



Sarah E. Goode STEM Academy

CEFPI James D. MacConnell Award Sarah E. Goode STEM Academy

1. Executive Summary

The Public Building Commission (PBC), in partnership with its clients, builds and renovates quality public facilities throughout Chicago's communities to enhance education, public safety and recreation. The PBC's almost \$2 billion program includes schools, firehouses, police stations, libraries and parks. To that end, the PBC and the Chicago Public Schools (CPS) have a long-standing partnership and shared vision to create new educational facilities that foster and develop youth throughout the City of Chicago. Through an innovative and historic capital program known as Modern Schools Across Chicago (MSAC), the strength and commitment of that partnership resulted in the completion and opening of 18 new school projects and the scheduled completion of the final school in Fall 2013 (Attachment A). One of these school projects includes the Sarah E. Goode STEM Academy completed in Fall 2012, which we have focused on for the purposes of this award submittal.



Sarah E. Goode STEM Academy

Before we go into the many award-winning attributes of the Sarah E. Goode STEM Academy, it is important to share important details on the success of the MSAC program. The MSAC program is financed by a combination of Chicago Public School bonds and Tax Increment Financing (TIF) funds as a means of overcoming an absence of state funding and ensuring the commitment of both the Chicago Public Schools and the City of Chicago to the successful completion and operation of these new schools.

The Program delivers new and modernized schools for Chicago Public Schools (CPS) and benefits the District's 409,279 students, their parents and their teachers. Neighborhoods are improved by this Program, which not only strengthens academic achievement but also provides much needed meeting space, recreational space, and green space in communities across the City. Oversight of this ambitious Program is provided by the Public Building Commission of Chicago (PBC) and its 11 member Board, Chaired by the Mayor of Chicago. As responsible stewards of public funds, the PBC has implemented practices that encourage economic sustainability and community use opportunities within each of the facilities the PBC develops.



Sarah E. Goode STEM Academy

The construction of new facilities and the renovation of existing facilities in the MSAC program arise against the backdrop of a large and diverse U.S. city with dozens of unique neighborhoods. The planning and development of each school demands an awareness of the community where it is to be built, and the unique population of students to be served. In the implementation of the MSAC program, the PBC has brought forth unique design elements and environmentally sustainable design strategies that focused on the adaptability of prototypical designs to these individual communities and students.

Schools have to function for today's immediate uses, as well as for potential new uses in the decades to come. It is with these expectations for change that the schools are designed and built. The features of the schools being developed under the MSAC program include advanced electronic infrastructures and updated technology while also incorporating the flexibility to adapt to new needs and evolving technology.

The new schools, like all PBC construction projects, are designed to achieve a minimum "Silver" level LEED certification from the U.S. Green Building Council. To date, 12 new schools have achieved LEED Gold certification, two new schools have been awarded LEED Silver certification, and four new schools are registered and pending LEED certification. Some sustainable design features include green and reflective roofs to combat the "urban heat island" effect; aggressive stormwater management plans; low-flow plumbing fixtures; low-emission materials; the use of recycled materials in the buildings' construction; recycling of construction waste; enhanced natural light; high-efficiency heating and cooling systems; and native and adaptive landscaping. By including environmentally sustainable design elements, schools achieve long-term results of reduced operating costs and preservation of our natural resources; and the PBC leads by example to encourage private construction projects to also include sustainable design elements.



Native and adaptive landscaping at Sarah E. Goode STEM Academy



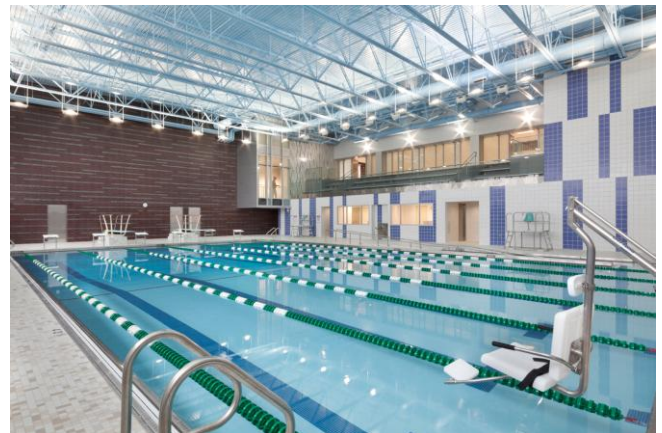
Sarah E. Goode STEM Academy

The PBC has a rich history of community participation in its programs and projects, with a commitment to economic opportunity and human sustainability. The MSAC program has a direct impact on construction job creation in the City of Chicago. The PBC promotes economic opportunity and human sustainability, and enforces contract provisions for City residency, community hiring, minority- and women-owned worker and business participation program, bid incentives for apprentice utilization and local business participation standard. These policies aim to put people to work in the community and the City of Chicago at large.

