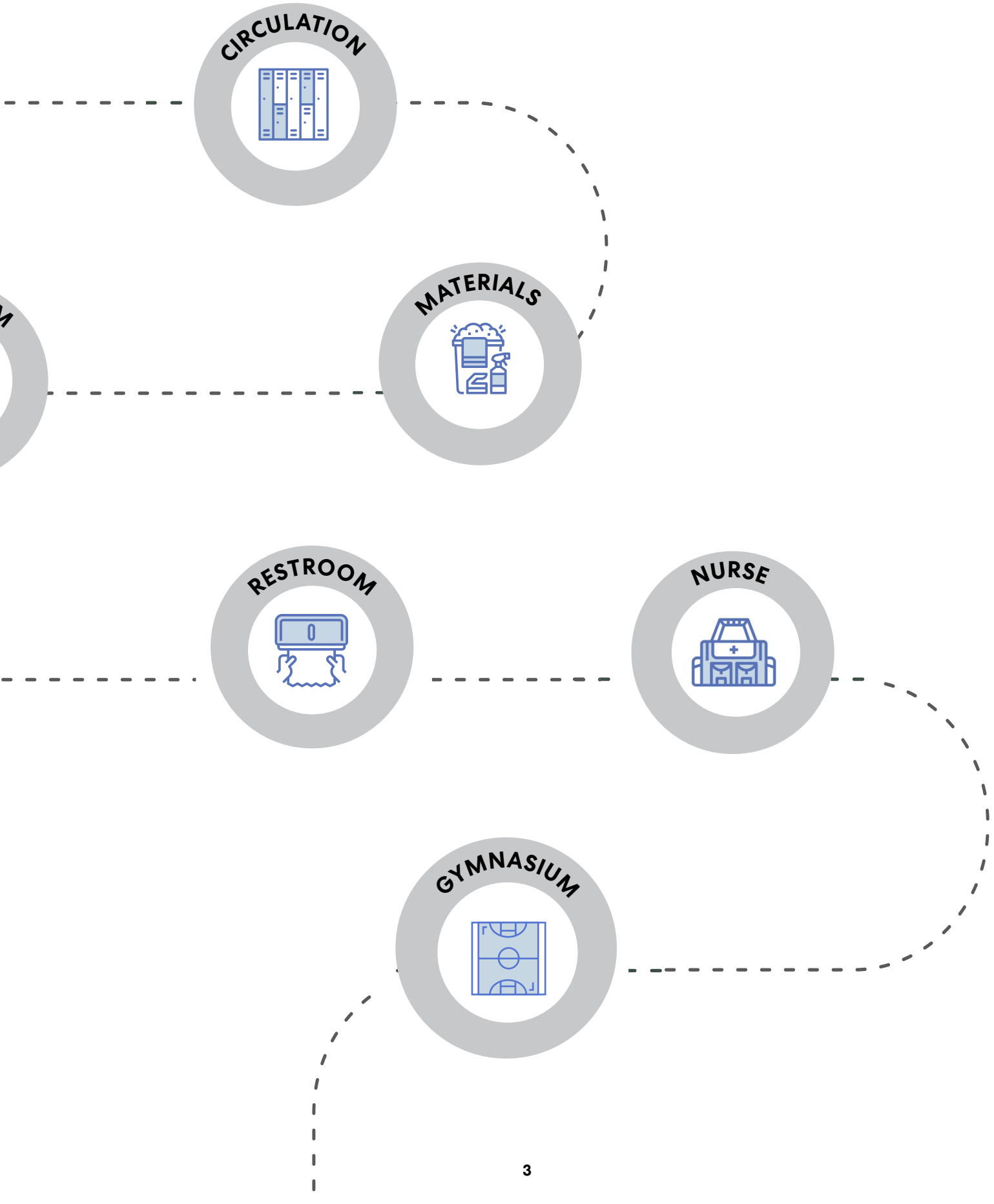



A DAY IN THE LIFE

# Meet Riley

In the pages that follow, we invite you to imagine how these design interventions will impact Riley, an imaginary—but very real—student. We owe it to students like Riley to make school buildings as inviting, safe, and healthy as they can be.

