Public Building Commission of Chicago

Site Development Guidelines

October 2010

Acknowledgments

Site Development Task Force

The Public Building Commission
- Leona Ketterl, AIA, LEED AP
- David Earnhart, AIA, LEED AP
- Kathryn Pichette, LEED AP

SMNG-A Architects
- Ken Schroeder, FAIA, ALA
- Todd Niemiec

Hitchcock Design Group
- Dave Frigo, ASLA, LEED AP
- Julie Gilbert, ASLA, LEED AP
- Craig Farnsworth, ASLA

Terra Engineering, Ltd.
- Jamil Bou-Saab, P.E.
- Arvin Villanueva

Public Building Commission Board of Commissioners

Richard M. Daley *Chairman*
Erin Lavin Cabonargi *Executive Director*

Bishop Arthur Brazier
Adela Cepeda
Dr. Robert B. Donaldson II
Mary B. Richardson-Lowry
Benjamin Reyes
Cynthia M. Santos
Samuel Wm. Sax
Todd H. Stroger
Gerald M. Sullivan
Bryan Traubert

Contributors

The Public Building Commission
- Erin Lavin Cabonargi *Executive Director*

Scott Mehaffey *City of Chicago, Landscape Coordinator*
John Lough *City of Chicago, City Forester*
Ronald Daye *City of Chicago, Chief Landscape Architect*
Julie Bedore *Department of General Services*
Kevin Taylor *Chicago Public Schools*
Adam Schwerner *Chicago Park District*
Janet Attarian *Chicago Department of Transportation*
Jeff Brink *Chicago Department of Transportation*
Basil Souder *Lohan Anderson*
Helen Kessler *HJKessler Associates*
Ernest Wong *Site Design Group*
Robert Sit *Site Design Group*
Christy Webber *Christy Webber Landscapes*
Kelly Bolger *Christy Webber Landscapes*
Ray Hufnagel *Christy Webber Landscapes*
Jaime Zaplatosch *Openlands*
Terry Guen *Terry Guen Design Associates*
Ed Lovelace *Maranjil Landscaping*

Contributing Committees

Chicago Parks and Open Spaces Advisory Committee
Chicago Department of Environment
Mayor's Landscape Committee

Contents

Public Building Commission Project Manager shall provide current specifications that correspond to these guidelines.

All LEED credits reference LEED 2009 for New Construction and Major Renovations and LEED 2009 for Schools New Construction and Major Renovations.

Letter from the Chairman

As Chairman of the Public Building Commission, I welcome you to our first publication of *Site Development Guidelines*. The Guidelines serve as a comprehensive reference and education tool for site development of publicly funded projects, with a focus on responsible management and environmental stewardship.

The site development surrounding public facilities plays a critical role in defining each building. By developing carefully designed plans for paving, landscaping, green roofs, lighting and stormwater management, we strengthen each facility and continue our commitment to making Chicago the greenest city in the nation.

Our streamlined project oversight ensures high quality, low maintenance and environmentally sustainable facilities throughout Chicago. With guidance from the PBC Board of Commissioners, client agencies, consultants, and internal staff, PBC procedures continue to evolve and improve. As you read the *Site Development Guidelines*, please note that we will continue to update and inform you of any new and innovative strategies.

Whether you are a client agency, a professional services consultant, or a citizen of Chicago, I believe you will find that the PBC's commitment to high standards in all phases of development is central to the way we operate and to the long term beauty, durability and vitality of our public facilities.

Sincerely,

Richard M. Daley
Chairman
Public Building Commission of Chicago

Letter from the Executive Director

The Public Building Commission (PBC) holds a unique role in shaping the City of Chicago, building its public facilities and infrastructure. The *Site Development Guidelines* are intended as a tool for professional service providers, builders and other staff working on behalf of the PBC and its clients. As an application of lessons learned and best practices, these guidelines will bring both quality and consistency to the process of site development and maintenance surrounding each of the public facilities we deliver.

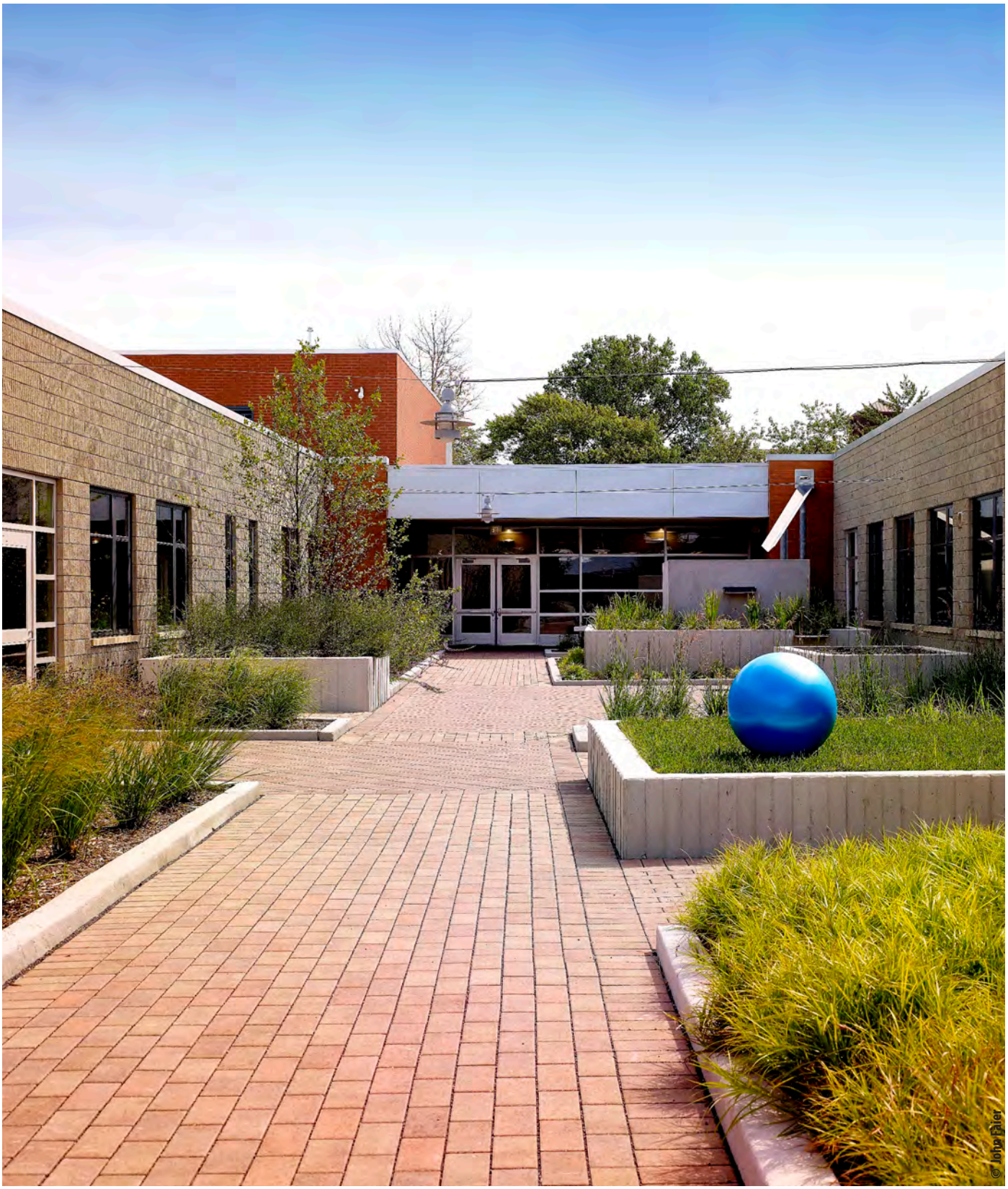
The PBC is responsible for a wide range of projects, from firehouses, fire houses and police stations to schools and libraries. Therefore, the importance of continuity and consistency of development and maintenance are paramount. The parameters described herein will be applied throughout Chicago on public development projects. It is for that reason that so many dedicated professionals, from both the public and private sectors, have worked hard to develop standards that will be applied in every stage of a project's development, from zoning and site selection to the training of the people who will maintain a facility and its grounds.

Responsible public development is the mission of the Public Building Commission. These guidelines exhibit our commitment to both economic sustainability and environmental sustainability in every project we take on. Noteworthy is our Landscape Design section, offering site elements key to responsible landscapes for public facilities. They encourage bio-diversity to mitigate the effects of invasive species. The plant selections are drought resistant, native to the area, require little maintenance to thrive, and provide year round aesthetic interest. Ornamental fencing protects the landscapes for future enjoyment and instructional signage is encouraged to engage and educate the community on plant species and sustainable features.

Our commitment to the environment and to the exemplary stewardship of the public fund through the leadership and vision of the PBC's Board Chairman, Mayor Richard M. Daley, whose is dedicated to making Chicago the greenest city in the nation. We are grateful for the opportunity to implement that laudable goal.

Sincerely,

Erin Lavin Cabonargi
Executive Director
Public Building Commission of Chicago


© John Faier

Introduction

The Public Building Commission of Chicago (PBC) created these site development guidelines in its mission to serve the people of Chicago by providing high-quality, sustainable public facilities. The guidelines offer PBC staff, architects, landscape architects, engineers, facility managers, maintenance staff and user agencies with both a design reference and educational tool. The goals of the site development guidelines are to coordinate and standardize the processes of design, construction and maintenance of the various public facilities by outlining design strategies, site elements, minimum expectations and decision rationale that can be applied to all PBC sites.

The PBC promotes public facilities that educate and inspire students, neighborhoods and public employees. This encourages the development of active community groups to become environmental advocates for and stewards of their local facilities.

There are several assumptions made in these guidelines with respect to barrier-free design and sustainability. Public facilities shall be designed to achieve LEED Gold and Silver Certification, as required by Chicago Development Standards. In addition, all public facilities shall follow these guidelines as outlined to pursue the goals of this document. Because sustainable development standards and benchmarks continuously evolve and improve, these guidelines are a living document, of which the PBC will methodically evaluate built projects. These guidelines will then be updated to include lessons learned and updates that reflect changes in agency missions, technology and regulations.

Definitions and Role Delineation

Additional Services: Additional services provided by the DA or AOR for the project beyond the scope of services under the terms of an agreement.

Architect of Record (AOR): The firm retained by the Commission for the purpose of developing a complete design package and construction documents for permitting and construction of the project that complies with the Commission's approved criteria.

Responsibilities: Further develops the conceptual plans produced by the DA, develops contract documents and submits the documents for permit review for the building and site. The AOR, with their design team, develops construction drawings and specifications pursuant to sustainable design strategies best suited for the facility and site and provides contract administration services while the project is under construction, through project closeout.

AOR's Estimate of Probable Construction Cost: The AOR's professional opinion of the cost necessary to construct the project and furnish all items required to complete the Project as described in the corresponding design phase.

Authorized Commission Representatives (ACR): One or more persons designated in writing by the Executive Director of the PBC for the purposes of assisting the Commission in managing the project. As specifically directed by the Commission, the ACR will act on behalf of the Commission.

Responsibilities: The Commission has designated the ACR to assist the Commission in managing the project and to have the authority, as specifically directed by the Executive Director, to act on its behalf. The DA and AOR shall cooperate at all times with the Commission, its ACR and Project Manager in the performance of the services. Although it is anticipated that the DA and AOR will interface and cooperate with representatives of the User Agency during the course of the Project, the DA and AOR will take direction with respect to the services solely from the ACR.

Civil Engineer (CE): Subconsultant of the DA and/or AOR to design, develop and document the site design, site components, utilities and stormwater management facilities.

Commission: The Public Building Commission of Chicago (PBC), a municipal corporation, acting by and through its Chairman, Secretary, Assistant Secretary, Executive Director, including the ACR, as designated by the Executive Director in writing.

Construction Budget: The total funds budgeted by the Commission for constructing the project and furnishing all items necessitated by the project which must be shown or described in the CDs to be prepared by the AOR. The construction budget does not include any payments made to the DA, AOR, consultants or reimbursable expenses.

Construction Project Manager: The PBC or its PMO staff member designated as the ACR for the construction portion of the project.

Responsibilities: Becomes the single Project Manager for the construction phase of the Project after the issuance of the 100% Construction Documents and receipt of contractor bids.

Construction Documents (CDs): All of the Contract Documents for the construction and improvement of the project including the bidding instructions, standard terms and conditions for construction contracts, technical specifications, drawings, addenda, bulletins and modifications to those parts.

Design Architect (DA): The firm retained by the Commission for the purpose of preparing the prototype and concept design documents for the project.

Responsibilities: Creates conceptual design for the building and site based upon preliminary User Agency program requirements. The conceptual design generally includes programmatic review and development with the User Agency and PBC staff, site test-fits, preliminary code review (where required) and adaptation of prototype components. Early consideration is given for site conditions that are in any way outside of the norm. The DA will engage the services of a LA and CE as required to complete the conceptual design.