2. Scope of Work

The new Sarah E. Goode STEM Academy implements the new CPS Urban Model High School (UMHS) prototypical design to serve 1,200 students. The three-story, 207,000-square-foot high school features steel frame and masonry construction and includes:

- Standard academic classrooms
- Visual and performing arts classrooms
- Two distance learning labs
- Scene shop
- Dressing room
- Green room
- College resource center
- Library/media resource center
- Gymnasium
- Natatorium with six lane pool
- Fitness weight room
- Kitchen
- Administrative spaces
- Outdoor Athletic Amenities:
 - Artificial Turf Field with Running Track and Bleachers
 - Soccer & Football Field with Bleachers
 - Baseball Diamond
 - Softball Diamond
 - Track & Field Venues
 - 5 Tennis Courts
- Parking Lot
- Entry Plaza
- Outdoor Reading Garden
- Green and Reflective Roof



Natatorium with six lane pool



Artificial turf field with running track and bleachers



Sarah E. Goode STEM Academy

The prototype design was also modified to include lab and classroom spaces to implement STEM (Science, Technology, Engineering & Math) education programming, in keeping with Mayor Emanuel's commitment to educational and job opportunities for CPS students. STEM education programming focuses on technology and career readiness while earning college credit. To facilitate STEM based learning opportunities, additional programming was designed in specialized lab spaces within the school.



STEM computer lab

The PBC's management approach to capital construction in the public sector integrates a small but highly capable career workforce with the depth, flexibility, and talent of the Rise Group (now ARCADIS-US), the PBC's Program Manager. The PBC/Rise ARCADIS team has established an enviable record of cost and schedule performance, program and project controls, and design innovation. For example, since the team's inception in 2008, dozens of new municipal facilities, including new schools, have been delivered with a construction value of nearly \$1B; 8.17% under program budget representing a variance savings of \$184M for our clients. The Program enjoys a change order rate across all project types of 2.8%, well below the accepted industry standard for building programs of this magnitude. The Sarah E. Goode STEM Academy experienced a change order rate of 3.3%, a figure which includes a major client requested change to create STEM Academy classrooms not envisioned in the original scope of work.



Sarah E. Goode STEM Academy

Project managers usher projects through the planning phase, design phase, and construction phase. On-site construction teams are organized traditionally with a Project Manager, an Assistant Project Manager if warranted by project size, and a Document Controls Manager. All project teams are supported in the field by program-wide safety, quality, and MEP expertise. Project managers are responsible for all aspects of their projects including budget, cost, and schedule performance, construction quality, and reporting. Project execution is monitored by a Director of Construction through Daily Reports, Weekly Reports, and periodic project reviews. Program execution is monitored by monthly reporting on key performance indicators and variance reporting. Centralized staff provides planning, design, environmental, procurement, controls, and legal support.



Construction at Sarah E. Goode STEM Academy

Impressively robust program and project controls provide real-time budget, cost and schedule information to our managers, our clients, and our governing board; ensuring transparency, enhancing accountability, and strengthening confidence in the public process. The PBC uses Primavera Contract Manager (Expedition) for budget/cost management and Primavera P6 to document and track scheduling activities on each project. Program-wide program/project management costs are 7.78% of total construction costs, and the Sarah E. Goode STEM Academy project beat that performance with program/project management costs of 7.14%. Program-wide Indirect Costs are 16.26% of total construction costs, and the Sarah E. Goode STEM Academy beat that performance with Indirect Costs of 15.18%.

Despite the major client requested design change late in construction to create the Sarah E. Good STEM Academy, all construction work was completed early enough to allow adequate move-in and preparation time prior to the commencement of the 2012 school year. Quality of construction was excellent and all punch list items are essentially complete. Quality and timeliness of work was enhanced by the use of an Urban Model High School prototype design. Prototype designs can not only save money and simplify the design/construction process; they also provide a powerful platform for evaluating new buildings and incorporating lessons learned into subsequent designs. The Sarah E. Goode STEM Academy benefited from such informed feedback.



3. Budget

The PBC's approved budget for the project was \$109,459,234. As of 2/28/13, the total project cost is projected at \$82,582,677, which represents completion at an estimated 24.5%, or \$26M under the approved budget.



Sarah E. Goode STEM Academy entrance

4. Community Engagement Process

The development of new and existing schools in the City of Chicago is a comprehensive and open process that draws input from multiple agencies and elected officials because the schools, their features and their placement, are amazingly relevant factors in the day-to-day lives of so many of the city's residents. Public meetings are held prior to both the Chicago Plan Commission and the Chicago City Council, Local School Councils are consulted and local community organizations make specific contributions to the new school's placement and features. The completed schools incorporate features and finishes with colors and textures that complement the neighborhood that surrounds it.