Follow Riley's journey through school at
**healthyk12.perkinswill.com/**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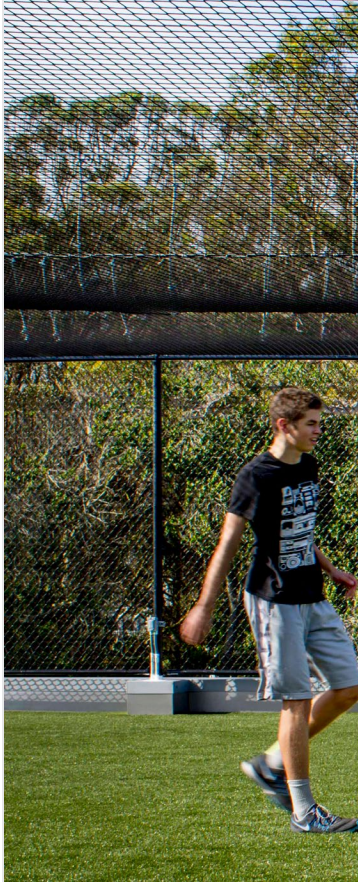

# Our goal.

**This series is focused on translating research into practical design solutions that promote child and staff health in our K-12 Schools. These documents will continue to be updated to reflect novel findings and community input. This primer is not a comprehensive list, and some strategies may not be achievable in existing buildings. Our goal is to identify opportunities where design and operations decisions can improve human experience.**

**The guidance provided is based on the available information as of the date of publication and does not replace federal, state, or local public health recommendations. It aggregates best practices and innovative solutions at the intersection of buildings and school health. We encourage schools to reach out and seek expert advice on their unique circumstances.**

**Project:** *The Willows Community School*

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### —— Outdoors and Siting

**Outdoor environments in academic settings play a critical role for students' overall wellbeing, regardless of a public health crisis.** While the pandemic underscored this need, studies have shown that students with greater access to these spaces had better mental health, higher test scores, and lower chronic absenteeism (Kweon et al., 2017; MacNaughton et al., 2017).

Our **holistic framework** address the most critical issues affecting schools through three lenses: Educational Adaptation, Health Promotion, and Risk Mitigation.

## Introduction

**A KEY FINDING FROM OUR FUTURE OF SCHOOL SURVEY:**

Eighty-one percent of respondents said they were either “very likely” or “somewhat likely” to include outdoor learning spaces in their new or renovated schools in the future.

**Project:** *The Willows Community School*

# Classes taught in nature improve student attention, stress, self-discipline, and enjoyment.*

**Before a student ever enters a school building, the location and surroundings can have both a short- and long-term impact on health.** Environmental and social drivers can influence student performance by impacting a student's physiology, psychology, cognitive function, growth, and behavior.

Outdoor environmental pollutants such as noise, traffic exhaust, and extreme temperatures can penetrate the campus and a facilities interior. **Proximity to major roadways, airports, industrial sites can lead to noise and air pollution that:**

- Can distract from learning (Stansfeld et al., 2005),
- May lead to potential cognitive impairments (Haines et al., 2001),
- Prevent the opening of windows or outdoor play (Bergstrom et al., 2015),
- Exacerbate asthma and other respiratory health conditions (Oliveira et al., 2019),
- Reduce lung function later in life (Gauderman et al., 2007).

**Additionally, environmental justice concerns exist. Studies across the United States have found that public schools with a high percentage of low income students, eligible for free and reduced lunch were more likely to be near major roadways** (Kingsley et al., 2014). Because outdoor air pollution often increased in these communities it has also been found to be associated with lower standardized test scores (Lucier et al., 2011; Mohai et al, 2011; Pastor, Sadd, & Morello-Frosch, 2006, Rosofsky et al, 2013; Clark-Reyna, Grineski & Collins, 2016).

Similarly, greenspace such as tree cover, plants, and shrubs have also been associated with impacts on student performance. **Schools with more trees were shown to have higher test scores and lower chronic absenteeism** (MacNaughton et al., 2017). However, not all outdoor greenspaces are created equal – athletic fields may not provide the same benefits as trees and shrubs (Kweon et al., 2017).

As more research in this area is being completed there is growing evidence that activities in nature may benefit children socially, including improvements in self-esteem, confidence, resilience, and stress (Roberts, Hinds, & Camic, 2019). According to our Future of School Survey, 60% of respondents adapted outdoor spaces or athletic fields during the 2020-2021 academic school year to meet the educational and physical safety needs of students. Importantly, this change might be here to stay with **80% of respondents saying they would like to use their outdoor spaces in the future for learning and teaching**.