A LA and/or CE shall be brought onto the site design team during conceptual planning to work with the DA to maximize the potential of the site and create a realistic budget for the project. There may be occasions when one or more of the following are not available at the conceptual design level and must be investigated by the AOR team: Phase I and Phase II environmental tests, percolation tests and utility information.

Deliverables: The documents, in any format (electronic or hard copy) requested by the Commission, including technical specifications, designs, drawings, plans, reports, forms, recommendations, analyses and interpretations that the DA or AOR is required to provide to the Commission.

Design Management Manual (DMM): A three-ring binder of information given to the design team by the PBC at the project design kick-off meeting. The DMM contains information on standard forms and procedures for performing project work with the PBC, as well as reports and data that have been collected to date on the project. It also contains a CD with electronic files of project documentation (as-builts, surveys, etc.) and the program design standards.

Design Milestones and Peer Reviews: A typical project process includes five design milestones in which a peer review of deliverables is conducted at each submittal. Design milestones are:

- Conceptual planning (DA), transfer to AOR
- 100% Schematic design
- 60% CDs
- 90% CDs, submitted for permit
- 100% CDs, that are then issued for construction documents

Design Project Manager: The PBC or its PMO staff member designated as the ACR for the design portion of the project.

Responsibilities: Provides input during the development of the project scope, schedule and budget. The Design Project Manager may also identify extraordinary issues related to the design and construction of the project and present strategies to address the issues prior to the design kick-off.

Environmental Consultant (EC): An environmental engineer who provides oversight during construction administration with regard to soil remediation to confirm compliant testing, construction and proper disposal of environmentally impacted materials.

Landscape Architect (LA): Subconsultant of the DA and/or AOR to design, develop and document the site design, site components and landscape elements.

Master Specification Template: The template specification furnished by the PBC which requires editing by the AOR team to customize it for a specific project.

PBC Three-Phase Delivery:

Phase I: Site Control. When a site is purchased by the PBC or one of the user agencies, the first phase of site preparation is to fence the site in its entirety, and typically then a sign is installed giving indication of the upcoming construction project. This is primarily for security purposes, but also gives the community some information of what is and will be happening in their neighborhood.

Phase II: Site Preparation. Upon review of the EC's findings, the design team develops a proposed site preparation scope of work coordinated with the geotechnical consultant's findings and the proposed utility service connections into the new building. The site preparation design will include all work necessary to abate and demolish existing structures on the site, as well as to prepare the site both environmentally and geotechnically in order to implement the building construction and site development scope of work. This includes, but is not limited to, the development of soil management strategies that will be subject to the review and approval of the Commission. The site preparation scope of work may also require the design of all utilities to be brought within five feet of the building perimeter. This proposed scope of work will be submitted to the ACR for review and approval.

Phase III: Vertical Building Construction and Site Development. A six-phase approach consisting of the following:

- Schematic Design Phase
- Design Development Phase
- CDs Phase
- Bidding Phase
- Contract Administration Phase
- Close-Out Phase

in which the design team develops a complete design package; prepares CDs for permitting and construction; and assists the ACR with bidding, construction administration and close-out documents through the construction and completion of the building and site.

Planning Project Manager: The PBC or its PMO staff member designated as the ACR for the planning portion of the project.

Responsibilities: Completes activities for the planning phase, while providing the Design Project Manager and the rest of the design team with all information necessary for the Design Project Manager to move forward with management of the design and project approvals.

Project Management Organization (PMO): An individual acting in a Project Management role on the PBC's behalf, typically as an ACR.

Project Schedule: The project schedule will be provided to the DA and/or AOR. The DA and/or AOR must promptly notify the ACR whenever there is an actual or projected variance to the project schedule. The project schedule will represent the information in Book 1 of the CDs approved by the Commission for the project. The project schedule will clearly identify major activities within the project, including each phase of planning, design and construction.

Request for Design Change (RFDC): The process by which a change to the design is formally accepted or rejected. It can be requested by any stakeholder in the process and provides schedule and budget impact. It allows for tracking of changes that are otherwise not required by code or by the agency's applicable standards.

Request For Information (RFI): The process by which the General Contractor submits questions to the AOR team for clarification of the bid documents.

Subconsultant or Subcontractor: Any person or entity hired or engaged by the DA or AOR to provide any part of the scope of services required under the terms of an agreement.

User Agency: The governmental agency or agencies that requested the Commission to undertake the construction and/or improvement of the project. The User Agency is responsible for operations and maintenance of the facility after occupancy.

Implementation Process

The creation of truly sustainable public facilities has never been more important to the PBC. These facilities must be sustainable from environmental, financial and social points of view. Achieving Leadership in Energy and Environmental Design (LEED) Certification requires that the entire design team work in a coordinated effort through the implementation process so that site and building elements work in unison, and without conflict, to produce a high level of performance. The design, specification, construction, post-construction, and commissioning must be tracked, measured and documented to the U.S. Green Building Council (USGBC) in order to achieve specific LEED points. Subsequent maintenance for many site elements, such as permeable paving, bioswales and green roofs, is not just discretionary as resources permit, but required to assure proper establishment and the full functionality of these site elements. This effort provides paybacks of measurable environmental and social benefits as well as operational cost savings over the life of the facility.

Planning and Design Phases

Zoning and Site Analysis

Design team, including LA and CE: Site design must conform to the minimum requirements of the Chicago Zoning Ordinance, the Bureau of Forestry's Tree Removal and Replacement Guidelines and all applicable regulations. Tree removal on the right-of-way (ROW) requires Bureau of Forestry approval and permit.

The LA and CE shall conduct a site visit and prepare a report evaluating the existing site conditions, with specific attention paid to the existing vegetation, drainage patterns and site topography.

Mature existing trees cannot be relocated and must be considered as early as possible during project conceptual design. Protection is required for all existing trees and vegetation to remain on-site. Location of protection fencing and construction access routes shall minimize impact on root zones and low tree canopies.

Testing

Design team, including LA and CE: Complete all testing as early in the project process as possible. Conduct and/or review, at a minimum, the following tests:

- Phase I and II Environmental
- IEPA Tier I or Tier II test results regarding site soils and drainage
- soil tests on existing soils-to-remain to assess bearing capacity and site porosity
- soil tests on existing soils-to-remain to assess subsoil and topsoil composition (percent silt, clay and loam), soil pH, percentage of organic matter fertility (nitrogen(N), phospherous(P), potassium(K) and micronutrients), salinity and percolation

Conduct all applicable soil infiltration tests in accordance with Chicago's Department of Water Management standards. Test locations shall be performed within close proximity and depth of the proposed infiltration locations for more accurate correlation between field and design data.

Suitable soil is crucial to plant health and longevity.

Program Development

Design team, including LA and CE: Confirm, as soon as possible, that all site program elements can be incorporated into the site plan as follows:

- within the allotted space
- in a safe and coordinated manner that meets the guidelines and the Chicago Zoning Ordinance

Deviations shall be identified for incorporation into Planned Development or Special Use exceptions where required. Any discrepancies with the preliminary site plan shall be brought to the attention of PBC Project Manager.

LA and CE must be included in the early phases of design to aid in site planning with the prototype building.

Budget Establishment

Design team, including LA and CE: Develop and review the budget for the following:

- line items
- quantities
- unit prices

These need to be sufficient to complete the project through the warranty period. Where possible and appropriate to client needs, a separate site maintenance budget shall be established.

Site Design

Design team, including LA and CE: Involve in early site design phases to incorporate:

- conservation and preservation of existing on-site natural resources such as vegetation and soil
- exterior spaces and features that complement the building
- cost-effective (life cycle costs), functional and low maintenance site elements
- stormwater management facilities
- maximized and consolidated landscape areas
- minimize hardscape areas
- safety and security
- durability
- adapt to climate change

This will minimize harmful impacts to the environment, the site and facility users.

Design team must collaborate early in process to produce an integrated site design.

Construction Phase

Construction Sequencing

Team meeting: The General Contractor (GC), Excavator, Landscape Contractor, ACR, Maintenance Agency, AOR, LA, CE and EC shall conduct a pre-construction meeting to review the GC's work plan. Items for presentation by the GC to include a plan for the following:

- construction sequencing
- tree protection fencing for existing trees-to-remain
- soil stockpiling
- appropriate time for site visits by the design team
- removal of site and construction debris
- inspection of sub-grade conditions prior to topsoil placement
- inspection of topsoil prior to placement of plant materials and after soil amendment
- subsoil and topsoil placement
- avoiding excessive compaction and its negative impacts on drainage
- plant layout
- any other site related issues

On-site meeting shall be held to review and coordinate site work.

Construction Administration

Material selection: The LA and Landscape Contractor, in conjunction with the Chicago Bureau of Forestry, shall tag all major plant material at its source. This includes:

- shade trees
- evergreen trees
- ornamental trees

The LA shall approve plant material sources for the following:

- shrubs
- perennials
- groundcovers
- vines

Site visits: The LA shall perform documented site visits per the specifications and identify any perceived or anticipated general work compliance problems. Since each site is unique and will have different construction-related issues, the amount of time needed for site visits may need to be adjusted in consultation with the AOR and ACR.

LA shall tag all major plant material that will be used on-site.

LA shall review plant layout prior to installation.

Construction Administration (continued)

Change orders and substitutions: Final site conditions may vary from the information gathered earlier in the design process. If these conditions are discovered by either the LA or the Landscape Contractor, the following steps shall occur, as needed:

- inform the ACR
- evaluate the conditions
- prepare a plan to remediate the condition or propose a substitution more likely to survive the new conditions,
- determine acceptable prices

Preliminary Acceptance: After the GC has performed and completed their own punch list review work and provided it to the ACR team and requests the design team for punch list review, the LA and CE shall perform the following services:

- conduct a site visit
- prepare a site report
- prepare a punch list
- use photography to supplement the text and clearly communicate the issues and punch list items, especially to those not familiar with the site or its conditions
- confirm that all pertinent storm drainage systems are correctly installed and are operating properly

Final Acceptance: When the GC deems that the preliminary punch list items have been satisfactorily addressed, the LA and CE shall perform the following services:

- conduct a site visit
- prepare a site report
- prepare a punch list
- use photography to supplement the text and clearly communicate the issues and punch list items, especially to those not familiar with the site or its conditions
- User Agency training

For Final Acceptance to be granted, all temporary maintenance must be performed and all warranties, product manuals and as-built drawings must be compiled and provided to the PBC.

LA shall review plant installations for preliminary and final acceptance.

Post-Construction Phase

Education and Training

Education: Education regarding non-traditional and newly developed site elements shall be incorporated into every site's post-construction requirements. This will help facility managers, maintenance staff and end users:

- gain insight into the design principles and benefits involved
- foster an appreciation for what has been developed
- aid in improved maintenance and longevity of the design element

Educating facility managers, maintenance staff and end users will foster an appreciation for the non-traditional site elements.

Training: Contractor is required to provide training to monitor and maintain site elements. The training shall be recorded and provided for future reference. The training shall take place at the same time as the building systems training. Proper training on required maintenance will facilitate the following:

- efficient operation of stormwater management facilities landscape and other site amenities
- prolong their useful life

Site Evaluation

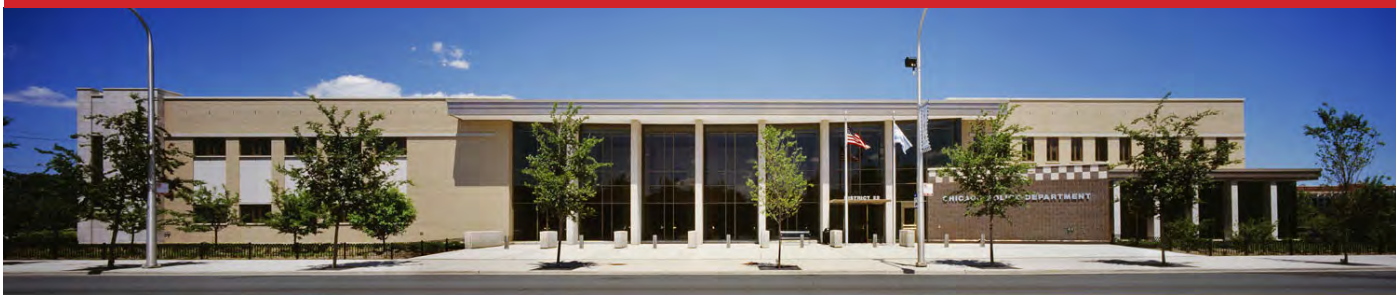
ACR Team: Eleven (11) months, as required by the warranty, and two (2) years after Final Acceptance has been granted, the site shall be visited, photographed and a written evaluation prepared discussing the relative success of the following:

- vehicular and pedestrian paving
- stormwater management facilities
- plants
- irrigation
- lighting
- site furniture
- other site amenities