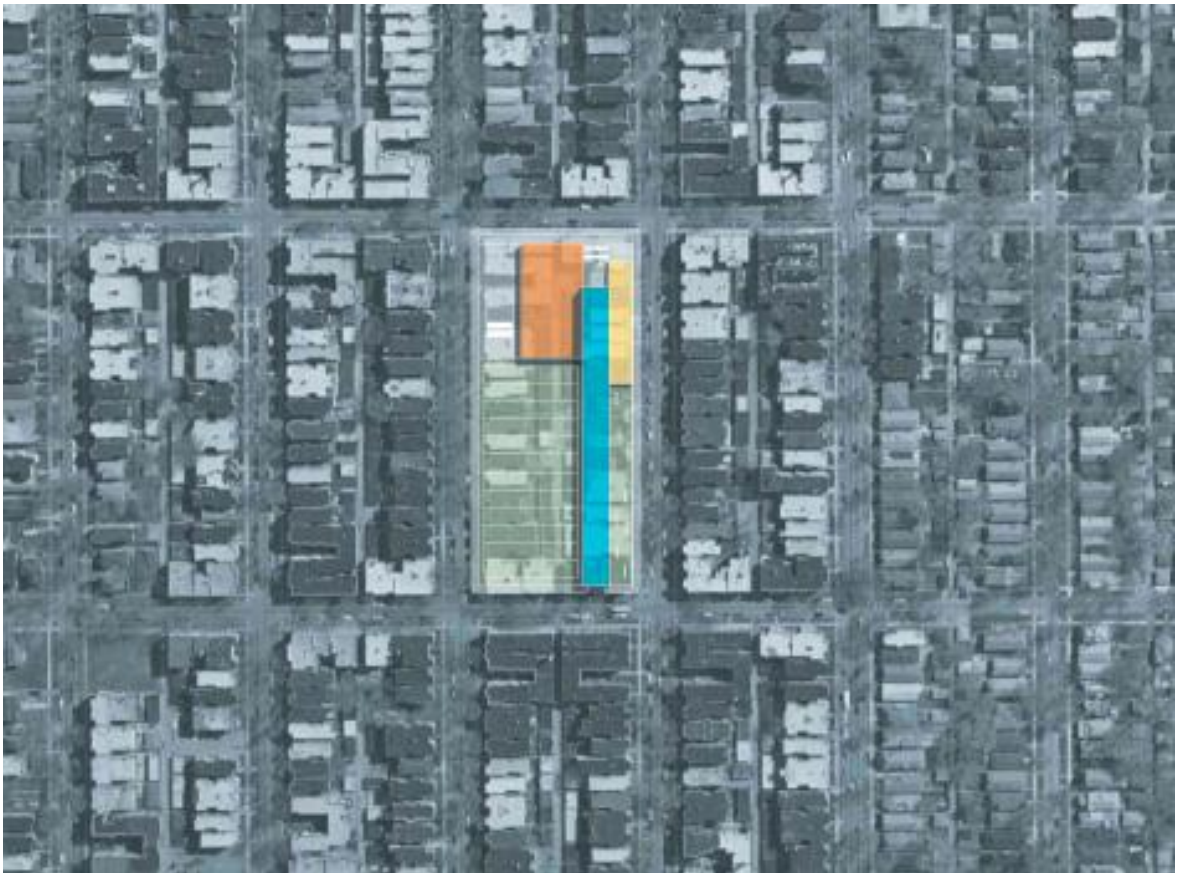
Prior to the inception of the new Sarah E. Good STEM Academy project, two community meetings were organized by the Chicago Public Schools (CPS) and the Public Building Commission (PBC). The first meeting was held in the local Alderman's office with a small group of key stakeholders where the draft site plan for the project was discussed. The whole community was invited to attend a second meeting located at the local elementary school. The floor plans for the high schedule, program and timeline for opening the school.



Sarah E. Goode STEM Academy

5. Educational Environment

Sarah E. Goode STEM Academy implements the Urban Model High School (UMHS) prototype design. The prototypical approach is possible due to Chicago's street grid system (Burnham Plan) that was developed over a century ago. Using this approach, the PBC is able to maintain parity among neighborhoods and enhance branding and identity by the Chicago Public Schools. The prototype strategy also allows for faster project delivery and lowered delivery cost. Prototypes can significantly reduce time for site selection and acquisition, building design and building department approval; and minimize the need for utility relocation. Savings are realized on both design and construction costs as well as life cycle costs.

