BEST PRACTICES FOR STORMWATER SCHOOLYARDS

IDEAS PRESENTED BY BIRGIT TEICHMANN, TEICHMANN LANDSCHAFTSARCHITEKTEN

FROM:

LIVING SCHOOLYARDS AS STORMWATER INFRASTRUCTURE INSPIRING SCHOOL GROUNDS OF BERLIN

TECHNICAL TRAINING WORKSHOP AT THE SAN FRANCISCO PUBLIC UTILITIES COMMISSION
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This document is a brief summary of best practices discussed by Birgit Teichmann during the two-part technical training workshop held on January 12, 2017 at the San Francisco Public Utilities Commission.

Full-length video recordings of this program can be found online at the following links:
Part #1: http://bit.ly/LSY-SI-video and Part #2: http://bit.ly/LSY-SI-video2

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DESIGN AND COMMUNITY ENGAGEMENT

PROJECT INITIATION

- Schools are the ones that initiate green schoolyard projects in Berlin. The school has to *want* a green schoolyard in order for the project to be successful.
- Public agencies and school districts play a supporting role in Berlin, providing the institutional framework and funding needed to bring the project to fruition. (Top down coordination and funding supports grassroots initiatives.)
- The state government for Berlin has a department called *Grün macht Schule* that specializes in helping schools create green schoolyards. Schools come to them for assistance, and they navigate the bureaucracy and help to match each school with the funding, advice, training, and specialty contractors/artists they need to create their green schoolyard.
- The citywide stormwater fee on impermeable surfaces, charged annually on all properties in Berlin, provides an important economic incentive for schools and school districts to unpave their grounds and keep them unpaved in the years to come.

DESIGN PHILOSOPHY

- Shape the design to reflect the school and its community.
- Create school grounds that are comfortable, welcoming, park-like environments.
- Create site design for school grounds that contribute to their city's ecological resilience in the face of climate change. Follow "Sponge School Ground" goals to manage stormwater and moderate temperature.
- Use the lowest level of technology possible to achieve the overall site design and all other goals. (e.g. unpave the whole school site and add topography, trees and shrubs, rather that relying on pumps)
- Plan to include some "chaos" in the design. Nature's aesthetic and children's aesthetic include more visual chaos than typical "clean" adult aesthetics. Focus on children's needs in environments built for children.
- Make the most of each site's potential. Save existing trees and large shrubs. Use existing topography if there are already some hills onsite.
- Maximize the number of different experiences children can have by including all different types of play elements, natural construction materials, outdoor rooms, and resulting microclimates.

SITE PLANNING, DESIGN PROCESS AND IMPLEMENTATION

- Path Analysis: Teichmann LandschaftsArchitekten begins their school ground design process by designing the network of pathways. Pathway placement is determined by observing existing use patterns onsite and following the users' "desire lines" to see how people move most efficiently from one place to another. The firm maps the movement patterns they observe, discuss them with school personnel, and then use the information as the organizing framework for the overall site design.
- Place-Making: Next, the designers identify spaces between the pathways and nestle different types of uses into each one. Play areas are one of the first to be identified, and go into locations that are the most desirable for play, e.g. nestled in the shade of an established tree.
- Topography: After focal points have been identified, the designer considers the topography for each area, and adds mounds between the pathways. The topography is shaped to control stormwater drainage and create outdoor "rooms" for different activities. The amount of soil that is cut and filled onsite must be balanced so that no soil will need to be imported or exported to create the topography.
- Vegetation: The designer surrounds each outdoor room with a buffer of vegetation, and also adds vegetation buffers around the perimeter of the school site to screen the school from the neighborhood and streets. The plant pallets in Teichmann's designs rely on robust native trees and shrubs. They do not use perennials since they do not stand up to heavy foot traffic from hundreds of children.