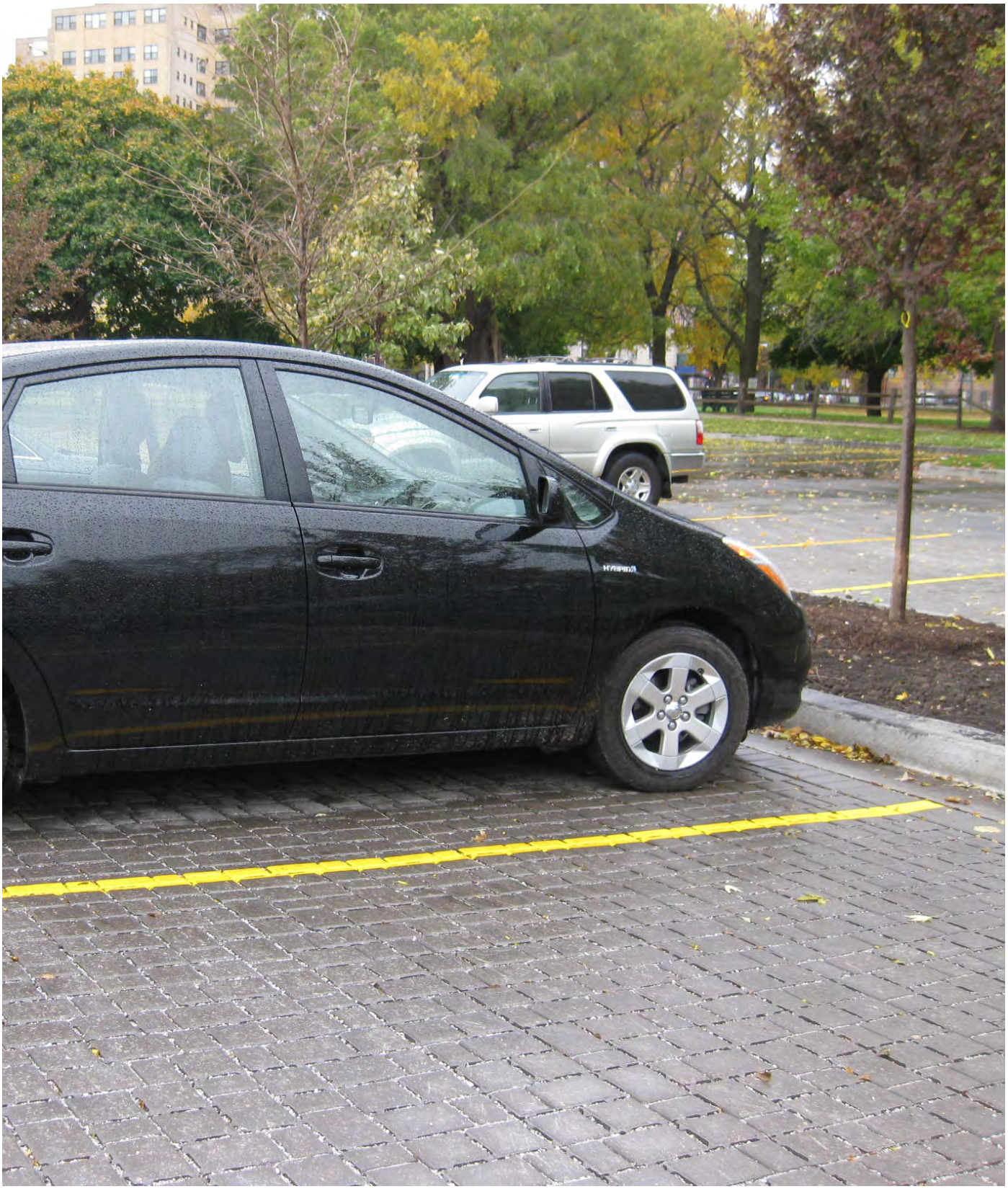
The PBC commissioning checklist shall be followed for the evaluation. The evaluation shall be distributed and archived in a manner so that trends and lessons in successful and unsuccessful site design can be learned and applied to future projects.

Completed projects will become part of an on-going Project Elements Database. Various components of each site will become part of a database, where evaluations will be conducted and future guideline recommendations will be developed. See Appendix A.

Site Components



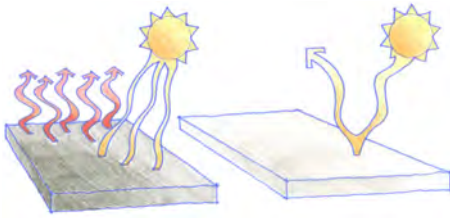
The utilization and organization of various site component options give the outdoor spaces of PBC facilities their form, function, aesthetics and performance capabilities. They also dictate maintenance requirements. Selection and placement of site components shall anticipate and attempt to deter security issues, misuse and damage typically encountered on public project types. Site program and context, municipal and User Agency regulation, sustainability targets, security issues, project budget and the desirable coordination of architecture, site furnishings, landscape and stormwater management design will all influence the selection and design of site components.



Paving

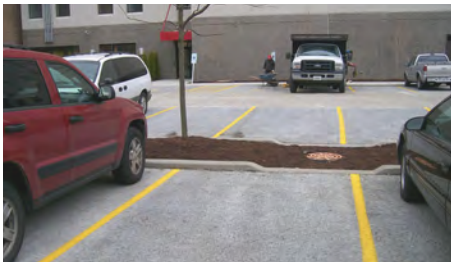
Overview

Since paved surfaces tend to increase the Urban Heat Island Effect (UHIE) and stormwater runoff, the areas designed for vehicular and pedestrian paving shall meet City zoning requirements, but be no larger. Selecting materials with a high albedo, or Solar Reflectivity Index (SRI), that reduce stormwater runoff is important in reducing a site's contribution to these urban concerns.



Selecting materials with high SRI is important in reducing a site's contribution to the UHIE.

All pavements shall meet ADA guidelines. Regardless of paving type, use of local and recycled content within the paving and as the base material is highly encouraged. Crush and stockpile existing on-site concrete for fill material when applicable. Coordinate shade tree locations in relation to the pavement to provide the maximum shading when full grown.

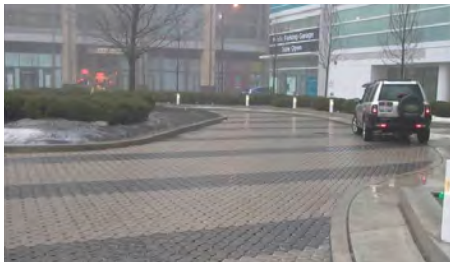


Paving that reduces stormwater runoff, such as porous concrete, shall be utilized.

Costs: Marginally higher costs for areas with permeable pavement solutions are offset by reduced stormwater quantity, improved stormwater quality, and a reduction in the City's urban heat islands. Higher costs are due to the new construction techniques and maintenance methods being utilized, but will be reduced as they become mainstream.

Vehicular Paving

Function: The main function of vehicular paving is to provide circulation routes and parking for automobiles and buses in a secure, safe and efficient manner.



Vehicular drop-off areas must be wide enough for vehicles to bypass a stopped car.

Design: On-site vehicular spaces shall be designed with the following characteristics:

- size appropriately for anticipated User Agency uses which may include delivery, maintenance and refuse vehicles
- encourage low speeds within the site
- provide a drop-off near the main entry of the building that is wide enough for vehicles to bypass a stopped car
- coordinate with bike and pedestrian traffic through the clear design of crosswalks, signage and other traffic devices
- optimize line of sight for pedestrian and vehicular safety
- provide space for snow storage after plowing
- anticipate the use of salt during the winter
- coordinate vehicle bumper overhang at parking space with adjacent pedestrian walk

Vehicular Paving
(continued)

Bus drop-off areas: The design of these areas shall comply with the following characteristics:

- delineated separately from automobile drop-off areas
- it shall be designed so that buses do not have to back up to exit the site if bus staging occurs within the site, as opposed to at the existing street curb

Elementary schools are typically neighborhood schools where the majority of students walk to school. For high schools, it is assumed that students will use public transportation.

- Elementary schools shall provide four (4) bus staging / drop-off spaces
- High schools shall provide two (2) bus staging / drop-off spaces

Elementary school students typically walk to the neighborhood school.

Service vehicle access: Another function for vehicular paving is to safely accommodate emergency, delivery and maintenance vehicles. Turning radii shall accommodate the standard anticipated vehicles for the following:

- loading zones
- trash enclosures
- service areas
- drop-off zones
- fire lane and fire department access requirements as mandated by code


Service vehicle access shall safely accommodate emergency, delivery and maintenance vehicles.

Number of parking spaces: The number of parking spaces for the various PBC site types will vary greatly, but shall not exceed the number required by Chicago Zoning Ordinance. Parking lot design shall include the following:

- the required number of ADA parking spaces
- designated parking areas for school drop off, low emission vehicles, carpool and electric car charging stations
- all parking lots shall meet the screening and fencing requirements for parking lots as prescribed in the Chicago Landscape Ordinance
- all school parking lots shall have lockable gates in addition to the required fencing unless this is in conflict with the emergency vehicular access requirements. Coordination of fencing and gates with the ACR and User Agency is critical early in the design process to meet zoning and other governing agency submittal deadlines.


Parking lots shall provide the required number of ADA parking spaces.

Pedestrian Paving

Function: The main function of pedestrian paving is to give people a way to move through a site in a secure, safe and efficient manner.

Design: The design of pedestrian paving areas shall be as follows:

- Common walks: concrete, standard or with integral color
- Special use areas: colored concrete or decorative pavers
- Entry plazas: surfaced with a decorative paving, coordinated with the building façade materials, to denote it as the main entrance

Common walks shall connect the following elements:

- main entry
- bike parking
- drop-off areas
- emergency exits
- parking including accessible parking spaces
- public sidewalks
- linkage required for fire safety egress

On school sites, bike lanes shall be designed with the following characteristics:

- differentiated from the pedestrian traffic either on the sidewalk or street
- connected to the bike parking

On school sites, the design of entry plaza areas have additional requirements as follows:

- sized to accommodate the entire student body. This space will be used for student queuing both before and after school

School entry plazas shall be sized to accommodate the entire student body.

Materials

Traditional paving: Portland Cement Concrete (PCC), or concrete, is the preferred material due to its strength and reflectivity as measured by the SRI. Concrete may be used in conjunction with integrally colored concrete.

Bituminous asphalt has a shorter useful life span in comparison to concrete. Also, as a petroleum product, it adversely contributes to the UHIE. It shall only be used when other options are not acceptable or practical.


Concrete is a preferred material due to its strength and reflectivity.

Materials
(continued)

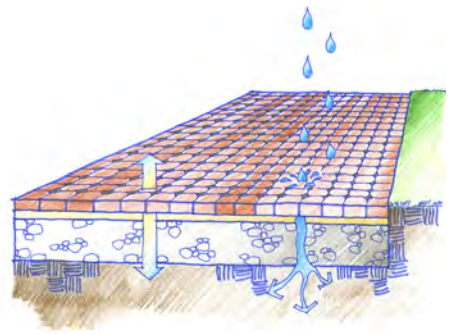
Permeable paving: Permeable pavers and permeable concrete paving reduce the quantity of stormwater runoff, increase the quality of stormwater runoff, maximize subsoil infiltration and minimize impacts to the City sewer system. Permeable paving use is encouraged for vehicular areas, including fire lanes, and pedestrian areas.

Design: Effective permeable pavement design relies on the following:

- soil infiltration tests in early design to understand opportunities
- pervious subgrade soil condition or an engineered subgrade condition with underdrains
- using raised curbs, horizontal separation from landscape beds, and thoughtful plant selection to help minimize problems with adjacent site materials, such as mulch and leaf debris, that will compromise the system's permeability
- an understanding of maintenance procedures

Additional design considerations include the following:

- Permeable pavers can be installed for the whole parking lot or in drainage strips, typically in the parking stalls
- The latest generation of paver systems, characterized by having narrower water intake areas along all sides of the paver, poses less of a trip hazard than earlier designs where water entered the paving only at the corners voids of each paver
- Shall have high albedo, or SRI



Permeable pavers increase the quality of stormwater runoff.

The latest generation of permeable pavers have narrower water intake areas along all sides.

Porous concrete reduces the quantity of stormwater runoff.

Permeable pavers can be installed as drainage strips in parking stalls.

Maintenance

Permeable pavement: Maintenance of permeable pavement includes the following:

- Routine semi-annual cleaning of permeable pavement is necessary to keep its functional porosity
- The resources needed to clean the pavers need to be addressed in the preliminary project budget
- The most effective cleaning method has not been determined since permeable pavement use is still a new concept. The Chicago Department of Transportation (CDOT) is studying this and currently considers the vacuum-sweeper or street sweeper, the most effective cleaning method. For smaller areas that don't have access to a street sweeper, a stiff bristle broom, rotary broom, leaf blower or wet-dry vacuum can be used
- No special blades or plows are required for snow plowing
- De-icing salt shall be used sparingly so it does not clog the voids
- Use of sand or other grit for traction is not allowed, it will clog the voids
- Site Owners are subject to City fines for non-compliance if water cannot infiltrate to the stone subbase if used to meet the requirements of the Chicago Stormwater Ordinance

Pavement cleaning is also beneficial, not only because it improves the site appearance and function of water infiltration, but because it restores the original SRI of the paving material.