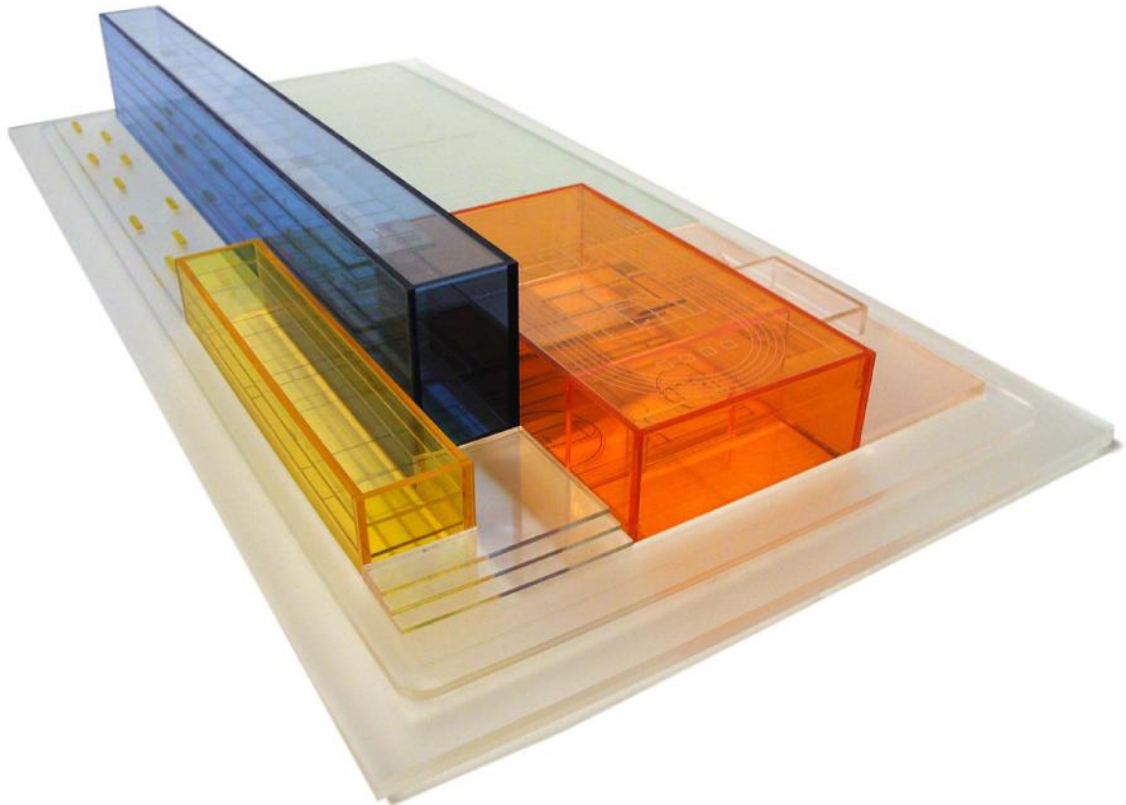


Example of how the Urban Model High School (UMHS) prototype utilizes Chicago's street grid system



Sarah E. Goode STEM Academy

The Urban Model High School (UMHS) design prioritizes the enrichment of the mind, body and spirit (Attachment B). The building is based upon these three core areas. The “mind” includes space for education, including classrooms, computer labs, science labs and administrative space. The gym, pool, fitness and weight room, and outdoor athletic spaces represent program spaces for the “body”. For the “spirit”, the UMHS program includes a library, art labs, music rooms and outdoor reading garden.



Urban Model High School model featuring mind, body and spirit

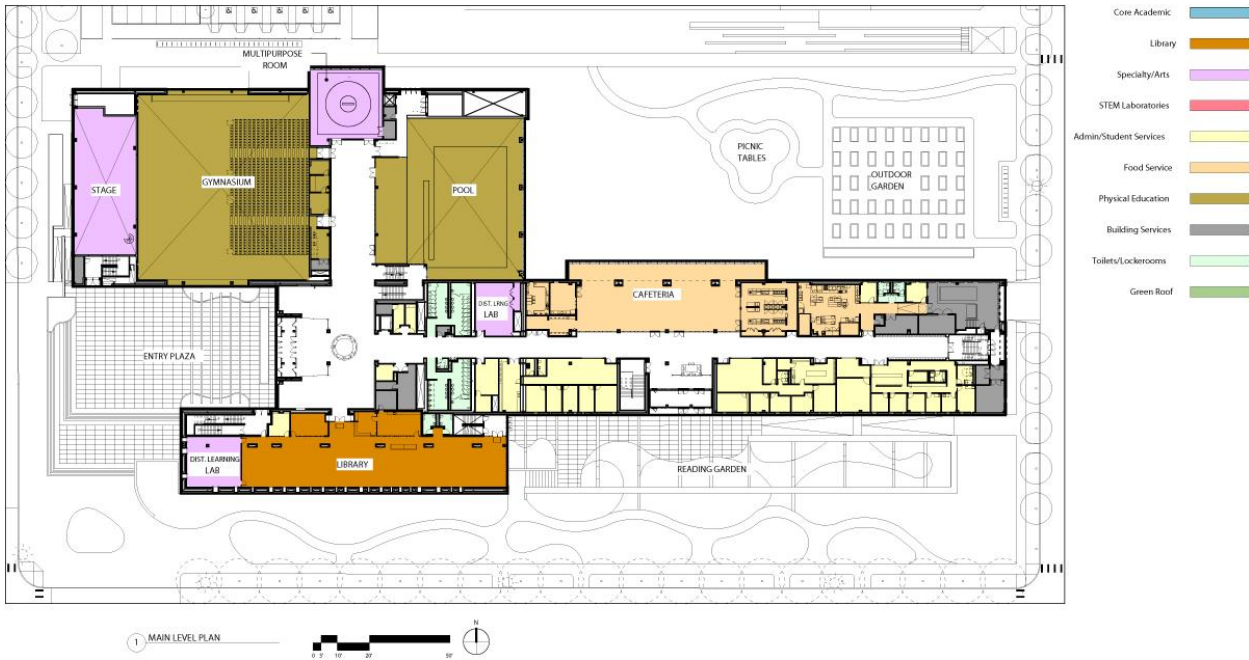
The multiuse spaces within this building provide opportunities for breakout spaces for groups to convene and extend the teaching from the classroom. There is potential for project-based learning, student presentations, inter-class projects throughout the building and site.



