Sidwell Friends School
Middle School Roof Program and Design Objectives
28 June 2004

Middle School Sustainable Design Program

Sidwell Friends School has established a challenging sustainable design program in order to meet the objectives of LEED Platinum certification for the new Middle School. Every aspect of the addition and renovation design must perform not one or two, but many functions at a highly integrated level. The roof of the building is no exception. As in a conventional building, the roof must provide structure and weather-tight enclosure as well as rainwater conveyance. Unlike a conventional building, the roof of the new Middle School is being designed to meet several more complex program objectives as follows.

- Rainwater: Rather than immediately directing rainwater from the roof into the storm sewers, the Middle School addition will employ a vegetated roof to significantly reduce the amount of storm water through infiltration and evapo-transpiration within the planting zone. Furthermore, the vegetated roof provides additional insulation for the building, reducing heating and cooling loads, and reduces the amount of heat reflected back into the immediate environment. The renovated portion of the Middle School will not use a vegetated roof due to the capacity of the existing structure, but instead will direct all rainwater to an underground cistern to be stored for irrigation on campus.
- Heating and cooling: Natural ventilation penthouses located between classrooms in the addition are part of the mechanically assisted natural ventilation system which is being designed to reduce the need for traditional air conditioning. A central plant designed to eventually serve most of the campus will be located in the basement of the Middle School addition. Cooling towers for the central plant air conditioning equipment will be installed on the roof of the addition.
- Energy collection: Photovoltaic panels, which collect solar energy and convert it to electricity, and solar thermal collectors, which heat hot water by direct thermal transfer for hot water and heating hot water uses, will both be employed. Equipment will be located on the roof of the existing building.
- Daylighting: Operable skylights are positioned towards the center of both new and existing portions of the Middle School to bring daylight into the inner parts of the classrooms, which are being designed to be naturally lit, without the use of electric lights, for significant portions of the school day. These units will also assist in the natural ventilation strategy.
- Curricular integration: The new Middle School building is intended to be a living example and laboratory for the students to learn about physical and biological systems. The roof is being designed to be accessible to small groups for observation and learning.

Zoning Code Requirements and Design Proposals

The zoning code requires rooftop equipment and structures to be set back from the roof edge a distance equal to the height of the structure, not to exceed 18 feet. The code further requires rooftop equipment and structures to be consolidated into a single enclosure. The code gives the BZA some room to make administrative allowances for structures that do not comply with the letter of these requirements, but meet their intent. The following features of the Middle School roof do not comply due to the need to meet the rigorous sustainable design program objectives.

1. The new stair to access the roof is not set back from the building perimeter.
   The stair to the addition roof is positioned at the west end of the building, at the innermost side on the site, in order to provide rooftop access for maintenance and observation of rooftop equipment and structures. A stair location set back from the building perimeter would interfere with classroom layout and daylighting and natural ventilation objectives. The stair location is at one end of the main building corridor, maximizing life safety provisions and integrating the roof access with primary building circulation patterns. The existing building provides a precedent for this location, with a stair extending to the roof at the southwest perimeter wall which now provides a second means of egress from the rooftop.

2. Equipment and structures are not consolidated into a single enclosure.
   The natural ventilation penthouses must be located between classrooms in order to effectively ventilate each classroom, necessitating three separate shafts. Three cooling tower components will eventually be

BZA
Case No. 17149
Exhibit No. 63
District of Columbia
CASE NO. 17149
EXHIBIT NO. 63

required in order to correspond to the modular equipment in the central plant below. Initially two units will be installed, though the intention is to design the roof for the three required to handle the full campus load. Aligning the cooling towers with the natural ventilation penthouses frees up the space immediately above the inner portion of the classrooms for skylights. If these structures were to be consolidated they would conflict with skylight locations and so would be detrimental to the daylighting program. Collecting the structures into a single enclosure in their ideal locations would create the appearance of a much larger rooftop structure, and would negatively impact both the rooftop vegetation and the skylight effectiveness. On the roof of the existing building, a new air handler will replace an existing unit. Photovoltaic and solar thermal arrays will be low, within setback requirements, and will not be visible from the ground. This equipment would not function effectively in collecting solar energy if enclosed. Architectural enclosures are planned for all decentralized rooftop equipment and structures which could be visible from the ground.

3. Cooling towers, while less than 18 feet high, are closer to the roof edge than their height.
The cooling tower equipment size is fixed by design loads and manufacturers' standards and limitations. Clearances are required around the cooling towers to permit air circulation necessary for proper function, making their consolidation impractical. The modular approach to the central plant equipment makes a single unit impractical. The cooling towers are 15'-6" high above the roof surface and are set back 12'-0" from the face of the north building wall. The air handler to be replaced on the existing roof will comply with height and setback requirements.