Permeable pavers require routine maintenance to retain their porosity.

Permeable pavement cleaning is beneficial because it improves the function of water infiltration.

LEED Credits

SS Credit 6.1: Stormwater Design: Quantity Control
SS Credit 6.2: Stormwater Design: Quality Control
SS Credit 7.1: Heat Island Effect: Non-roof
MR Credit 3: Materials Reuse
MR Credit 4: Recycled Content
MR Credit 5: Regional Materials


© Steinkamp Photography

Stormwater Management

Overview

Stormwater Management Facility (SWMF): SWMFs must be designed in accordance with all local, state and federal standards. Geotechnical information shall be obtained and reviewed for the design of the SWMF. The SWMF shall complement the overall site design, proposed structures and landscape features. Proactive health, safety and overflow measures shall be incorporated into all SWMF design. The contractor shall provide as-built survey information to the CE for verification of construction and to the User Agency for information and record purposes. The minimum information documented shall meet the requirements of the latest edition of the Chicago Stormwater Ordinance.

Stormwater management goals include:

- utilizing non-structural Best Management Practices (BMPs) to the maximum extent possible
- incorporating and maximizing the use of BMPs to reduce or remove Total Suspended Solids (TSS) from entering the City sewer system
- diverting collected stormwater from the City sewer lines to the extent possible
- maximizing subsoil infiltration in order to minimize impacts to the City sewer system
- using collected stormwater for irrigation or other site and building functions
- recharging ground water
- educating end users on proper function and maintenance

Native plants: It is preferred to use native plants, but healthy, vigorous plants are a greater priority, so species shall be chosen based on their adaptability to the site conditions.

Costs: All SWMFs using at- or above-grade strategies are less expensive than below-grade options. Underground detention tanks or pipes shall only be utilized when necessary to meet Chicago Stormwater Ordinance requirements due to the high cost and lack of environmental benefits.

Collected stormwater can be used for irrigation.


Stormwater management maximizes subsoil infiltration in order to minimize impacts to the City sewer system.


Underground pipes shall only be utilized when necessary to meet ordinance requirements.


Underground detention tanks temporarily divert collected stormwater from the City sewer lines.

Naturalized Detention

Function: An area used to temporarily store stormwater on site and slowly release it at a controlled rate. These areas are intended to look and function as native wetlands and include native plants that grow both above and below the normal water level.

Potential benefits include the following:

- reduces rate and quantity of stormwater runoff
- filters silt, pollutants and debris
- reduces erosion of pond edges
- enhances appearance of detention ponds
- provides habitat for wildlife
- recharges ground water
- reduces storm sewer piping and structures
- can be used to reduce detention requirements

Naturalized detention areas look and function as native wetlands.

Filter Strip / Sedimentation Basin

Function: A vegetated area used to filter and temporarily store stormwater on-site, allow sediments to settle and slowly release the water at a controlled rate.

Potential benefits include the following:

- filters silt, pollutants and debris
- reduces rate and quantity of stormwater entering the system
- recharges ground water
- reduces storm sewer piping and structures
- can be used to reduce detention requirements

Vegetated filter strips and sedimentation basins filter and temporarily store stormwater on-site and allow sediments to settle.

Bioswale

Function: A shallow vegetated swale that is used to convey and slow the speed of surface stormwater runoff, allowing water to infiltrate into the ground instead of flowing directly into the sewers.

Potential benefits include the following:

- filters silt, pollutants and debris
- reduces rate and quantity of stormwater entering the system
- recharges ground water
- reduces storm sewer piping and structures
- can be used to reduce detention requirements
- helps reduce localized flooding
- provides location for wildlife habitat

Bioswales are landscape strips with plants that convey and slow the speed of surface stormwater runoff, allowing water to infiltrate back into the ground.

Filtration Basin / Rain Garden

Function: A vegetated landscape area that slows stormwater runoff from impervious surfaces such as roofs, sidewalks and parking lots, and allows it to infiltrate back into the soil.

Potential benefits include the following:

- provides attractive garden area to receive stormwater
- filters silt, pollutants and debris
- reduces rate and quantity of stormwater entering the system
- recharges ground water
- reduces storm sewer piping and structures
- can be used to reduce detention requirements
- helps reduce localized flooding
- provides location for wildlife habitat

Filtration basins and rain gardens are planted with native plants that slow stormwater runoff from impervious surfaces and allows it to infiltrate into the soil.

Erosion and Sediment Control

Function: Erosion and Sediment Control (ESC) measures shall be installed during the construction phase in accordance with the City of Chicago, local, state and federal requirements.

Potential benefits include the following:

- controls migration of soil particles into the ROW, adjacent properties, waterways and existing sewer systems
- filters silt and debris
- improves quality of stormwater entering the system

Measures shall be suitable and applicable for the project site. If the site area is limited, manual wash down of vehicles prior to exiting the subject property shall be considered.

Silt traps control migration of soil particles into the existing sewer system.

Cisterns

Function: A container used to collect and store rain water runoff from impervious surfaces such as building roofs and air conditioner unit condensation for reuse in building plumbing and mechanical systems or for irrigating plants.

Potential benefits include the following:

- reuses rain water
- reduces potable water use
- reduces rate and quantity of stormwater entering the system
- can be used to reduce detention requirements

Cisterns collect and store rain water.

Historic water tanks can be used as cisterns to reduce detention requirements.

Maintenance

Operation and Maintenance Plan: The Owner is required to submit an Operation and Maintenance Plan that is to be implemented during and after construction activity per the latest edition of the Chicago Stormwater Ordinance. The Owner is responsible for performing long-term maintenance of the BMPs as well as informing future Owners of such responsibilities. Refer to the Chicago Stormwater Ordinance for required minimum submittal and operations and maintenance practices.

LEED Credits

SS Credit 5.1: Site Development: Protect or Restore Habitat
SS Credit 5.2: Site Development: Maximize Open Space
SS Credit 6.1: Stormwater Design: Quantity Control
SS Credit 6.2: Stormwater Design: Quality Control
SS Credit 9: Site Master Plan
WE Credit 1: Water Efficient Landscaping
WE Credit 2: Innovative Wastewater Technologies
WE Credit 3: Water Use Reduction
MR Credit 4: Recycled Content
MR Credit 5: Regional Materials
ID Credit 1: Innovation in Design

Utilities and Associated Agencies

Overview

Utility lines and structures shall be designed to meet all local, state and federal standards. Obtain up-to-date survey information documenting all utilities and existing infrastructure within proximity of the project limits.

Coordination and discussions shall be performed with all applicable utility agencies and Owners to document locations of existing and/or future infrastructure, to coordinate existing facility protection measures during construction operations, and to coordinate new utility service connections. A list of agencies with existing infrastructure and jurisdiction in the Greater Chicago area are listed below, but are not limited to:

- City of Chicago Department of Water Management
  - Sewer Section
  - Water Section
- City of Chicago Department of Transportation
  - Office of Underground Coordination
  - Bureau of Electricity
  - Office of Emergency Management
- Illinois Department of Transportation
- Illinois Environmental Protection Agency
- Illinois Department of Natural Resources
- Metropolitan Water Reclamation District of Greater Chicago
- US Army Corps of Engineers
- Commonwealth Edison
- Peoples Energy
- AT&T, RCN, Comcast, Sprint, etc.

Routing of utility lines shall utilize the shortest logical runs possible, but not at the expense of compromising site design.

Location

Utility locations: Above ground utility structures shall be grouped for combined screening. Routing of utility lines shall utilize the shortest logical runs possible, but not at the expense of compromising the site design. Coordinate with landscape design, especially with regard to required landscaping. Special design considerations shall be made for trees that are to be planted near overhead wires.

Utility structures shall be coordinated with landscape design, especially required landscaping.

Screening

Screening: All above ground utilities shall be screened using fencing, walls and/or landscaping. The screened utilities shall be easily accessed for servicing and monitoring. Utilities adjacent to the building shall be screened with walls that are incorporated into the building's overall design.

Screening of site utilities shall reduce negative impacts while allowing them to be monitored and easily accessed.

Soil

Overview

The quality of the subsoil, topsoil and drainage system is directly correlated to the success of many site elements. Plant material, pavements and stormwater facilities all require compatibility with the subsoil, topsoil and drainage system in place directly beneath, adjacent or downstream. An understanding of each of the element's complete system requirements is important in order to specify the correct soil conditions.

Soil composition

Soil and topsoil composition: Existing soils shall remain on-site and undisturbed whenever possible in order to:

- reduce costs of hauling away and importing soil to the site
- minimize contributions to landfills
- protect the root zones of existing trees

The existing stockpiled soils shall be amended and made friable, as needed, to use as planting media.

Existing soil shall remain on-site whenever possible.

Grading: Within the drip line of existing trees, there shall be no grading (cut or fill) or the addition of any topsoil. These areas shall be protected throughout construction as identified on the required Demolition / Tree Protection Plan.

Amendments: Soils shall be amended per the specifications. The amendments, which can include compost, fertilizer, sand, etc, shall be of local origin and from a sustainable source. Use of locally-produced composted organic material shall be evaluated in lieu of Sphagnum Peat Moss, which is neither local nor sustainable.

Within the drip line of existing trees, there shall be no grading and the areas shall be protected throughout construction.

Topsoil

Placing topsoil and compost: Topsoil shall not be placed until the area to be covered has been shaped, trimmed and finished. All irregularities or depressions in the surface shall be filled or smoothed out before the topsoil is placed. If the existing surface has become hardened or crusted, it shall be aerated to provide a bond with the topsoil to be applied. The surface below the topsoil shall be compacted to maximum of 85% Modified Proctor. When compost is specified, it shall be placed at the specified depth on top of the topsoil. The LA and CE will verify that the proper topsoil and compost depths have been applied. After verification of proper depths, the Contractor shall completely incorporate the compost into the topsoil.

Topsoil (continued)

Finishing: The surface of the topsoil or compost/topsoil blend shall be free from clods, stones, sticks and debris and shall be according to the lines, grades and the minimum thickness shown on the plans. If requested by the LA or CE, one rolling of the entire surface shall be made.

Topsoil specifications: The topsoil areas shall meet the following requirements:

- ROW: Chicago Department Of Transportation (CDOT) soil specifications
- Internal planters: CDOT soil specifications or Chicago Park District (CPD) soil specifications
- BMPs: Chicago Stormwater Ordinance soil specifications
- Remaining landscape areas: CPD soil specifications

The CDs shall coordinate topsoil types and depths with the specifications.

Depth: Topsoil depths and overall volume shall be maximized to accommodate the mature size of the plant material selected. The following depths of topsoil are to be provided as part of the final site work:

- planting beds: 18" minimum
- turf areas: 6" minimum

Subsoil

Subsoil backfill: In all planting areas, subsoil backfill shall be native to the site, or shall be of a local (maximum 500 mile radius) non-limestone origin. In areas where the migration of subsoil into the upper subsoil or topsoil is a concern, a geotextile fabric shall be used in order to separate and constrain the subsoil material.

Subsoil backfill shall be native to the site or of a local non-limestone origin.

Structural soil: The use of structural soil is required in certain parkway situations per the Chicago Landscape Ordinance. The purpose is to provide enhanced root growth areas under paving adjacent to planting areas and to provide links between planting areas for root expansion.

Structural soil shall also be utilized for any large paving areas with incorporated trees plantings such as entry plazas.

Subsurface drainage

Subsurface drainage: Based on soil profile, subsurface drainage may be required to encourage long term plant health. Drainage can be achieved through three methods:

- horizontal trench drains
- drainage pipe
- vertically augured trenches

Trench drains and drainage pipes can be:

- linked to dry wells
- filled with gravel
- routed through bioswales
- routed into rain gardens
- a combination of the above

Subsurface drainage may be required to encourage long-term plant health.

LEED Credits

SS Credit 6.1: Stormwater Design: Quantity Control
SS Credit 6.2: Stormwater Design: Quality Control
WE Credit 2: Innovative Wastewater Technologies
MR Credit 5: Regional Materials

Landscape Design

Overview

Landscape design for PBC sites serves many purposes such as:

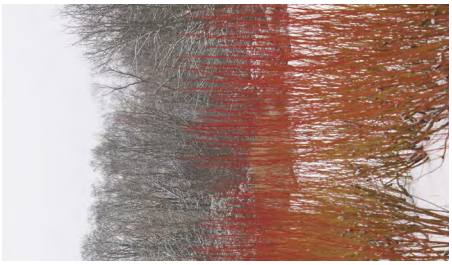
- providing human scale to large buildings
- complementing and softening site architecture
- grounding a building to its site
- providing screening of on-site and off-site elements
- providing habitat
- mitigating site conditions such as UHIE and stormwater management
- providing general site aesthetics
- providing educational opportunities
- increase the urban tree canopy

Landscape plantings connect a building to its site.