Sarah E. Goode STEM Academy



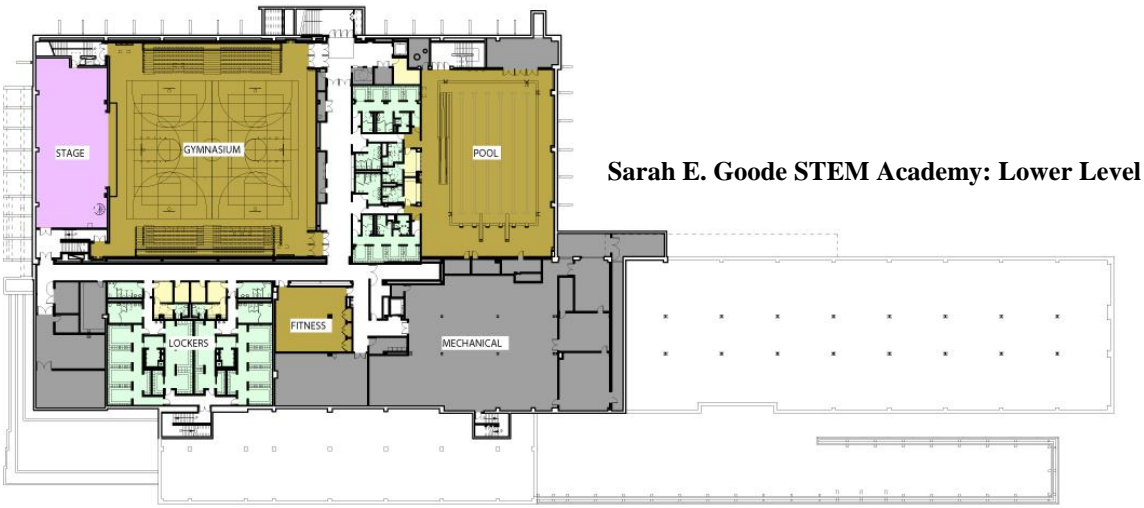
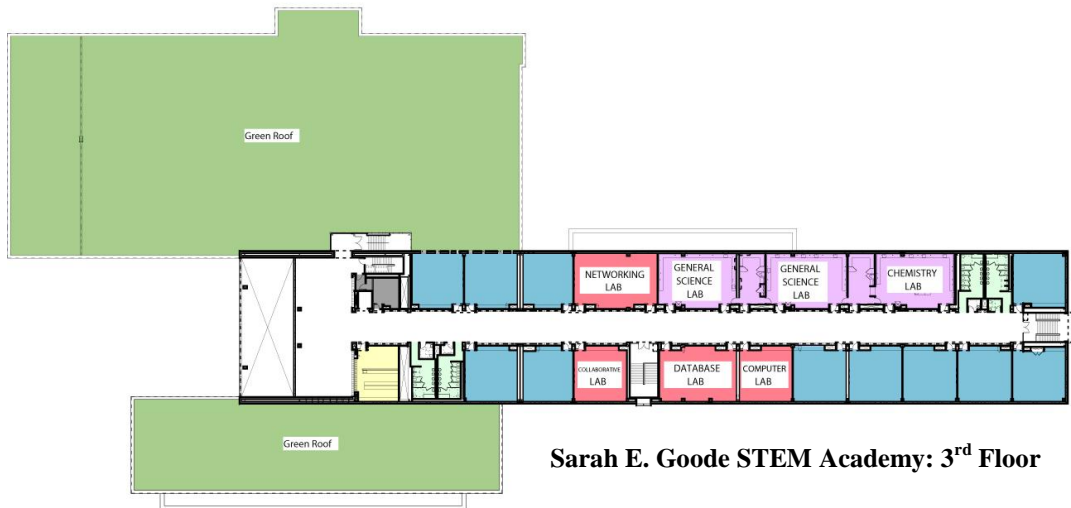
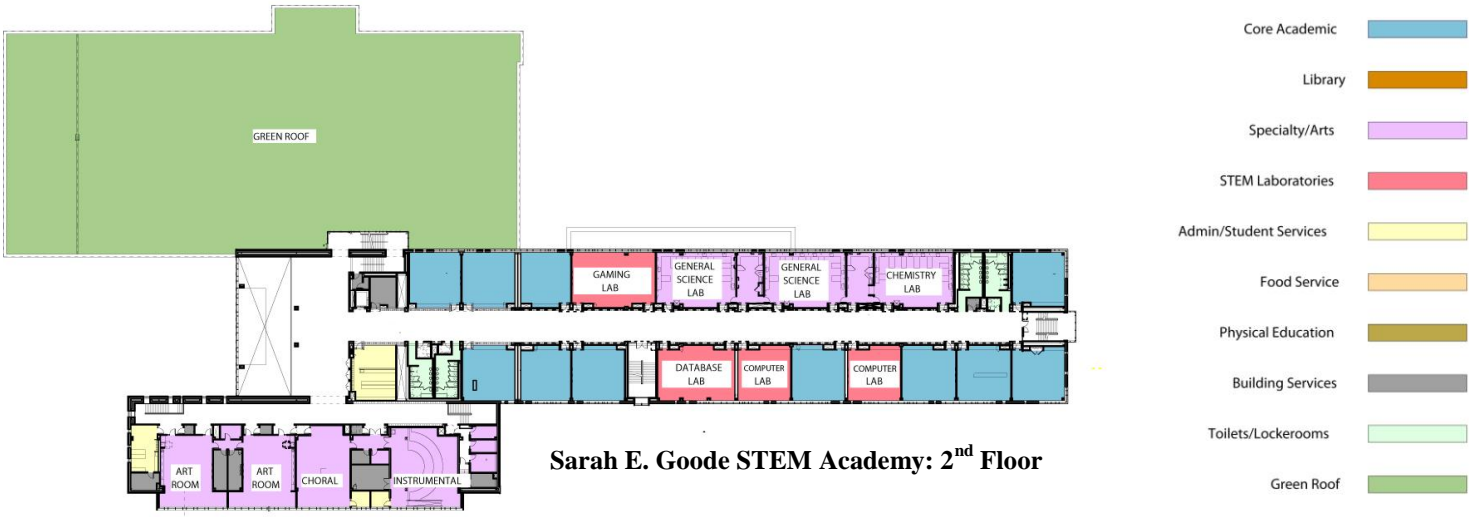
Sarah E. Goode STEM Academy: Site Plan



