The Neptune Midtown Community Elementary School serves 700 students, from pre-Kindergarten through fifth grade, in approximately 149,500 SF of facility space. Space is designated for both community and student use. It includes a safety and security center, a full-size gym and assembly area, a wellness clinic equipped for a variety of health programs, a parenting and tutoring center, and an outdoor amphitheater.

Neptune Midtown Community Elementary School
Neptune, NJ

"Many principles of sustainable design – solar orientation, shading, natural daylighting, passive ventilation and utilizing the earth's constant temperature – are ageless concepts. While materials and technologies have evolved and responded to our ecological needs, returning to these basic principles can truly help us achieve our collective environmental goals." - Marcus Rosenau, AIA, LEED AP, SSP Architectural Group

Location of Project: Neptune, NJ

Submitted by: Jeanne Perantoni and Marcus Rosenau, SSP Architectural Group, Inc

Project Team

Architectural Design: *SSP Architectural Group*

Land Use Planning: *Schoor DePalma*

Structural Engineering: *Maitra Assiciates, P.C.*

Sustainable Design: *7 Group*

Landscape Master Planning: *R.M. Hanna Landscape*

Landscape Design: *S. Edgar David & Associates*

Survey/Geotechnical: *Maser Consulting PA*

Kitchen Design: *Ivan R. Bass, Inc.*

Specifications: *Conspectus, Inc. (formerly 'Focus Collaborative')*

Environmental: *Environmental Management Associates*

Civil Engineering: *GEOD Consulting Group*

Construction: *Turner Construction Company*

Overview

The Midtown area traditionally functioned as an important neighborhood center within greater Neptune Township, providing a focal point for community and economic activities. Midtown's established circulation network, infrastructure and neighborhoods represent some the Township's oldest developed areas, many of which were in need of revitalization and expanded community services.

The Neptune Midtown Community Elementary School serves 700 students, from Pre-Kindergarten through Fifth Grade, in approximately 149,500 SF of facility space.

The school and its site offer bioretention stormwater swales, ground source ("geothermal") heat pump heating and cooling, natural daylighting and a thermally efficient exterior shell. The use of low-VOC materials, chemical free cleaning and underfloor air distribution result in a superior indoor air quality. The school's (as well as the District's) curriculum is now enhanced by integrating the following elements into various classroom lessons: a 6,000 SF roof garden, bioswales, a 30 kW photovoltaic system and a composting toilet.

Process

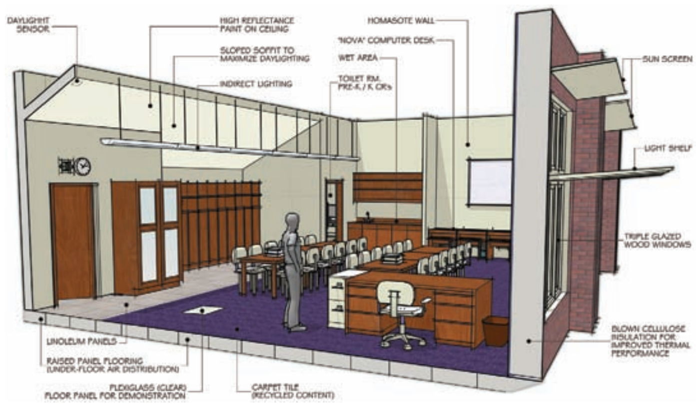
Design

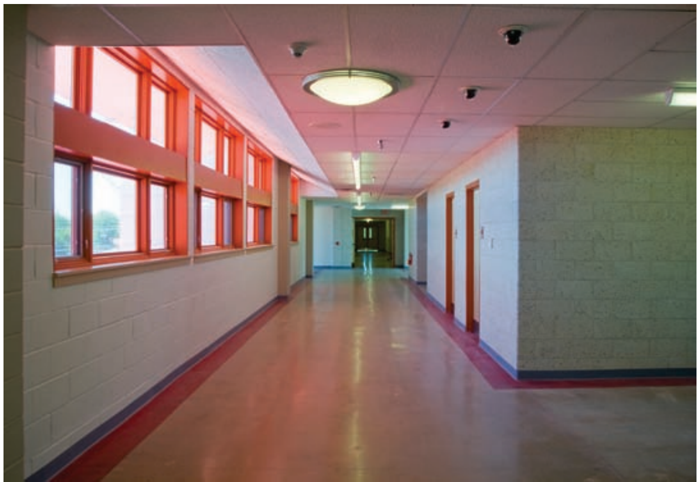
In 2002, a Smart Growth Community School Planning Grant provided the incentive and opportunity for the Township to foster partnerships and strategies to site and develop school facilities that would serve a wide range of community need. This dovetailed with the objectives of the Master Plan for Neptune, which had a focus on the development of a new Community School that would act as a catalyst for community reinvestment, serve as a source of community pride, and provide essential community services for all Township residents.