Design Objectives

Seasonal interest: Since most facilities are in use year-round, a high degree of seasonal interest shall be developed for the landscape design. This can be achieved through the following means:

- flowers
- foliage color
- fall color
- persistent fruit
- bark and twig color
- evergreen foliage
- plant texture
- plant habit



Seasonal interest is encouraged for the landscape design.

Plant health: Design to foster plant health and minimize maintenance and pruning. Plant maintenance is generally easier, and plant stress is reduced if plantings are given adequate space, both above and below ground, to grow. There is a direct correlation between tree lifespan, ultimate tree size and amount of tree maintenance to the allotted soil volume provided. Combining tree plantings into groves of trees, and having them share an overall larger root zone makes the plantings more sustainable and allows the trees to reach greater size than trees planted in individual tree pits with tree grates. This principle also applies to shrub, perennial and groundcover plantings. The design team shall incorporate these concepts into the site design and subsequent landscape plantings.

Persistent fruit and evergreen foliage can help create winter interest in the landscape and offer forage and shelter to wildlife.

Design Objectives (continued)

Pruning: Design to minimize maintenance and pruning. The following shall be coordinated to limit plant pruning to instances of removing dead or disfigured material:

- plant species
- cultivar selection
- plant placement

Security and safety: Plants in foundation planting beds and other areas where security is a concern shall be maintained at a maximum height of thirty inches (30") so that site lines are not compromised and the landscape does not offer hiding places. Plants within sight triangles of vehicular and pedestrian routes shall be maintained at a maximum height of twelve inches (12") tall in ROW. Trees that can be limbed up to a height of six feet (6') can be used in these areas, as long as critical sight lines are not obscured.

Biodiversity and enriched habitat: With the introduction of destructive insects and animals becoming more common, the concept of biodiversity has never been more important. In order to support this concept, effective site design shall consider the following:

- Inventory existing plant material to remain on-site and the plant material on the adjacent properties to see if any specific plant species are over planted in the area
- Design a layered and diverse community of plants on-site to create the opportunity to utilize the landscape as a mini-arboretum or learning lab that also provides the shelter and food for native and beneficial insects, birds and animal
- Native species and cultivars provide the most wildlife benefit for forage, habitat and other biodiversity-supporting services.
- Larger and consolidated landscape areas provide higher quality habitat
- Create a palette of plants for the site that is not so diverse that it creates visual confusion or requires overly complicated site maintenance
- Interpretive signage shall be incorporated to inform the surrounding community and end users of concepts used in the design

Landscape design shall incorporate plant biodiversity.

Native species and cultivars provide the most wildlife benefit for forage, habitat and other biodiversity support services.

Larger and consolidated landscape areas provide higher quality habitats.

Design Objectives (continued)

Microclimate modification: Landscape creation and placement can play a significant role in modifying and mitigating microclimates on project site. The best overall solution is holistic in design and involves the coordination of the entire design team. For example, the placement of trees to shade the south and west facades of the building shall be coordinated with the day-lighting goals of the building interior. Due to the significance of trees in urban places, the Chicago Trees Initiative was developed as a long-term approach to significantly expand the tree canopy in the City of Chicago. The opportunities for microclimate modification include:

- Shading of building facades and windows to reduce cooling needs and provide glare control
- Placement of landscape upwind to channel desirable winds, and to reduce winter winds and drifting of snow
- Shading of paved areas to reduce the UHIE, and create more hospitable outdoor spaces for end-users
- In conjunction with other BMPs, landscape can help to intercept, filter, absorb and transpire stormwater on site, decreasing the total amount of stormwater sent downstream while cooling the site in the process
- Maximization of landscape area provides the greatest mitigation for the UHIE

Shading of paved areas helps to reduce the UHIE.

Landscape Types

Planting themes: Themed garden areas can be used for the following:

- display, teaching and laboratory classroom areas
- inspiration for non-science related teaching
- library reading gardens that incorporate garden and plant types made famous in literature
- learning the alphabet or local history
- inspiring creative writing and art instruction
- growing edible plants to supplement on-site food preparation

Every themed garden in public areas shall have interpretive signage to identify and explain the garden theme. All themed gardens do best when there is an on-site advocate for their existence. Community and school groups can also adopt these areas.

Themed gardens can be used for interactive teaching.

Landscape Types (continued)

Edible gardens: The ACR and User Agency shall approve the use of edible gardens prior to designing. To be effective, edible gardens need to be designed to have the following attributes:

- containers or raised beds isolated by a liner from the subgrade to avoid possible contaminated soil
- containers filled with a combination of soil and compost to provide balanced plant nutrients
- dimensions of four foot (4′) wide maximum and eight foot (8′) long minimum with a soil depth of twelve inches (12″) minimum
- planted with a combination of edible annuals, perennials, vines, trees and shrubs

Edible gardens allow people to interact with nature.

Raised and curbed planting beds: Use raised plantings in curbed planters in the following situations:

- where the isolation of soils is required, for example, in edible gardens
- where soil depth cannot otherwise be achieved due to underground utilities or subgrade conditions
- where elevating the planting area will offer protection for plants or access to users of the area, i.e. accessible planters


Curbed planters offer plant protection while directing users around the landscape.

Campus Parks: Campus parks are large green spaces added to a Chicago Public Schools (CPS) campus that consist primarily of turf, trees, pathways, play structures and athletic fields. Most do not have garden components, but have spaces that can facilitate outdoor classroom activities and teaching opportunities that focus on plants and other nature based activities. Garden areas may be added to these parks, if deemed appropriate by the ACR or User Agency.

Native gardens: Native plants are often incorporated in landscapes. Many are tolerant of urban conditions and drought and require little or no fertilizer and pesticides. Native gardens can be designed to attract wildlife, butterflies and birds, create examples of specific ecosystems (woodland, savanna, prairie or wetland) for teaching and study and are important components of stormwater BMPs such as rain gardens and bioswales. The key to the success of native plants is to replicate site conditions as closely as possible to those found in their native environment. This includes soil and moisture regimes.


Native gardens attract butterflies and birds.

Landscape Types
(continued)

When identified as a native garden or used exclusively to create specific landscapes such as a woodland, savanna, prairie or wetland, native gardens come under visual scrutiny. To mitigate any negative impressions, the following design approaches shall be utilized:

- Choose species that will provide four season interest. Certain species, such as purple coneflower and prairie dropseed, are generally accepted as traditional perennials. These and others can form the basis of a natural area's plant palette. More obscure but curriculum-important species can be added in small quantities or later as the area matures
- Grasses shall be a large component (30% minimum) of the native area used as a unifying element that also provides winter interest and wildlife benefit if left in place as a habitat and food source
- Organize and mass the plants similar to a traditional perennial or mixed bed. As the species reseed, the effect will become more naturalized. By this time, the area will likely be an accepted part of the overall landscape
- Thoughtfully integrate natural gardens into the overall design of the site, with well-defined edges. This will make them more acceptable because they appear more intentional and not just poorly-maintained plants in left-over space
- Areas that are seeded, while being the most affordable to install, require the most stewardship and specialized maintenance to become established. Seeded areas also tend to draw the most negative comments while they mature from site users, maintenance staff, and the surrounding community
- The use of plugs or larger sized plants is strongly encouraged. They can decrease the time to produce an attractive landscape and standardize the maintenance to what is required for other perennials elsewhere on the site
- Interpretive signage shall be added to educate the community on the native plant species , how the area functions and the benefits of native gardens

Species shall be chosen that provide four season interest.

Integrate natural areas into the overall design of the site, with well-defined edges. Areas planted with plugs or larger sized plants are strongly encouraged.

Landscape Types (continued)

Vertical gardens: The use of vertical elements such as trellises, arbors, walls and fences in conjunction with vines shall be considered in the following situations:

- where horizontal space is limited
- to subdivide outdoor spaces so they are more in scale with their intended uses
- where screening or glare reduction is desired
- to provide shade and intercept solar radiation in areas where tree canopy cannot be provided
- to provide access to plantings in enabling garden settings
- to provide additional wildlife habitat
- to visually soften or screen large blank building walls and fences
- to shade and insulate masonry cladding, thereby prolonging its useful life

Vine species shall be chosen according to the following factors:

- means of attachment (tendrils, twining, etc.)
- sturdiness of the structure
- matching the mature size of the vine to its structure

Vertical gardens can be used where screening is desired.

Plant Selection

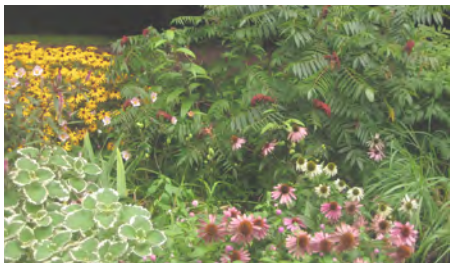
Species selection: Proper plant species selection involves a combination of the following factors:

- understanding the future environment that the plant will occupy
- the design intent and maintenance capabilities of the landscape of which it is to be a part
- the specific environmental preferences and tolerances of any given plant species or cultivar

Incorporating all of this criteria provides the greatest chance for success.

Specific factors to consider are the following:

- hardiness
- cultural and site requirements
- mature plant size



Hardiness, cultural requirements, and mature plant size shall be considered when choosing plant species.

Plant Selection
(continued)

Hardiness: USDA Zone 5b is the plant hardiness zone for Chicago. Chicago is a Zone 5 on the newly-created USDA Heat Zone Map. Plants are best able to cope with issues of hardiness when they are fully established and not under stress from other conditions such as drought or disease.

Chicago is in the USDA Zone 5b hardiness zone.

Cultural and site requirements: The assumption that most landscape material will receive minimal care once established.

Choose plant species according to the following factors:

- soil moisture conditions
- sun or shade conditions
- drought tolerance
- salt tolerance
- disease resistance
- insect and herbicide resistance
- amount of foot traffic
- snow piles

Plant species and locations shall anticipate many factors including salt tolerance, and piling of snow.

On tough sites, utilize plants with strong growing habits as long as the following non-invasive plant conditions are met:

- plant cannot seed into adjacent areas
- plant cannot spread via rootstock
- additional plant maintenance to keep plants from spreading or rampantly growing is acceptable to the User Agency

Include permanent barriers, such as walks, deep curbs or other root barriers to keep plants with aggressively spreading roots and rhizomes out of adjacent plantings.

Avoid the following plant species:

- species listed in Chicago's Invasive Species Ordinance
- species with thorns or poisonous fruit
- species that require dead-heading of flowers
- species that have unattractive foliage during one of the growing seasons, exceptions can be made for native areas and stormwater BMPs
- species that drop excessive and potentially dangerous fruit, such as the Ohio Buckeye tree

Plant Selection (continued)

Mature plant size: Understanding a plant's mature size, height and spread is crucial in landscape design. Properly chosen and sited plants that will not grow beyond their allotted space will greatly limit the amount of pruning required to only corrective pruning and the removal of deadwood. Conversely, there are conditions that require larger plant material, such as for a canopy of shade or high branching for clear site lines. When properly chosen, plants will mature over time and become an asset to the site and not overgrow their space impacting drives and walks, obstructing critical site lines and views or cause conflicts with utilities.

Maintenance

Landscape assessment: An assessment of the site landscape shall be performed each spring and fall. Any plants in poor condition or dead shall be removed and replaced. If the plantings have to continually be replaced, a LA, arborist, or forester shall be consulted to determine the following:

- cause of the plant failure
- propose a recommendation to correct the condition or select a plant substitution that meets the original design intent

Trees shall be pruned by a Certified Arborist.

Pruning: An arborist or City Forester shall assess all trees for pruning requirements. Trees shall be pruned by a Certified Arborist. Pruning is utilized to remove dead and diseased wood, correct rubbing or damaged branching, and remove crossed or errant branches that distract from the overall form typical of the plant species. In the spring, all overwintered, non-evergreen perennial foliage shall be removed. Pruning shall not be done at a time that will sacrifice the plants ability to flower properly. Masses of shrubs and groundcovers shall not be pruned as individual plants, but as a cohesive mass, in order to fill the area and to reduce the need for mulch in landscape beds as the plantings mature. Shearing of plant material is to be avoided unless a formal hedge or other formal appearance is the design intent.

Supplemental watering shall be performed in drought conditions.

Supplemental watering: Supplemental watering shall be performed for two reasons: in response to drought conditions and in conjunction with new and replacement plantings. It shall continue until the drought has broken or for 12-18 months for new and replacement plantings.

Maintenance
(continued)

Mulching: Maintenance regarding mulching entails only replacing mulch that has decomposed or washed away in planting beds and tree rings. Mulch shall never be placed directly against the bark of a tree. The depth shall never be thicker than three inches (3") in depth. The basal flare of all trees shall still be visible after mulching is complete. Care shall be taken to not bury or damage plant material when placing new mulch around existing plants.

Mulching maintenance entails only replacing mulch that has decomposed or washed away in planting beds and tree rings.