Sarah E. Goode STEM Academy: Main Level



Sarah E. Goode STEM Academy





Sarah E. Goode STEM Academy

Technology is integrated into the entire building. At a minimum, wireless access points allow for access to the network in all locations. Distance learning labs are provided to connect students not only to other high schools and colleges, national or international, but also to the professional world. Chicago Public Schools has committed to integrating STEM curriculum into their high schools. This school has six STEM labs, each focusing on different skills. Sarah E Goode STEM academy has also partnered with IBM to enable students to pursue a career in technology and gain potential workplace skills. STEM labs and teaching support a program allowing students to graduate with industry certifications and up to two years of college credit

Learning extends from building to site with an exterior reading garden connected to library through glazed wall, garden plots adjacent to cafeteria and cistern, native landscaping identified on signage throughout site and a contemplation garden that overlooks the entire site. The design of the school also allows for flexible district planning whereby the 2nd and 3rd floors are largely identical, each floor is self-contained with classrooms, lockers and faculty offices and can accommodate subdivision into 600 student academies per floor if desired.



Reading garden with entrance to the library



Sarah E. Goode STEM Academy

6. Physical Environment

- Physical Attributes of the Environment



Cistern with cascading water element

- Steel frame and masonry construction
- The brick façade is articulated with rusticated horizontal bands shifting past each other
- Bands create interesting shadows and texture that reduce the redundancy of the building's length
- Random look is created from a pattern that is quantifiable and efficient to construct
- Community garden area includes raised garden plots near the cafeteria and an outdoor gathering area
- Small cistern with a cascading water element diverts non-potable water from the roof to serve these gardens and are visible from the classrooms and to the public
- 17.3 acre outdoor area with reading and biology gardens that include: native plantings, and stormwater management in with areas of transitional greenspace, and along with the required playing fields and parking. In addition, areas have been designated for community gardens
- 32,000 SF of green roof with a bird sanctuary that includes perches and sloped areas to promote an increase in biodiversity
- Continuous dimming daylight controls on lighting
- Fully accessible to people with disabilities
- 40% energy savings over ASHRAE 90.1-2004
- Geothermal heating and cooling system
- HVAC system of distributed ground source heat pumps with a central energy recovery unit
- Demand control ventilation
- Solar thermal hot water heating provides pool water heating



Sarah E. Goode STEM Academy

- **Facilities Place within the Larger Context of the Community**

The site has a residential neighborhood to the south and west, and an industrial corridor to the north and east. The site plan oriented the building east-west to create a strong edge to the south of the site, addressing the residential neighborhood. This siting helped to create a campus area with the nearby elementary school, with open space north of the school site. The size of the site also allowed for a gracious front yard that enhances the pedestrian experience along the sidewalk, creates a secondary park-like feel, and gives a larger setback from the street for the 3-story volume. The school was constructed on a previously developed site, and within ½ mile of urban-density residential zones and more than 10 basic services (neighborhood amenities).