*****Kuo et al., 2019*

**Strategies**

| | STRATEGY | CATEGORY | NEW/EXISTING | IN YOUR SCHOOL? |
|---|---|---|---|---|
| **O.1** | Create **accessible outdoor learning spaces** with WiFi, power outlets, and durable furniture in various sizes. | **Risk Mitigation**<br>**Health Promotion**<br>**Educational Adaptation** | **New Construction**<br>**Existing Building** | **O Yes**<br>**O No**<br>**O Not Applicable** |
| **O.2** | Reduce **urban heat islands** by promoting the use of green or cool roofs, shade trees, landscaping, and reducing impervious surfaces (**National Park Service,2021**). | **Risk Mitigation**<br>**Health Promotion**<br>Educational Adaptation | **New Construction**<br>Existing Building | **O Yes**<br>**O No**<br>**O Not Applicable** |
| **O.3** | Plan for post-Construction **stormwater management** (**Collaborative for High Performance Schools, 2020**)**.** | **Risk Mitigation**<br>Health Promotion<br>Educational Adaptation | **New Construction**<br>Existing Building | **O Yes**<br>**O No**<br>**O Not Applicable** |
| **O.4** | Special attention should be paid to **site selection** to account for the proximity to industrial sites, major roadways, and oil and gas wells to avoid outdoor air pollution concerns (Grineski et al., 2020, Grineski et al., 2018, Mohai et al., 2020). | **Risk Mitigation**<br>Health Promotion<br>Educational Adaptation | **New Construction**<br>Existing Building | **O Yes**<br>**O No**<br>**O Not Applicable** |
| **O.5** | Enforce **anti-idling measures** to prevent exposure to diesel exhaust that may lead to indoor air quality concerns, asthma exacerbations, and the unnecessary burning of fossil fuels (**Collaborative for High Performance Schools, 2020**). Avoid intake louvers near drop off and pick up sequences. | **Risk Mitigation**<br>Health Promotion<br>Educational Adaptation | **New Construction**<br>**Existing Building** | **O Yes**<br>**O No**<br>**O Not Applicable** |
| **O.6** | Incorporate **wildfire mitigation strategies** that work for your local area: when appropriate, include wider roads surrounding the school, create gravel buffers between buildings, include nearby irrigation sources, have steel framing, and biodegradable flame retardants. | **Risk Mitigation**<br>Health Promotion<br>Educational Adaptation | **New Construction**<br>Existing Building | **O Yes**<br>**O No**<br>**O Not Applicable** |
| **O.7** | Use a **land berm** to protect the school site from sea level rise and flooding events. | **Risk Mitigation**<br>Health Promotion<br>Educational Adaptation | **New Construction**<br>**Existing Building** | **O Yes**<br>**O No**<br>**O Not Applicable** |
| **O.8** | Strategically place trees to **reduce indoor thermal gains**, provide views of nature, and maximize daylight during the day as well as during power outages. | **Risk Mitigation**<br>Health Promotion<br>Educational Adaptation | **New Construction**<br>**Existing Building** | **O Yes**<br>**O No**<br>**O Not Applicable** |
| **O.9** | Provide **rooftop PV arrays or PV canopies over parking** to generate electricity on site. | **Risk Mitigation**<br>Health Promotion<br>Educational Adaptation | **New Construction**<br>**Existing Building** | **O Yes**<br>**O No**<br>**O Not Applicable** |
| **O.10** | **Elevate the building, roads, and critical infrastructure** above the floodplain, to prevent the school from becoming an island during extreme weather events. | **Risk Mitigation**<br>Health Promotion<br>Educational Adaptation | **New Construction**<br>**Existing Building** | **O Yes**<br>**O No**<br>**O Not Applicable** |
| **O.11** | Include opportunities for **nature-based curriculum** (Kuo et al., 2019) | Risk Mitigation<br>Health Promotion<br>**Educational Adaptation** | **New Construction**<br>**Existing Building** | **O Yes**<br>**O No**<br>**O Not Applicable** |