Fertilizing: Fertilization of landscape beds shall occur only if site observation or soil testing show a nutrient deficiency. In order to be as sustainable and non-leaching as possible, formulations of fertilizers shall be organic in composition and slow-release .

Pesticides: Pesticides shall not have to be applied, but if a pesticide does need to be applied, a non-toxic solution shall be the first course of action. If stronger measures are required, a pesticide with the lowest toxicity shall be used. The pesticide shall not remain persistent in the soil or on the plant surface, nor be able to migrate into adjacent areas.

In the fall, all fallen leaf debris shall be removed from the site.

Leaf collection: In the fall, all fallen leaf debris shall be removed from the site.

Snow removal: Damage from snow removal and salting operations shall be evaluated every spring for both hardscape and landscape areas. Damaged plant material shall be pruned or replaced, and debris left in snow deposit areas removed. If damage is consistently heavy, the following courses of action shall be taken:

- relocate the snow piling areas to more tolerant portions of the site
- reduce the quantity of salt or substitute other products such as potassium chloride or sand
- redesign areas with more salt tolerant paving and landscape materials, or landscape materials that are more economical to replace such as sod
- acknowledge that these damage levels are unchangeable and acceptable, and commit resources to repair them annually

LEED Credits

SS Credit 5.1: Site Development: Protect or Restore Habitat
SS Credit 5.2: Site Development: Maximize Open Space
SS Credit 6.1: Stormwater Design: Quantity Control
SS Credit 6.2: Stormwater Design: Quality Control
SS Credit 7.1: Heat Island Effect: Non-roof
SS Credit 9: Site Master Plan
WE Credit 1.1: Water Efficient Landscaping: Reduce by 50%
WE Credit 1.2: Water Efficient Landscaping: No Potable Water Use or No Irrigation
WE Credit 2: Innovative Wastewater Technologies
ID Credit 3: The School as a Teaching Tool
ID Credit 1: Innovation in Design

Lawns

Overview

Mown lawn areas are often a large component of sites. They consume large amounts of resources such as water, fertilizer, pesticides and labor in order to maintain them. The overall site design shall consider this and size mown lawn areas as needed to facilitate outdoor activities. Do not utilize mown turf as a default design solution for leftover outdoor areas. Traditional lawns have a certain degree of tolerance for shade, poor drainage and high traffic and may not be sustainable where desired. Other plant materials such as low groundcovers, no-mow lawn, i.e. Use no-mow fescue and Buffalo Grass or artificial turf in these areas and remaining spaces as they require less ongoing maintenance resources and are more tolerant to all conditions.

Lawn areas require a lot of resources and maintenance; therefore, use shall be limited.

Design Objectives

Species selection: Lawn area design shall be based on the following criteria:

- programmed use
- cultural conditions
- desired level of maintenance

No-mow turf: A more sustainable alternative to mown turf in low-traffic areas is to use a no-mow turf such as a fescue blend. Low-mow turf is generally slower to germinate and establish than traditional turf. To provide a quicker greening of the area, the no-mow fescue seed mix shall include Annual Ryegrass (*Lolium multiflorum*) at a general rate of .6 lbs / 1000SF or 25 lbs. / acre.

No-mow turf is more sustainable than mown turf and is encouraged in low-traffic, non sports field areas.

Artificial turf: Artificial turf shall be used on CPS high school combined football and soccer fields. Additional use of artificial turf for sport fields shall be determined by the User Agency.

Artificial turf type is dependent on the athletic events the field will be used for. Refer to PBC's *How to Choose Turf* Comparison Table, available through the PBC project manager, to determine which product shall be used for the artificial turf field.

Artificial turf shall be used on CPS high school combined football and soccer fields.

Maintenance

Clean-up and replacement: Prior to every mowing, the area shall be inspected and all trash removed that could be thrown by the mower or harm mowing equipment. In autumn, all fallen leaves shall be removed from mown lawn areas, prior to snow fall.

Mowing: To conserve resources, reduce pollution and encourage deep rooting, turf areas shall be maintained at the taller end of the range recommended for the species used. No more than 1/3 of the turf blade shall be removed at one mowing to decrease stress to the turf. No-mow turf shall be mowed once in the early spring to remove overwintering foliage and seed heads. It may be mowed again in late summer to remove seed heads. Areas and edges of turf that cannot be cleanly cut with a mower shall be cut with an edger / line trimmer, taking care not to injure adjacent trees or other plant material.

Fertilizing and pest control: Fertilizing and pest control programs shall be utilized on an as-needed basis, based on site monitoring, including visual inspections and soil testing. Prescribed applications of fertilizers, herbicides and pesticides may not be needed on a constant basis. They can create water and plant quality issues if they are over prescribed or migrate into adjacent stormwater facilities and other environments. When fertilizers and pesticides are required, selection of chemicals and the formulation of those chemicals shall be organic in composition and slow-release.

Core aerification: Mowed turf areas showing decline from soil compaction or excessive thatch buildup shall be core aerated in the fall or early spring.

Slit or drill seeding: Turf areas showing decline from excessive use shall be slit or drill seeded to thicken sparse lawns.

Only 1/3 of the turf blade shall be removed when mowing.

Areas and edges of turf that cannot be cleanly cut with a mower shall be cut with an edger / line trimmer.


Lawns showing decline from soil compaction or excessive thatch buildup shall be core aerated.

Maintenance (continued)

Supplemental watering: Supplemental watering may be necessary for three reasons:

- to keep lawn areas which receive high use (athletic fields) in useable condition
- in response to drought conditions (beyond what would simply cause turf to go dormant)
- in conjunction with new and replacement plantings

Supplemental watering continue until the drought has broken or for 3-6 months for new and replacement plantings.

LEED Credits

SS Credit 5.2: Site Development: Maximize Open Space
SS Credit 6.1: Stormwater Design: Quantity Control
SS Credit 6.2: Stormwater Design: Quality Control
SS Credit 7.1: Heat Island Effect: Non-roof
WE Credit 1.1: Water Efficient Landscaping: Reduce by 50%
WE Credit 1.2: Water Efficient Landscaping: No Potable Water Use or No Irrigation

Green Roofs

Overview

Chicago's commitment to green roofs is world-renowned. The benefits of green roofs are all in line with the mission of the PBC. These include the following:

- mitigating the UHIE
- managing stormwater run-off
- extending roof membrane life
- providing insulation and energy savings
- maximizing open space
- creating habitat
- improving aesthetics

Green roofs mitigate the UHIE and maximize open space.

System Types

Extensive green roof: This type of roof is characterized by the following:

- lightweight, shallow growing media depth, 3″-6″
- limited plant use
- with or without tray system
- temporary irrigation until established
- minimum maintenance after established

Extensive green roofs include a shallow growing media and require minimum maintenance after plant establishment.

Intensive green roof: This type of roof is characterized by the following:

- greater growing media depth, 6″-36″
- wide variety of plant options
- permanent irrigation is recommended
- requires regular maintenance

Intensive green roofs include a greater growing media depth and allow for a wide variety of plant options.

Which type of roof: An intensive type of green roof has proven more successful in the Chicago area due to its continuous volume of soil. Plants have the ability to send roots through the entire soil volume without the restrictions of tray partitions. Other factors influencing the final decision to use either type of roof include the following:

- weight restrictions
- budget (soil and plantings / structural support systems)
- anticipated roof uses, accessible to building users, viewable from inside the building, set up as an outdoor laboratory
- roof location relative to solar and wind directions
- the facility's maintenance expectations
- requirement of one warranty for roof system and green roof

Access to water on the roof is required and green roofs shall be watered as required during the establishment of the plants.

System Types (continued)

Accessible roofs: Accessible green roofs provide additional secure and programmable space for all PBC facilities. These areas can be used for break spaces for all facilities, reading rooms for libraries and schools, and outdoor classrooms and laboratories for schools. At a minimum, green roofs must be accessible for maintenance. Access to water shall be provided on every green roof.

Accessible green roofs provide additional programmable space.

Soils and Drainage

Soil composition: There are several successful soil mixes for green roofs. These are characterized by the following:

- lightweight
- contain a combination of mineral and organic ingredients capable of storing and delivering the moisture, nutrients and oxygen required for root and plant growth
- at a stable decomposition level so that soil volumes stay relatively constant

Soils mixes shall be coordinated with the design intent and program of the green roof, the weight the roof is designed to support and site conditions regarding anticipated wind and water. If alternate soil blends are proposed, soil shall be tested using German Landscape Research, Development and Construction Society (FLL) criteria.

Soil depths: Soil depth shall be four inches (4") minimum. Soils depths greater than 4" are encouraged.

Sub soil drainage and storage: Since permanent irrigation is not encouraged, a drainage mat with the capacity to store stormwater shall be part of the system cross-section.

Soil mixes shall be coordinated with the weight the roof is designed to support.

Soil depths greater than 4" are encouraged.

Planting Design

Species selection: Planting design for green roofs shall be governed by the following considerations:

- soil depth
- roof visibility
- the intended use for the roof
- orientation relative to solar and wind access
- maintenance to be provided

Species selection is critical in green roof success.

Maintenance

Monitoring: Green roofs shall be monitored weekly during the first two (2) years of establishment and monthly thereafter to address the following:

- watering needs
- weeding
- trash removal

LEED Credits

SS Credit 5.1: Site Development: Protect or Restore Habitat
SS Credit 5.2: Site Development: Maximize Open Space
SS Credit 6.1: Stormwater Design: Quantity Control
SS Credit 6.2: Stormwater Design: Quality Control
SS Credit 7.2: Heat Island Effect: Roof
IE Credit 9: Increased Acoustical Performance
ID Credit 1: Innovation in Design
ID Credit 3: The School as a Teaching Tool

Planting Accessories

Overview

A coordinated program and approach toward planting accessories will provide a strong foundation for the ongoing maintenance, health and visual attractiveness of the landscape.

Accessories

Mulch: To be the most beneficial to plant health, mulch shall be of organic composition. The use of gravel or other mineral or inorganic mulches shall be tempered and restricted to only those areas where organic mulches are not feasible (e.g. Bioswales where shredded hardwood mulch would float and be washed downstream or into stormwater inlet structures).

Mulch shall be of organic composition, aged, shredded and locally-produced.

Organic mulches shall have the following characteristics:

- be locally grown and produced
- be of uniform size
- be aged or composted shredded hardwood
- installed so that the basal flare of the tree is visible
- installed at a 3" depth that will suppress weed growth, create more consistent soil moisture and temperature conditions
- not be installed deeper than a 3" depth that will bury plants, deter water from penetrating into the soil, or harbor rodents or other non-beneficial animal life

Edging: The best type of edging for plant beds is dictated by the effect desired, the need for maintaining the same edge over time, and the initial construction cost vs. Annual maintenance costs.

Spade edging is the most basic edging type, either created mechanically or with a flat spade.

Spade edging is the most basic edging type. It is typically created mechanically on large sites, but a flat spade can also be used. The edge shall be re-established on an annual basis. It is difficult to maintain straight lines and formal or aligned layouts with this technique as the edges tend to creep over time.

Stone or concrete edging is only recommended in very formal areas.

Stone or concrete unit edging is only recommended in highly formal ornamental garden spaces where there is no concern about the ability for individual sections to be easily removed from the ground since there are no footings. Due to its relatively small unit size, this edging can conform to changes in both direction and grade.

Accessories (continued)

Tree grates and guards: Surrounding trees with paving and other hard surfaces presents a serious challenge to the long term health and viability of the trees. The goal in such situations is to provide the largest possible volume of continuous soil so the tree roots have access to sufficient amounts of water, nutrients and oxygen.

Tree grates shall have the following characteristics:

- 5'x10' in size
- 4'x6' or 5'x5 ' in size in constrained sites
- made of cast iron and with recycled content
- an expandable center hole to allow for future tree growth
- accessible
- a pattern that allows easy refuse clean up

In high use areas such as schools, where trees are likely to be damaged, tree guards shall be considered. Tree guards shall have the following characteristics:

- only be used in conjunction with tree grates to which they can be securely anchored
- expandable and removable for future tree growth
- made of steel
- coordinated with the tree grates and other site furniture

Tree grates shall be 5'x10' in size.

In high-use areas such as schools, tree guards shall be considered.

LEED Credits

SS Credit 6.2: Stormwater Design: Quality Control
MR Credit 4: Recycled Content
MR Credit 5: Regional Materials
MR Credit 6: Rapidly Renewable Materials

Irrigation

Overview

Irrigation systems are not encouraged for PBC landscapes. This is in order to conserve water and dispense with the maintenance required to keep systems functional and programmed properly.

Design Objectives

Temporary irrigation: All sites require irrigation during the 12-24 month establishment period after Final Acceptance. The cost for this shall be included into the overall project budget. Temporary irrigation systems can be provided in the following ways:

- by hand watering from building spigots, water trucks or fire hydrant meters
- by installing temporary irrigation systems which are removed at the end of the establishment period

To facilitate watering during drought periods, and to provide for general external water needs, wall mounted, weather-proof and lockable water spigots shall be provided along the building perimeter, spaced a maximum of 100' apart.