The Neptune Midtown Community Elementary School was thus planned as the anchor of the Midtown Neighborhood Master Plan. Completed in September 2008, it has adhered to the following goals for the entire neighborhood:

- It has established a centrally located community-based elementary school that has transformed a thirty-year-old unimproved vacant area into an attractive visual anchor for Neptune Midtown.
- It has preserved and reinforced the existing social fabric of the neighborhood with the creation of a Community Recreation Center, Youth Services area, Parent Resources area, Health and Wellness Center, Community Policing Center and Intergenerational Tutoring Center.
- It has encouraged attractive, functional and context–sensitive infill development, with a focus on sustainable site-use that minimizes stormwater runoff within an attractive, park-like setting.
- It has fostered efficient traffic and pedestrian circulation in the heavily trafficked area bounded by four key roadways – Route 33, Memorial Drive, Atkins Avenue and Embury Avenue.

The goal from the outset of the planning of Neptune Midtown Community Elementary School was to design an energy efficient, low-maintenance building that would enhance learning. In keeping with the standards established by then–Governor McGreevy's Executive Order 24, and the emerging design practices of the New Jersey Schools Development Authority, the District sought to create the best environment possible for student learning. Obtaining LEED™ certification was considered the best means to ensure this goal.





Ratings and Awards

2004 CEFPI Smart Growth

2004 "Schools as Centers of Community Honor Society" Award - Knowledgeworks Foundation

Awaiting approval for LEED Platinum

The initial measure of success was to be LEED™ Gold certified with an emphasis on energy efficiency, water conservation and perhaps most importantly, the establishment of superior indoor environmental quality. During the early stages of design development, a full-day interactive design charrette was held, at which time a number of energy efficiency and other green measures were identified. One of these included rotating the building 90 degrees in order to better control solar gain while also enhancing the natural daylighting into classrooms and other program spaces. Review of the lighting levels and fixture types led to a reduction in the overall number of fixtures and a nearly 50% reduction in the watts used for lighting per square foot.

On the other hand, some measures led to concerns about increased costs. Such concerns included triple-pane wood windows to increase exterior wall and roof insulation, and raised floor and underfloor air distribution. However, by evaluating the impact of these features on the mechanical system, the team found that the air system could be reduced by 40%, and the simple payback due to reduced energy loads would be three to five years. This was well within the acceptable range of the owner and NJ Schools Development Authority (the state agency funding and overseeing design/construction of the project).

Build

The General Contractor was responsible for preparing a construction waste management plan to ensure at least 75% of the construction debris and waste was diverted from landfills. This involved using electronic media instead of print, recycling metal scraps, masonry debris and plastic product containers, and donating unused materials to non-profit agencies. Delivery truck drivers, who usually leave the wooden pallets on site for disposal, were required to take the pallets back for reuse, offsetting the need for manufacturers to produce and/or acquire new pallets. The box below shows how the construction team handled specific materials, in the interest of reducing waste.

The contractors also had to ensure compliance with recycled content, low-VOC content and local/regional material goals. They succeeded in providing approximately 34% material with recycled content, surpassing the required 5% and 10% goals required of LEED Materials & Resources Credits 4.1 and 4.2.

Due to the project demand for high indoor air quality, the contractor also developed an indoor air quality plan to be implemented during construction. The most important aspect of this plan was sealing and protecting all openings in the ventilation ductwork to prevent dust and debris contamination. Since most spaces were also receiving ventilation through the raised floor system, it was critically important to keep the space below the floor clean.