Aerial view of Sarah E. Goode STEM Academy

This school is well served by public transportation, within ¼ mile of 2 CTA bus lines and within ½ mile of a Metra commuter train line. Alternative transportation is encouraged through the addition of bike racks for students and staff, showers to serve school staff who commute to school via bike, and a bike path through the site which connects to recommended bike routes. In addition, preferred parking spaces are designated for low emitting and fuel efficient vehicles, and for carpool vehicles.

In addition the school is designed for community use on evenings and weekends with separate, independent entrances for library and athletic wings as well as dedicated storage and spaces for the Chicago Park District or another community operator.



Sarah E. Goode STEM Academy

- **Project Inspires and Motivates**

The new high school offers STEM education programming focused on technology and career readiness while earning college credit. Specialized lab spaces are included to facilitate STEM based learning opportunities. The school has come to see their new sustainable building as an opportunity for students to apply some of their STEM curriculum to understanding a very tangible case study.

7. Results of the Process & Project

- **Achieving Education Goals and Objectives**

Goal 1: Technology:

- 6 specialized STEM labs integrated into curriculum
- Aligns the school in partnership with IBM to help students pursue technology careers
- STEM labs and teaching support a program allowing students to graduate with industry certifications and up to two years of college credit

Goal 2: Extend learning from building to site:

- Exterior reading garden connected to library through glazed wall



Garden plots

- Garden plots adjacent to cafeteria and cistern
- Native landscaping identified on signage throughout site
- Contemplation garden overlooks entire site



Sarah E. Goode STEM Academy

Goal 3: Flexible district planning

- 2nd and 3rd floors are largely identical
- Each floor is self-contained with classrooms, lockers and faculty offices
- Will accommodate subdivision into 600 student academies per floor if desired
- Can use separate building entrances and administration areas

Goal 4: Sustainable Design

- This was the first Chicago new construction school to include a geothermal system, and also to implement a rooftop bird sanctuary
- The green roof, landscaped areas, permeable pavers and playing fields increase the overall site's perviousness, compared with its initial 85% impervious condition, and will reduce the stormwater runoff from the site by 42.6%.
- Both the roof and most site hardscape materials are very light in color, to contribute less to the urban heat island effect in and around the building. Lower summer temperatures around the building translate into less energy required to cool it, as well as providing a neighborhood amenity. The approximately 40% vegetated roof, and 189 new shade trees, contribute to this effect.
- Low flow and sensed plumbing fixtures are expected to result in over 39% reduction in building water use.
- Special pool filters are expected to reduce pool water lost during regular backwashing by over 90%, and also require less chemical usage.
- A ground source heat exchange – geo-exchange- system using water-to-air heat pumps to heat and cool the building, along with well insulated building exterior walls and roof and other energy efficiency
- Over 75% of jobsite waste is to be recycled or reused, or otherwise kept out of landfills.
- This school will contain at least 20% recycled content materials.
- A minimum of 40% of the materials used to build this school will be manufactured within 500 miles of the project site.
- At least 50% of the wood used in this building will come from sustainably managed forests certified by the Forest Stewardship Council (FSC).
- This school was designed to provide daylight to over 80% of the classroom areas (primary learning spaces) and temperature and lighting controls for teachers and staff.



Efficient lighting systems



Sarah E. Goode STEM Academy

- **Achieving School District Goals**

The Sarah E. Goode design team was able to implement forward-thinking design due to the existing and evolving policies and procedures promulgated by the Public Building Commission. A solid sustainability program along with long-range durability and performance requirements/expectations set the stage. A truly integrated design process, a willing and engaged client and early analysis was key to implementing the environmental program for the new high school. Early analysis led to the decision to pursue geothermal for heating and cooling. Program goals for the school and the site led to the integration of rooftop and other ecological and hydrological features. Going forward, the school principal will have many opportunities to make the building part of the STEM curriculum. In addition, the school will be maintained using integrated pest management and green cleaning strategies.