Temporary irrigation shall be used during the plant establishment period.

Permanent irrigation: If the site program dictates and the maintenance resources allow, a permanent irrigation system can be developed. LEED requirements outline a design approach which specifies the smart design of these systems with the following characteristics:

- water-saving layouts
- designing controllers and weather stations to deliver water in a precise and conservative manner
- programmed correctly for optimal performance
- ongoing assessment of the system's programming as site conditions change over time

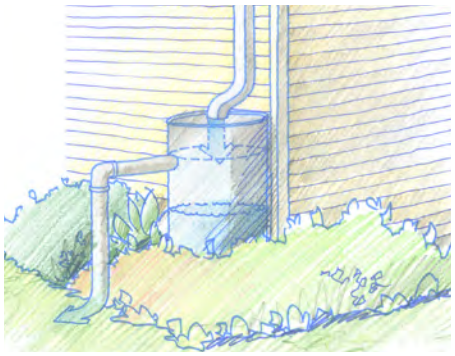
Water-saving layouts shall be used if a permanent irrigation system is installed.

Design Objectives (continued)

Water harvesting: Water harvesting from sites is encouraged through the use of above-or below-ground cisterns or rain barrels. Only high-quality water shall be harvested (not collected from areas with high concentrations of salt, fertilizer, herbicides or pesticides). Roofs and air conditioner unit condensation offer the best sources of high-quality stormwater for irrigation. An alternate potable water source is also required to supplement irrigation systems in the event of high demand or drought.

The design of cistern and rain barrel systems shall consider:

- size, appearance and location
- water collection to and outlet controls
- design of overflow, bypass and winterization features
- potential links to other cisterns or rain barrels on site
- preventative measures for adverse water stagnation that may result in mosquito and algae growth, i.e. store water a maximum of 72 hours
- thorough maintenance training and demonstration requirements



Water harvesting is encouraged through the use of rain barrels.

Roofs offer the best source of high-quality stormwater for irrigation.

LEED Credits

SS Credit 6.1: Stormwater Design: Quantity Control
WE Credit 1.1: Water Efficient Landscaping: Reduce by 50%
WE Credit 1.2: Water Efficient Landscaping: No Potable Water Use or No Irrigation
WE Credit 2: Innovative Wastewater Technologies
MR Credit 4: Recycled Content

Lighting

Overview

Safety and security: All exterior lighting serves the purpose of enhancing the safety and security of PBC facilities. New outdoor lighting shall conform to LEED and the Dark Sky Initiative goals regarding energy efficiency, light pollution, output levels, uniformity and lighting controls whenever possible. Photometrics and lumens shall meet the design criteria of the facility's use.

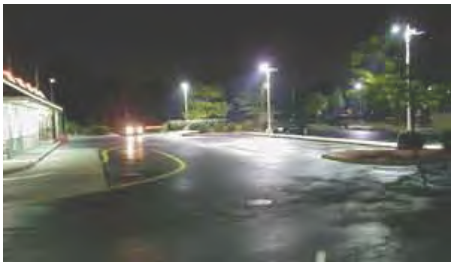
Non-essential lighting shall be placed on separate circuits or motion sensors to allow it to be turned off or dimmed when the site is not occupied. Utilize the most efficient lighting type for all site lighting and coordinate models to avoid redundancy or diminishing overall aesthetic design intent.

Non-essential lighting shall be placed on separate circuits or motion sensors to allow it to be turned off or dimmed when the site is not occupied.

Design Objectives

Exterior lighting: Light pole placement shall be based on the following criteria:

- Locations shall be generally between 10 to 15' from trees. This range shall increase or decrease depending on the spread of tree species proposed
- Heights shall be designed in coordination with the planned tree canopy, such that tree growth does not significantly affect light throw or required photometrics


Exterior light poles shall be Dark Sky compliant and placement shall be coordinated with the tree locations.

Bollard lighting: Bollard placement shall be based on the following criteria:

- Fixtures shall be chosen for their durability, and coordinated with adjacent site lighting and site furnishings
- Lights at building entries and drop-offs shall be placed far enough behind the curb and walks to protect them from opening doors and snow plowing operations
- Lights in landscape areas adjacent to walks shall be coordinated with the landscape plan so plantings do not block light, and avoid mowed turf so fixtures will not be damaged by lawn maintenance operations

Bollard lighting shall be placed in landscape areas adjacent to walks to light the path and be Dark Sky compliant.

LEED Credits

SS Credit 8: Light Pollution Reduction
EA Credit 1: Optimize Energy Performance
ID Credit 1: Innovation in Design

Fencing

Overview

Fencing to be provided for PBC sites falls under two categories:

- security
- screening

Fencing requirements of the Chicago Landscape Ordinance requirements shall be followed.

Design Objectives

Security fencing: Security fencing shall be provided, if warranted by the User Agency or the PBC. Security fencing shall be 4′ or 6′ tall depending on the User Agency's program. The fencing shall be black ornamental metal fence, greenscreen with plantings or wood if required by the Chicago Landscape Ordinance. Aluminum and hollow pickets are not allowed.

Security fencing shall be installed as required by the Chicago Landscape Ordinance.

An 18″ tall black ornamental metal fence shall be provided around all native landscapes to encourage their success by discouraging foot traffic and unauthorized mowing.

All fenced landscape areas shall have gate access at least 3′ wide.

Ornamental metal fencing is required around all native landscapes.

Screening Fencing: When screening with plant material is not viable, opaque screening metal or wood fencing shall be used to screen any objectionable views to or from the site, as permitted by the Chicago Landscape Ordinance requirements.

All ground-mounted transformers shall be screened by either a masonry wall or opaque wood or metal fence with locking gate. The screen wall or fence shall allow for access to the transformer. The height of the screen shall be 12″ above the height of the transformer with a maximum overall height of 6′.

Screening of trash enclosures and other outdoor storage facilities shall meet the Chicago Landscape Ordinance requirements.

Site Furniture

Overview

Site furniture for all PBC facilities shall be a coordinated and consistent family of benches, tables, bike racks, trash receptacles and flagpoles. They shall be neutral, timeless in design and available from multiple manufacturers. Ideally, they will have recycled content and be manufactured within the Greater Chicago Region. Site furniture shall be available in a variety of colors and in a durable finish which can be repaired. The final color selection shall compliment the materials and finishes of the facility for which they are proposed.

Site furnishings shall be a coordinated and consistent family.

Design Objectives

Benches: Benches shall have the following characteristics:

- 6′ or 8′ in length
- made of metal
- with center armrests
- located at major building entrances, drop-off points, and adjacent to play areas and athletic fields
- well anchored to pavements with tamper-proof hardware
- make provisions for accessible accommodations outlined in the building code, access and bench type

Site furniture shall be neutral and timeless in style.

Tables: Tables shall have the following characteristics:

- accommodate four people minimum and have fixed seating
- made of metal with a metal or composite table top
- included in any outdoor classroom and outdoor laboratory space
- included wherever outdoor dining is desired
- accessible
- used in secure areas

Trash receptacles: A minimum of one metal trash and one metal recyclables receptacle shall be provided at all major building entrances, activity areas and dining areas.

Benches shall be located at building entrances.

Bike racks: Bike racks shall have the following characteristics:

- located at every major entry to the facility
- quantity based on the facility's Full Time Employee (FTE) and LEED requirements
- located in secure areas of high supervision
- securely mounted with tamper-proof hardware

Connecting bike paths shall avoid or minimize conflicts with vehicular and pedestrian traffic, while anticipating major bike routes to the facility.

Bike racks shall be located at every major entrance to the facility.

Design Objectives (continued)

Flagpoles: The User Agency's program will dictate the number and location of flagpoles. The poles shall have the following characteristics:

- 25' minimum height
- ground set
- tapered aluminum
- a manually operated internal halyard
- a keyed cleat box

Paved access to each pole must be provided to facilitate the raising and lowering of each flag. Flags must be lit per the United States Flag Code or manually raised and removed every day.

Flagpoles shall be located at the main entry of all facilities.

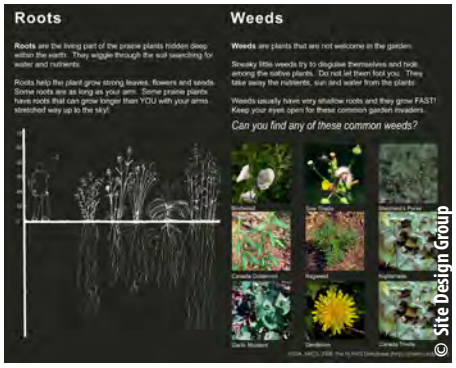
Bollards: The use of bollards or other sturdy elements shall be considered near main building entrances or other areas of major congregation adjacent to parking areas or streets for the following reasons:

- as a way to direct and separate vehicular from pedestrian traffic
- as a means of protection against potential harm from out-of-control vehicles or other hazards


Bollards can be used to separate vehicular and pedestrian traffic.

Signage: Interpretive signage shall be provided for all BMPs including but not limited to rain gardens, bioswales, green roofs, native gardens and permeable pavement. Signs shall explain how the area functions and the benefits of each sustainable design element. Additional signage for other sustainable features of the facility may be developed as program and budget allow. The design of interpretive signage shall be reviewed with the end user group. Television monitors in the lobbies or other common areas can also be utilized to help interpret important site features.

Signs shall be in visible locations. The signs shall be a combination of text and images, in full-color or monochromatic, and digitally printed. The sign panel shall be weather- and vandal-resistant to provide a strong and easy-to-clean exterior sign. It shall be mounted on a powdercoated steel frame.



Interpretive signage shall be provided for all native landscape areas.

LEED Credits

SS Credit 4.2: Alternate Transportation: Bicycle Use
SS Credit 5.2: Site Development: Maximize Open Space
MR Prerequisite 1: Storage & Collection of Recyclables
MR Credit 4: Recycled Content
MR Credit 5: Regional Materials
MR Credit 7: Certified Wood
ID Credit 3: The School as a Teaching Tool

Outdoor Learning Spaces

Overview

All areas of the site have potential to provide educational lessons to students and the community. Specifically, there are opportunities to design exterior spaces that can be programmed to host class activities in a passive way or even add to the curriculum in an interactive sense.

Design Objectives

Outdoor classrooms: Outdoor classrooms can provide an outdoor space for teaching. An outdoor classroom shall accommodate the following characteristics:

- minimum of 30 students
- shade shall be provided by trees, or overhead structures
- adequate seating with universal access and seating provisions as required by code
- access to power and data

Outdoor classrooms can host class activities.

Outdoor reading rooms: Outdoor reading rooms shall accommodate the following characteristics:

- adjacent to library functions, in a secure, visible and easily monitored area of the site
- quiet area of the site separated from the parking lot
- plantings shall be of four-season interest, and help buffer the area, while not compromising security or supervision
- shade shall be provided by trees, or overhead structures
- adequate seating with universal access and seating provisions as required by code
- lighting
- sized for both individuals and small groups

Outdoor reading rooms shall be in a quiet area separated from the parking lot.

The size of the area can vary greatly, but shall be a minimum of 200 square feet.

Design Objectives (continued)

Outdoor laboratories: Outdoor laboratories shall accommodate the following characteristics:

- provide interactive opportunities for learning
- situated in highly secure and fully accessible areas of the site designed for this purpose, such as green roofs, internal courtyards or fenced in areas adjacent to the building due to the special displays, exhibits and equipment likely to be used
- if not in a secure area, shall utilize elements that are vandal-proof, or can easily be relocated and stored
- access to power and data
- resilient surfacing able to be cleaned quickly after class use

These areas cannot be fully programmed at the time of building construction, since building end user staff will likely not be available during the design process for program input. Therefore, laboratory elements shall be highly flexible in their design, or left to later design and installation. If equipment cannot be left outdoors, lockable storage areas adjacent to the space or immediately inside the building shall be developed.

Typical activities in outdoor laboratory spaces could include:

- growing areas for plants raised by students
- permanent exhibit areas showcasing various ecosystems
- weather monitoring equipment
- science experiment space
- artwork space
- areas for temporary student art displays
- student performances
- ecosystem / plant propagation education

Outdoor laboratories shall provide interactive opportunities for learning.

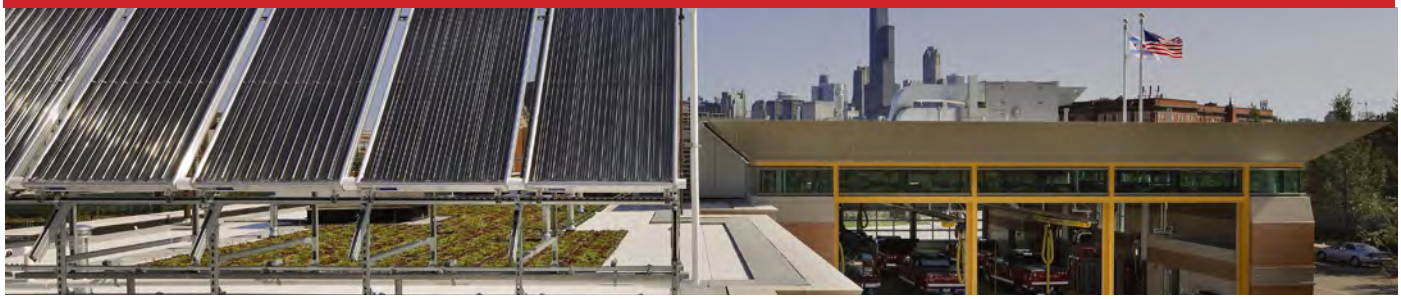
Outdoor laboratories can include growing areas for plants raised by students.