- Master Plan: The designers use the above adult-based site analysis as their framework, and then add ideas developed by children into this framework to create a master plan for the school grounds. (See additional notes below about participatory design.) The plan goes through several revisions as the school community reviews it. The final master plan is adopted when they have reached consensus.
- Technical Plan: A technical plan is prepared after the master plan is complete. It includes all of the details the builders will need to build the site according to the design. The more specific this information is, the better the outcome. (This type of plan is similar to schematic plans and construction drawings in the USA.)
- Professional Construction: The landscape architect oversees construction work implemented by professional contractors.
- Community Building: After the main site elements have been built, students work with local artists, like stone masons, carpenters, and tile mosaic artists, to create and install substantial design elements that add character to the site and build a sense of "ownership" for the final product.

CHILDREN'S PARTICIPATION IN DESIGN AND STEWARDSHIP

- Children's roles in the design, planning, building and stewardship of a green schoolyard are *central*. Their participation is not an added component—but is the *main rationale* for creating a green schoolyard. Their ideas are important and pivotal to the overall framework that is created for the site. The landscape architect should hold workshops that involve all of the children at the school in the design process. Workshops can include model building and other ways to visualize site design options.
- Use the design process to help children practice communication skills and consensus building techniques.
- Engage parents and teachers in contributing design ideas for the site, too.
- Bring in local artists to work with students after the main construction is complete, to create and install temporary and permanent artwork made from natural materials. Children are capable. Train them in real art techniques and then trust in their skills to do complex projects such as carving wood and stone under the direction of local experts and artists.
- Include children in ongoing site improvements such as modifying paving to add additional texture and patterns to the ground surface. Use simple, low-tech construction techniques that children can build, and repair themselves if needed.
- Include children in the stewardship of the completed green schoolyard. Their role is to learn how to be good stewards of the land they share, and the maintenance they perform is a nice benefit, but it is not the main outcome. (Students assist with maintenance, but are not the main maintenance crew. Maintenance is the responsibility of a school district/city government facilities/public works department.)

ENVIRONMENTAL CONSIDERATIONS

SPONGE SCHOOL GROUND STRATEGIES

- Follow "Sponge School Ground Strategies" to contribute to the city's ecological resilience in the face of climate change, by managing stormwater and moderating temperature.
- Reduce urban heat islands through ventilation, shade, increased reflection, and cooling through evaporation from trees, vegetation and soil.
- Create water sensitive school grounds by emphasizing infiltration, evaporation, onsite storage, retention, and drainage.

STORMWATER MANAGEMENT

- **Aim to infiltrate 100% of the rain that falls on each site.** Design for the 10-year storm event.
- Unpave as much of the site as possible and remove concrete and asphalt. (Save concrete pieces for use in building topography.)
- Use permeable pavers for pathways, gathering spaces, and other areas where paving is needed.
- Use permeable natural materials for play structure fall zones.
- Remove all storm drains that flow into the municipal stormwater network.

- Direct roof water from school buildings into vegetated areas to infiltrate into the ground. If flows are high, use underground detention basins to give the water more time to percolate.
- Use living roofs and "blue/green roofs" to slow the stormwater's passage from rooftop to landscape.
- Shape the topography onsite to channel stormwater to places where it can most easily infiltrate. Reinforce channels with expected higher flows, e.g. detention basin outflow areas.
- Make stormwater flows visible so that children will understand the schoolyard watershed.
- After infiltrating stormwater into the site, drill a groundwater well to irrigate the vegetation onsite if supplemental water is needed during plant establishment and unusually dry weather.

CLIMATE CHANGE MITIGATION

- Remove as much paving onsite as possible to reduce thermal mass that absorbs the sun's rays.
- Shade as much of the grounds with trees as possible.
- Use evaporative cooling from the trees, plantings and soil to cool the school ground microclimate.
- Be sure to maintain spaces between school buildings and other structures to allow ventilation that will further cool the grounds and provide fresh air.
- Add light colored surfaces to south facing building walls and other structures to increase reflection and reduce heat retention.
- Vegetated walls and roofs are also helpful to reduce temperatures.