Operate

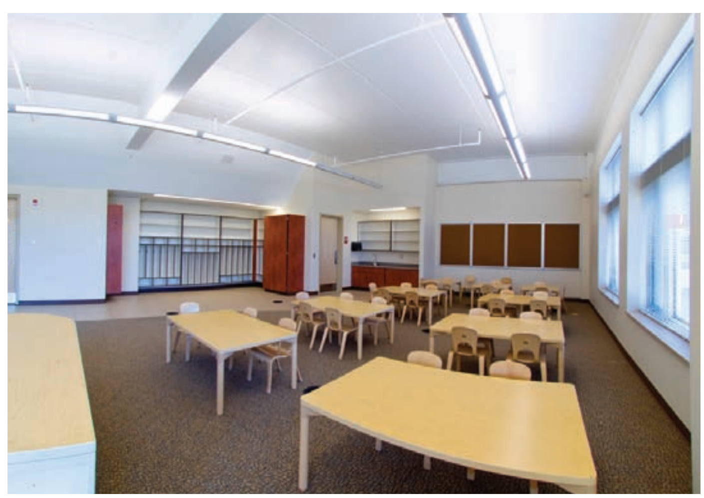
By specifying linoleum instead of vinyl composition tile (VCT) and stained, polished concrete in corridor spaces, the school is able to clean all of the resilient flooring with simple soap/water solutions and avoid the time-consuming and chemical laden process of stripping and waxing floors on a regular basis. The District has extended the practice of green cleaning by using only chemical-free cleaning products throughout the facility since the school's opening.

Operationally, the systems have performed with minimal need for adjustment and with only minor problems. Of the other elementary schools in the district, the staff reports that the Community School (the largest of all) has performed, per design, with the least amount of maintenance required.

Evaluate/Commissioning

At the onset of construction, a commissioning (Cx) team was assembled and included representatives from the Commissioning Agent, school district, Architectural and Engineering team, general contractor, mechanical, plumbing and electrical contractors and the construction manager. The Cx team developed and approved the Commissioning Plan and utilized it throughout the construction period.

The Commissioning Agent reviewed the contractor submittals for all equipment and prepared detailed testing forms. These forms, which covered such items as ground source heat pumps, heat exchangers, exhaust fans, cabinet heaters, testing and balancing plans, lighting controls, hot water systems and the photovoltaic system, were used as checklists through the installation, verification and testing stages.



A start-up, pre-functional and functional testing schedule was developed based on the construction sequence and the pertinent sections of the Operations & Maintenance manuals. Start-up and pre-functional testing began about 6 months prior to completion, with final functional and performance testing starting approximately one month prior to occupancy.

Finally, the Commissioning Agent ensured that all staff was properly trained and prepared a detailed manual for use in future training sessions. The extensive training sessions have resulted in a reduced number of call-backs/complaints from the maintenance staff.

Finance

The team reviewed costs carefully, since this project was identified as the test case for the state's schools construction program. During the charrette process and early evaluation period, the project team established 5-7 years as an acceptable payback period.

Many sustainable and efficient features could be implemented with no cost increase to the project. This included local/regional materials, low-VOC and recycled content products, reduced heat island effects (by simply selected a light roof color), daylight/views and construction waste management. Because of the predetermined site location, a number of LEED credits were easily achieved: urban and brownfield redevelopment, and public transportation access.

However, a number of the green initiatives and energy-efficiency measures resulted in a first cost increase – estimated to be about $125,000. While each of the energy efficiency measures met the payback criterion on an individual basis, the combined effect of these measures yielded about a 3.4-year simple payback. However, implementation of these measures allowed the design team to reduce the overall size of the ground-source heat pump system, including the total number required wells. A 40% load reduction that resulted from the energy efficiency measures meant a 40% decrease in the number of wells, which equated to a 10% reduction, or about $400,000 in the first cost of the overall HVAC system. By evaluating the building as a whole, instead of individual components, a first-cost of construction was reduced by $275,000. Operating costs will also be lower due to the smaller overall size of the mechanical system.

The photovoltaic system was completely funded by a grant from the NJ Board of Public Utilities (NJBPU). This pilot program provided $250,000 in construction costs plus $10,000 in design costs to install a photovoltaic system on a school facility, provided the facility pursued a minimum LEED Silver certification and used the system as part of the learning experience. The school was able to install a 30 kW photovoltaic array on the sloped roof of the cafeteria, where it can be seen by visiting public and to most students throughout the day.

The project was also eligible for a number of Smart Start rebates through the NJBPU. These rebates offset the cost of lighting, geothermal heat pumps, and variable frequency drives.

Performance

After 11 months of occupancy, a walk-through was performed. Detailed information on Energy and Water performance have yet to be determined.

Lessons and Trade-offs

Integrated Whole Building Design: ensure green, sustainable, and energy efficiency measures are evaluated together. Understand the positive impact one component can have on other building systems. Simply looking at first cost impact can scare many project team members away from these initiatives, but the integrated approach is more realistic.

If attempting storm water recharge (through either underground basins or bioswales), make sure the characteristics of the soil are known. These systems are not working as well as anticipated at the Neptune Community School due to remnants of past construction (residential foundations, debris, etc.), clay layers in the soil strata, and a highly variable ground water level.