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| | STRATEGY | CATEGORY | NEW/EXISTING | IN YOUR SCHOOL? |
|---|---|---|---|---|
| **O.12** | Use **structural soil in urban landscapes** that contains larger solid particles to promote larger tree canopy and optimize greenspace (MacNaughton et al., 2017). | Risk Mitigation<br>**Health Promotion**<br>Educational Adaptation | **New Construction**<br>**Existing Building** | **O Yes**<br>**O No**<br>**O Not Applicable** |
| **O.13** | **Account and mitigate sources of outdoor noise** to reduce disruptions to class by physical placement of the building on the site, and the inclusion of acoustical buffers indoors and outdoors (Mohai et al., 2020). Locate sensitive program spaces away from exterior noise and consider acoustically insulated windows. | Risk Mitigation<br>**Health Promotion**<br>Educational Adaptation | **New Construction**<br>Existing Building | **O Yes**<br>**O No**<br>**O Not Applicable** |
| **O.14** | Employ **rain gardens and other "soft" storm water strategies** before or in addition to engineered solutions such as, underground storage and leeching tanks. | **Risk Mitigation**<br>Health Promotion<br>Educational Adaptation | **New Construction**<br>Existing Building | **O Yes**<br>**O No**<br>**O Not Applicable** |
| **O.15** | Use **permeable pavement** where possible to reduce storm water runoff and increase infiltration (not all permeable pavement is created equal, some like crushed stone are low-maintenance while others such as permeable asphalt need to be "vacuumed" to maintain optimal permeability). | **Risk Mitigation**<br>Health Promotion<br>Educational Adaptation | **New Construction**<br>**Existing Building** | **O Yes**<br>**O No**<br>**O Not Applicable** |
| **O.16** | Select play equipment that encourages open-ended and imaginative play also known as **"Natural Playgrounds".** | Risk Mitigation<br>Health Promotion<br>**Educational Adaptation** | **New Construction**<br>**Existing Building** | **O Yes**<br>**O No**<br>**O Not Applicable** |
| **O.17** | Include **movable/flexible furniture** that can be reconfigured to varying educational needs. | Risk Mitigation<br>Health Promotion<br>**Educational Adaptation** | **New Construction**<br>**Existing Building** | **O Yes**<br>**O No**<br>**O Not Applicable** |
| **O.18** | **Specify native, drought-tolerant species** that provide habitat for local fauna. Include identification markers on plantings to create additional learning opportunities. | **Risk Mitigation**<br>Health Promotion<br>**Educational Adaptation** | **New Construction**<br>**Existing Building** | **O Yes**<br>**O No**<br>**O Not Applicable** |
| **O.19** | Provide **wheelchair accessible** outdoor learning and play space to ensure an equitable natural environment. | Risk Mitigation<br>Health Promotion<br>**Educational Adaptation** | **New Construction**<br>**Existing Building** | **O Yes**<br>**O No**<br>**O Not Applicable** |
| **O.20** | **Extend WiFi** to school grounds including fields and parking areas. | Risk Mitigation<br>Health Promotion<br>**Educational Adaptation** | **New Construction**<br>**Existing Building** | **O Yes**<br>**O No**<br>**O Not Applicable** |
| **O.21** | Account for **solar orientation** to optimize daylight. | Risk Mitigation<br>**Health Promotion**<br>Educational Adaptation | **New Construction**<br>Existing Building | **O Yes**<br>**O No**<br>**O Not Applicable** |

**Our aim is to support holistically healthy buildings, but we understand that each learning community is unique and has their own health priorities. Use these strategies as a starting point!**