MATERIAL USE

- Use natural and recycled materials wherever possible. Save the building materials during demolition, and reuse them to create seat walls around planting mounds, and as fill material to create topography.
- Use loose sand and shredded wood to create soft play structure fall zones.
- Use long-lasting *Robinia spp.* wood for play structures. In Berlin, it will last 20 years if it is placed in the sun and 15 years if placed in the shade.
- Maximize the number of textures and types of natural materials used in pathways and other ground surfaces to add interest and challenge. Avoid smooth surfaces on the ground, as they provide no challenge or interest and are detrimental to child development, since they hinder the development of coordination and balance.
- Use permeable pavers to reinforce high traffic areas such as pathways.

CHILDREN'S WELLBEING, LEARNING AND PLAY

PLAY

- Design the play areas to fit the site. Don't design the site to fit standard play structures. (The needs of the children and the site should drive the design and use, not commercial ideas of play.)
- Avoid commercially designed, standard catalogue play structures. Use unique play elements built from natural materials that also comply with local play standards.
- Include large sandboxes with hand-powered water pumps in every elementary and preschool yard.
- Include as much physical challenge as possible for every age group, including the oldest children at the school. Nature play has a much lower injury rate than standard playground equipment, according to a study by Berlin's insurance company. These findings are also confirmed by other research around the world. [See references to research on this topic from many countries in a document created by the International School Grounds Alliance: *Risk in Play and Learning*, http://bit.ly/ISGA-RiskDec. Teichmann and Danks both participated in writing this document, with their colleagues.]
- Provide all different types of things for children to do as they grow each year, and that appeal to children with different interests (sports, nature, imaginative play opportunities, etc.).
- All elements should meet local safety standards and codes, and be inspected regularly.
- Surface flows of stormwater can be used for children's play if the water is not stored, and if it comes from places (like rooftops) with appropriate materials that will maintain good water quality. (e.g. Do not allow children to play in stormwater that has flowed off of copper rooftops or other unsuitable surfaces.)

EDUCATION

- A high quality green schoolyard should provide educational opportunities for learning across the curriculum, at every grade level in the school.
- School grounds should provide opportunities for academic learning outdoors, both teacher led and child discovered. Learning opportunities should include basic mathematical experiences (counting, etc.) and opportunities to learn about natural sciences and hand-based technology.
- Include educational objectives that relate to physical abilities as well as academic standards. It's important to have goals for physical body movement and health (coordination, balance, strength, etc.).
- Include educational objectives regarding interpersonal and communication skills, as well as visual arts, and music curricula.
- Green schoolyards should include gathering places of all sizes, so classes can meet outdoors in large and small groups, and children will have social environments at recess and after school in which to gather. Gathering spaces help children to practice their social and communication skills.
- Keep electronic devices out of the schoolyard environment, if possible. Students get plenty of access to them in the classroom. When outdoors with a class, rely on hands-on, experiential learning using the environment as the main teaching tool. Be sure that children get their hands dirty.

INSTITUTIONAL FRAMEWORKS, SITE MANAGEMENT AND TRAINING

FUNDING

- Work with local agencies to strategize about funding sources to achieve a desired green schoolyard goal.
- Create a governmental entity that can act as a coordinator to help schools navigate the funding system and match their goals with available funding sources.

POLICY FRAMEWORK

- Integrate stormwater infrastructure planning with schoolyard site design to benefit children and the environment at the same time.
- Set up a stormwater management fee for the City that ties the amount of impermeable ground surface to the size of the fee. Set the fees on impermeable ground surface high enough that it is worth the time and energy needed to fix the problem. Incentivize property owners of all types to unpave their land and also create living roofs.
- Create and follow green schoolyard design guidelines and standards, recognized by the government.
- Prioritize green schoolyard infrastructure investments for low-income areas to achieve equity goals.
- If multiple public agencies are involved in oversight, ensure they collaborate.
- Provide examples of model projects that have worked effectively. It's better if these are local.

SITE MANAGEMENT

- Design the site to be as low-tech as possible. This will also make it low maintenance. If there are no pipes and no pumps onsite, there will be nothing complicated to maintain.
- Aim to design school grounds so that they will only have simple park-style maintenance needs. (e.g. tree trimming, occasional replacement of worn out structures)

TRAINING

- Train landscape architects as stormwater engineers and give them training in child development so that they can design for children, adults, and the natural environment at the same time.