- **Achieving Community Goals**

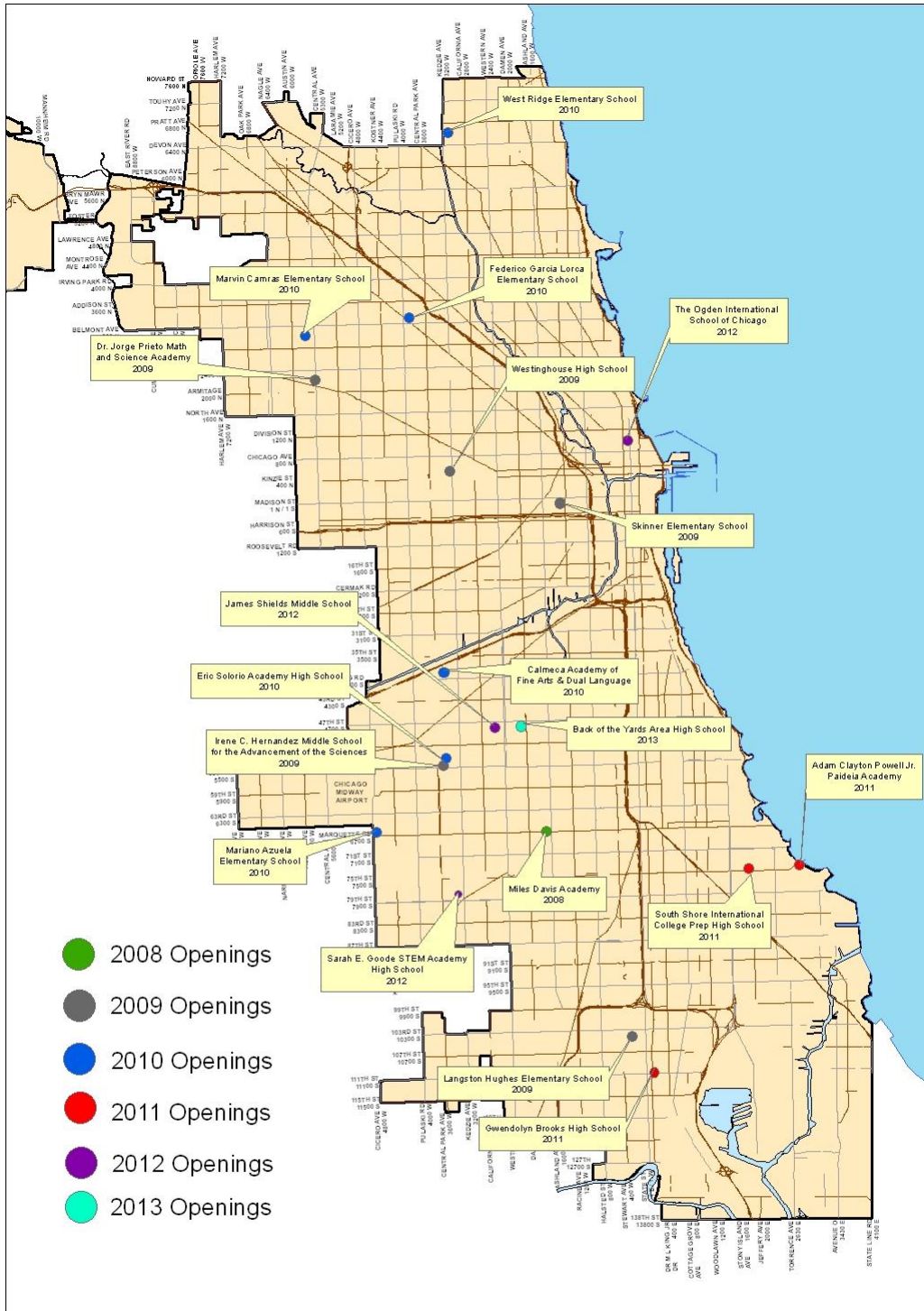
Jobs – the development of the Goode STEM project created an estimated 280 Full Time Equivalent (FTE) jobs, including 229 construction FTE jobs created and 51 professional services FTE jobs created. During construction, over 1,200 individuals were employed on the project.

The PBC includes goals for minority and women owned business participation on construction contracts, along with goals and requirements for community hiring, local hiring, and utilization of minority and women in the labor workforce. To date, the General Contractor has achieved the following:

- 35.72% MBE Participation (paid to date)
- 4.50% WBE Participation (paid to date)
- 8.78% Community Hiring
- 50.62% City Residency Hiring



Sarah E. Goode STEM Academy



Chicago Public Schools Capital Program
 Modern Schools Across Chicago
 Program Status as of April 4, 2013
 19 MSAC Projects (18 Completed & 1 in Construction)





Sarah E. Goode STEM Academy



body

- gym**
 - gym
 - multi-purpose/exhibition
 - exercise/auxiliary gym
 - storage
 - locker rooms
 - fitness room
- pool**
 - pool
 - wet locker rooms
- outdoor**
 - football/soccer field
 - basketball court
 - track



mind

- academies - 1 and 2**
 - classrooms (13)
 - computer/language lab (2)
 - general science classroom (2)
 - chemistry lab (1)
 - science prep room (2)
 - department offices
 - storage
- administration**
 - administration 1
 - administration 2
 - shared administration
- dining**
 - cafeteria
 - kitchen
 - recycling/loading



spirit

- library**
 - library
- art**
 - art classroom
 - kiln room
 - storage
- music**
 - choral classroom
 - instrumental classroom
 - practice rooms
 - storage
- outdoor**
 - green roof
 - reading garden