To perform properly, underfloor air delivery systems require an airtight seal around all edges. Keep wall-to-wall, wall-to-floor and other transition details as simple as possible to minimize the possibility of leaks and to maintain the required positive pressure in the floor plenum.

List of Green Strategies

Design

- Brownfield and Infill Site
- Transit-Oriented Design
- Integrated Design Process
- Energy Modeling
- Life Cycle Cost (LCC) Analysis
- Native and Adapted Plants
- Tree Preservation
- Energy-Efficient Landscaping
- Water-Efficient Landscape Design
- Turf Grass Reduction
- Rain Gardens & Vegetated Swales
- Low Flow Fixtures and Fittings
- Building Orientation
- Cool Roof
- Vegetated Roof
- Daylighting
- Air Infiltration
- Insulation
- Glare and Heat Gain Reduction
- High-Efficiency Lighting Systems
- Down-lighting
- On-Demand How Water Heating System
- Properly-Sized HVAC

- Dedicated Mechanical Systems
- Part-Load Efficiency
- Demand Control Ventilation
- Variable Frequency Drive (VFD)
- Energy Recovery Systems
- Sensor Controls
- Geothermal Energy System
- Photovoltaic System (PV)
- Purchase Green Power
- Life Cycle Assessment (LCA)
- Post-Consumer Recycle Content
- Construction and Demolition Waste
- Recycling Centers
- Green Cleaning
- Low-Emitting Materials
- Regional Materials
- Individual comfort controls
- Sound-Absorbing Materials
- Indoor Air Quality (IAQ) Management Plan
- Entryway Systems
- Moisture Control
- Interior Design and Lighting Design
- Views and Operable windows
- Sense of Place
- Crime Prevention Through Environmental Design (CPTED)

Build

- Site Protection Plan
- Construction & Demolition Waste Recycling Plan
- Indoor Air Quality Management Plan

Operate

- Operator and Occupant Training
- Alternative Transport
- Post Occupancy Evaluation (POE)
- Plug Load
- Integrated Pest Management
- Green Cleaning
- Source Reduction and Recycling
- Preventative Maintenance
- Flexible Work Space
- Wire Management System

Evaluate

- Building Performance Evaluation

Construction and Demolition Waste Recycling Measures

Concrete and Asphalt

- Place demolished concrete in designated recycling containers.
- Place demolished asphalt in designated recycling containers.
- Recycle unused asphalt roofing into paving or patching material.
- Donate unused roofing to not-for-profit organizations.

Cardboard and Paper

- Reuse boxes for shipping.
- Electronic distribution of correspondence.
- Minimize the number of blueprints and reproductions during design and construction.
- Place cardboard and paper in designated recycling containers.

Drywall

- Save leftover large sheets to give to not-for-profit organizations.
- Recycle drywall via manufacturer recycling program.
- Order drywall in optimal dimensions to minimize cutoff waste.
- Reuse larger scraps for filler pieces.
- Reuse joint compound buckets for tool and material storage.
- Recycle clean joint compound buckets.

Insulation

- Reuse leftover insulation to give to not-for-profit organizations.
- Place insulation in designated recycling containers.

Lumber

- Optimize building dimensions to correspond with standard lumber dimensions.
- Avoid over ordering of materials.
- Store lumber in dry and level areas to avoid warping.
- Reuse scrap lumber for cribbing/blocking etc.
- Save dimensional lumber (6’ or greater) to give to not-for-profit organizations.

Masonry

- Collect, stack and cover brick and other masonry materials to prevent soiling or loss.
- Stockpile cutoffs and excess rubble to be buried during back-filling.
- Reuse brick/block for patching or other projects.
- Return unused materials to supplier if applicable.
- Place masonry waste in designated recycling containers.

Metals

- Place scrap metal in designated recycling containers.
- Store flashing and other easily damaged metals in a protected place.
- Protect metals from weather using weatherproof cover held in place.

Paints, Stains, Solvents, Sealants

- Donate unused paints, stains, solvents and sealant to not-for-profit organizations.
- Reuse unused paints, stains, solvents and sealant for other projects or additional attic stock for the owner.

Plastic and Vinyl

- Place cleaned plastic containers, used plastic bags, shrink wrap and plastic wrap in designated recycling containers.
- Reuse vinyl flooring on other projects or additional attic stock for the owner.

Other Miscellaneous Materials

- Chip brush and trees for mulch on-site or send to Recycling Facility.