Ecosystem education can occur in outdoor laboratories.

LEED Credits

ID Credit 1: Innovation in Design
ID Credit 3: The School as a Teaching Tool

Looking Forward



Innovation in site design and sustainable technologies are occurring at an ever-greater pace, and current technology is constantly improving. Today's theories are soon tomorrow's standard practices. The following items are, at this time, still unproven in the Chicago marketplace, but appear promising and worthy of discussion and perhaps limited experimentation and evaluation for future projects.

Looking Forward

Design Objectives

LED street and parking lot lighting: Benefits include the following:

- energy efficiency
- long lamp life

Challenges include the following:

- finding multiple sources for all products for public bid

Green walls: Benefits include the following:

- mitigating the UHIE
- providing insulation and sound-proofing
- maximizing open space
- creating habitat
- improving aesthetics

Challenges include the following:

- durability
- plant placement
- irrigation
- appropriate non-invasive plant selection for propagation and long-term success
- required maintenance

On-site composting: Benefits include the following:

- on-site soil amendment
- decreased removal costs

Challenges include the following:

- education / investment by end users is not known at the time of design

Electric car plug-in stations: Benefits include the following:

- clean air
- life cycle cost savings
- energy savings

Challenges include the following:

- electric cars not readily available
- initial cost

Green walls are a new and innovative technology and, with proper research, may be incorporated into future projects.

Composting bins decrease removal costs.

Design Objectives
(continued)

Wind power: Benefits include the following:
- renewable energy
- clean air
- life cycle cost savings
- energy savings

Challenges include the following:
- technological efficiency
- initial cost

Solar power: Benefits include the following:
- renewable energy
- clean air
- life cycle cost savings
- energy savings

Challenges include the following:
- technological efficiency
- initial cost

Power cogeneration: Benefits include the following:
- clean air
- life cycle cost savings

Challenges include the following:
- timing issues
- initial cost

Reuse of fill materials: Benefits include the following:
- conserves resources
- diverts materials from landfills
- life cycle cost savings

Challenges include the following:
- state law

Structural cell system: Benefits include the following:
- ability to grow larger trees
- allows stormwater infiltration
- provides stormwater storage

Challenges include the following:
- coordination with subgrade and utilities
- initial cost

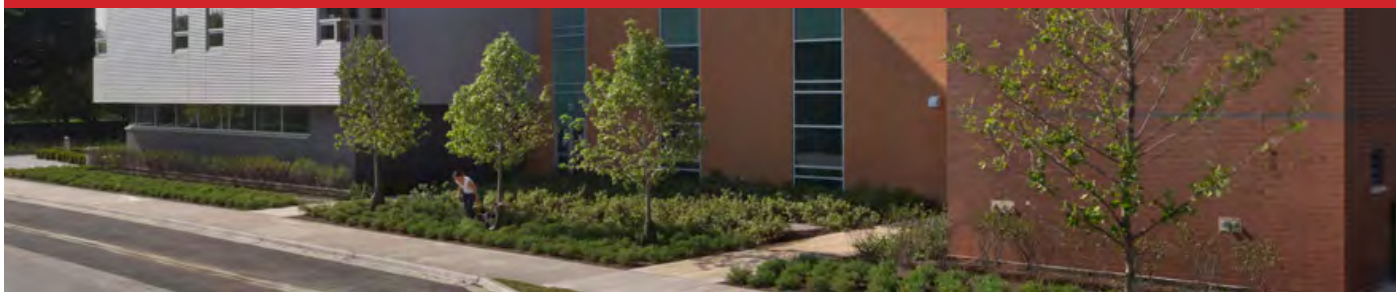
Wind power provides renewable energy while helping to protect the environment.

Solar power is a renewable energy and can reduce energy costs.

Structural cell systems provide the necessary soil capacity for trees to grow larger.


© Okrent Associates

Appendices



Appendix A: Project Elements Database

Innovations in architecture, site design and engineering, and product development are all helping shape PBC built facilities, creating higher-quality facilities for PBC, their clients and end-users. With newly constructed facilities now on-line, what is needed is a way to gather, analyze and disseminate information regarding these innovations so we can all become aware of which elements are truly creating long-term value and which elements need further review and revision or shall be discontinued due to poor performance.

PBC is interested in conducting case studies and creating a database of building and site elements that will help educate those who program, design, manage and maintain PBC facilities. Anyone interested in conducting or compiling the data for the case studies shall contact PBC. The elements to be included in the case studies currently include:

1. Green roofs
    a. Extensive (plugged tray systems)
    b. Extensive (pre-grown tray systems)
    c. Extensive (non-tray systems)
    d. Intensive systems
    e. 50% Extensive or Intensive system
2. Bioswales
    a. With supplemental storage pipes
    b. Without supplemental storage pipes
3. Vegetated Filter Strips
4. Rain Gardens
5. Native planting areas
    a. Prairie
    b. Wetland
    c. Savanna
6. Lawns
    a. Artificial Turf
    b. No-mow Turf
7. Vertical gardens
8. Permeable Paving
    a. Vehicular areas
    b. Pedestrian areas
    c. Poured-in-place, modular (concrete, clay)
9. Cisterns
    a. Above ground
    b. Below ground
10. Learning Garden
11. Outdoor Classrooms
12. Other

Below is a preliminary list of past PBC Projects with sustainable features. The list is in-progress and will be updated as more data is collected. The example installations listed below are for reference and have not been evaluated.

1. Green roofs
   a. Extensive green roof, seeded sedum mix, non-tray type over inverted roof system, approx. 10% extensive green roof
      i. Claremont Academy, CPS, Completed 2004
      ii. Edward K. "Duke" Ellington Elementary School, CPS, Completed 2005
      iii. Tarkington Elementary School, CPS, Completed 2005
      iv. Langston Hughes Elementary School, CPS, Completed 2009
      v. Mark T. Skinner West Elementary School, CPS, Completed 2009
   b. Extensive green roof, sedum mix, tray system, approx. 10% extensive green roof over modified bituminous roof system
      i. Jorge Prieto Math & Science Academy, CPS, Completed 2009
      ii. Irene C. Hernandez Middle School for the Advancement of the Sciences, CPS, Completed 2009
   c. 50% extensive green roof, sedum mix
      1. Federico Garcia Lorca Elementary School, CPS, Completion in 2010
      2. Calmeca Academy of Fine Arts and Dual Language, CPS, Completion in 2010
      3. West Ridge Elementary School, CPS, Completion in 2010
2. Bioswales
   a. With supplemental storage pipe structures
      i. Mark T. Skinner West Elementary School, CPS, Completed 2009
   b. Without supplemental storage pipe structures
      i. Jorge Prieto Math & Science Academy, CPS, Completed 2009
3. Native Planting Areas
   a. Westinghouse High School, CPS, Completed 2009
   b. Langston Hughes Elementary School, CPS, Completed 2009
   c. Jorge Prieto Math & Science Academy, CPS, Completed 2009
4. Vertical Gardens
   a. West Humboldt Park Branch Library, CPL, Completion in 2010
   b. Greater Grand Crossing Branch Library, CPL, Completion in 2010
   c. Little Village Branch Library, CPL, Completion in 2010
   d. Dunning Branch Library, CPL, Completion in 2010
   e. 31st Street Harbor, CPD, Completion in 2011
   f. Engine Company 109, CFD, Completion in 2010
5. Permeable paver systems
   a. Pedestrian areas
      i. Langston Hughes Elementary School, CPS, Completed 2009
      ii. Federico Garcia Lorca Elementary School, CPS, to be Completion in 2010
   b. Vehicular areas
      i. Federico Garcia Lorca Elementary School, CPS, to be Completion in 2010

6. Cisterns
    a. Mark T. Skinner West Elementary School, CPS, Completed 2009
    b. Langston Hughes Elementary School, CPS, Completed 2009
    c. West Ridge Elementary School, CPS, Completion in 2010
7. Learning Gardens / Outdoor Classrooms
    a. Langston Hughes Elementary School, CPS, Completed 2009

Appendix B: Online Resources

Chicago 2010 Stormwater Management Ordinance Manual *http://www.cityofchicago.org/content/dam/city/depts/water/general/Engineering/SewerConstStormReq/2010StrmWtrMnul.pdf*

Chicago Building Code *http://www.amlegal.com/library/il/chicago.shtml*

Chicago Climate Action Plan *http://www.chicagoclimateaction.org/filebin/pdf/finalreport/CCAPREPORTFINAL.pdf*

Chicago Department of Environment *http://www.cityofchicago.org/city/en/depts/doe.html*

Chicago Department of Zoning and Land Use Planning *http://www.cityofchicago.org/city/en/depts/zlup.html*

Chicago Department of Streets and Sanitation, Bureau of Forestry *http://www.cityofchicago.org/city/en/depts/streets/provdrs/forestry.html*

Chicago Department of Transportation *http://www.cityofchicago.org/city/en/depts/cdot.html*

Chicago Department of Water Management *http://www.cityofchicago.org/city/en/depts/water.html*

Chicago Fire Department *http://www.cityofchicago.org/city/en/depts/cfd.html*

Chicago Adding Green to Urban Design Plan *http://www.cityofchicago.org/city/en/depts/zlup/supp_info/green_urban_design.html*

Chicago Mayor's Office for People with Disabilities *http://www.cityofchicago.org/city/en/depts/mopd.html*

Chicago Park District *http://www.chicagoparkdistrict.com*

Chicago Police Department *http://www.cityofchicago.org/city/en/depts/cpd.html*

Chicago Public Library *http://www.chipublib.org*

Chicago Public Schools *http://www.cps.edu/Pages/home.aspx*

Chicago Trees Initiative *http://www.chicagotrees.net*

Chicago Zoning Ordinance *http://www.amlegal.com/library/il/chicago.shtml*

Guide to the Chicago Landscape Ordinance *http://www.cityofchicago.org/content/dam/city/depts/zlup/Code_Enforcement/ChicagoLandscapeOrdinanceGuide.pdf*

Illinois Accessibility Code *http://www.cdb.state.il.us/forms/download/iac.pdf*

Public Building Commission of Chicago *http://www.pbcchicago.com*

The Sustainable Sites Initiative *http://www.sustainablesites.org*

United States Green Building Council *http://www.usgbc.org*

Appendix C: Maintenance Program Resources

After School Matters *www.afterschoolmatters.org*

After School Matters is a nonprofit organization that offers Chicago teens innovative out-of-school activities through its science, sports37, tech37, words37 and nationally-recognized gallery37 programs.

Chicago Conservation Corps (C3) *http://chicagoconservationcorps.org*

The mission of the Chicago Conservation Corps is to recruit, train and support a network of volunteers who work together to improve the quality of life in our neighborhoods through environmental service projects that protect our water, clean our air, restore our land and save energy. C3 is an initiative of the Chicago Department of Environment, which in collaboration with Partner organization supports C3 Leaders by providing training, technical assistance and resources.

Chicago Trees Initiative *http://egov.cityofchicago.org/chicagotrees/cti.html*

The Chicago Trees Initiative is a city-wide, public-private effort to plant, care for and advocate for trees. This means many more trees will be planted in our great city, which is already known for its green urban spaces. Every Chicago resident and indeed, anyone who cares about trees has an important role to play. The goal invites all of us to be involved in planting and caring for trees on both public and private land.

Green Street Project *http://www.greenstreetproject.org*

Green Street Project is a unique, Chicago-based not-for-profit corporation that designs, incubates, and supports community engagement programs. Green Street Project's mission is to build more connected, compassionate and inclusive communities.

Student Conservation Association (SCA) *www.thesca.org*

SCA provides high school-aged members with hands-on conservation service opportunities. SCA's Community Programs offers year-round training and service opportunities that engage diverse high school students in major U.S. Cities including Chicago who may lack access to the natural environment and green job opportunities.

Mayor Richard M. Daley, Chairman

Erin Lavin Cabonargi, Executive Director

BOARD OF COMMISSIONERS

Bishop Arthur M. Brazier
Adela Cepeda
Dr. Robert B. Donaldson II
Benjamin Reyes
Mary Richardson-Lowry
Cynthia M. Santos
Samuel Wm. Sax
Todd H. Stroger
Gerald M. Sullivan
Bryan Traubert

50 W. Washington St., Room 200
312.744.3090 • e-mail: pbc@pbcchicago.com