Outdoors and Siting

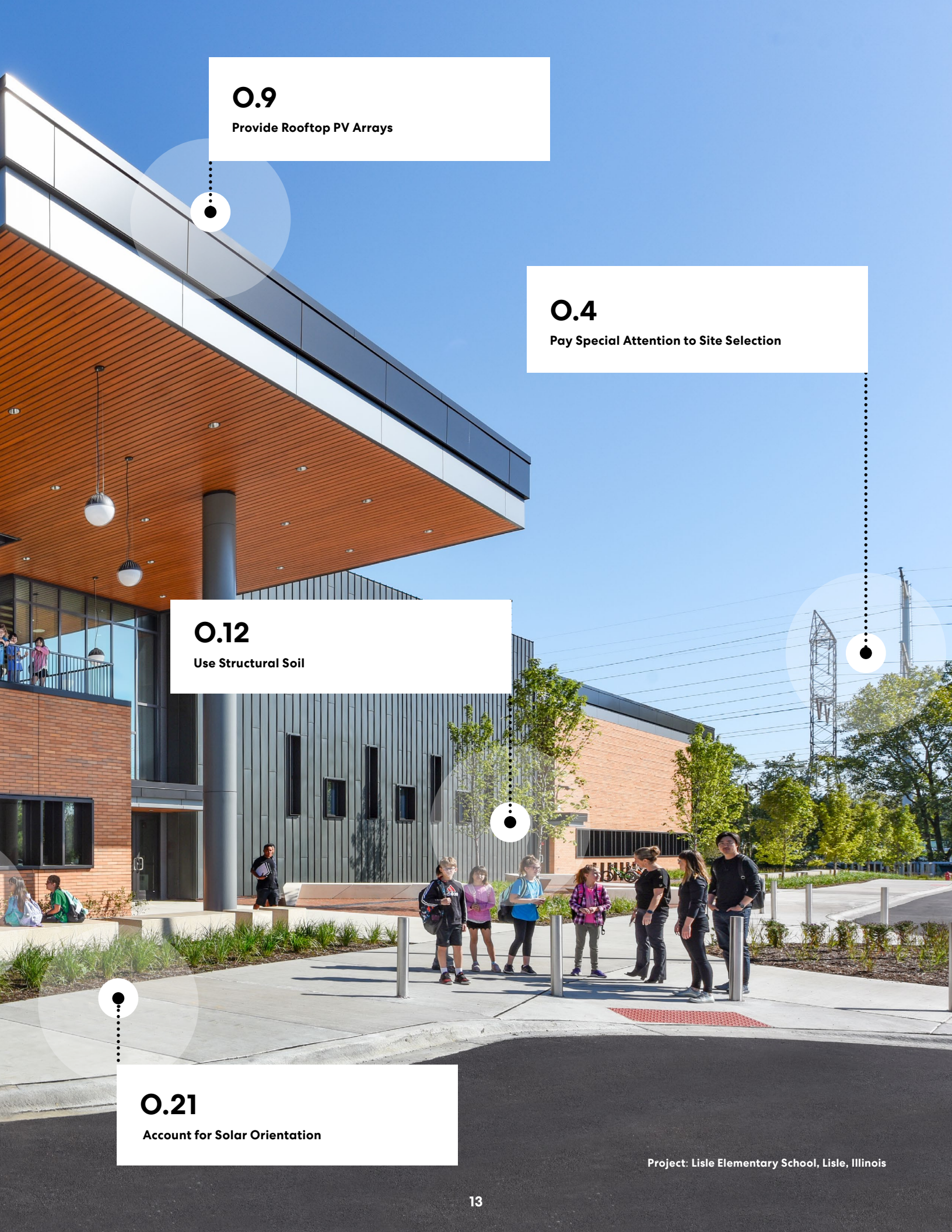
# Strategies in Action

## O.20

**Extend WiFi to School Grounds Including Fields and Parking Areas**

## O.1

**Create Accessible Outdoor Learning Spaces**



## O.9

**Provide Rooftop PV Arrays**

## O.4

**Pay Special Attention to Site Selection**

## O.12

**Use Structural Soil**

## O.21

**Account for Solar Orientation**

Project: Lisle Elementary School, Lisle, Illinois

## O.18 Specify Native, Drought-Tolerant Species

**Clockwise from Left:** *Lisle elementary School, Dena'ina Elementary School, Dena'ina Elementary School*

**Check it out!**

**"Perhaps the time has come to cease calling it the 'environmentalist' view, as though it were a lobbying effort outside the mainstream of human activity, and to start calling it the real-world view."**

**—E. O. Wilson, American biologist, naturalist, and writer**

**O.19**

**Provide Wheelchair Accessible Play Space**

**Resources:**

To understand more about resilient design, check out **RELi Resilience Action List** for strategies to support your community and school.

Our modular classroom, **Sprout Space**™ can reduce overcrowding and support greater social distancing year round with modular classrooms designed with green building strategies.

**What we're reading**: **Dr. Sara Grineski from the University of Utah** has been helping to quantify the greatest risks to school siting. From air pollution to traffic noise, her research shows that these environmental exposures have lasting impact on student health and performance and are not equally distributed.

**What we're reading: EPA's School Siting Guidelines** provide site screening information to assist in holistically evaluate future sites.

**What we're reading: Green Schoolyards America** offers research, examples and guidance on ways to optimize outdoor learning environments - no matter how small.

## O.11 Include Opportunities for Nature-Based Curriculum

**Project:** Rodriguez Elementary School, San Marcos, Texas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## O.8 Strategically Place Trees to Reduce Indoor Thermal Gains

**Project:** Shanghai American School, Puxi Campus Library Renovation

## Outdoors and Siting


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## Outdoors and Siting

**Project:** Katherine Johnson Technology Magnet Academy, DeSoto, Texas

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**Continue Riley's journey at:**

healthyk12.perkinswill.com/

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