First green school points to the future

Thomas L. Wells Public School

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THIS ARTICLE APPEARED IN THE NOV/DEC 08 ISSUE OF SABMAG, WWW.SABMAGAZINE.COM

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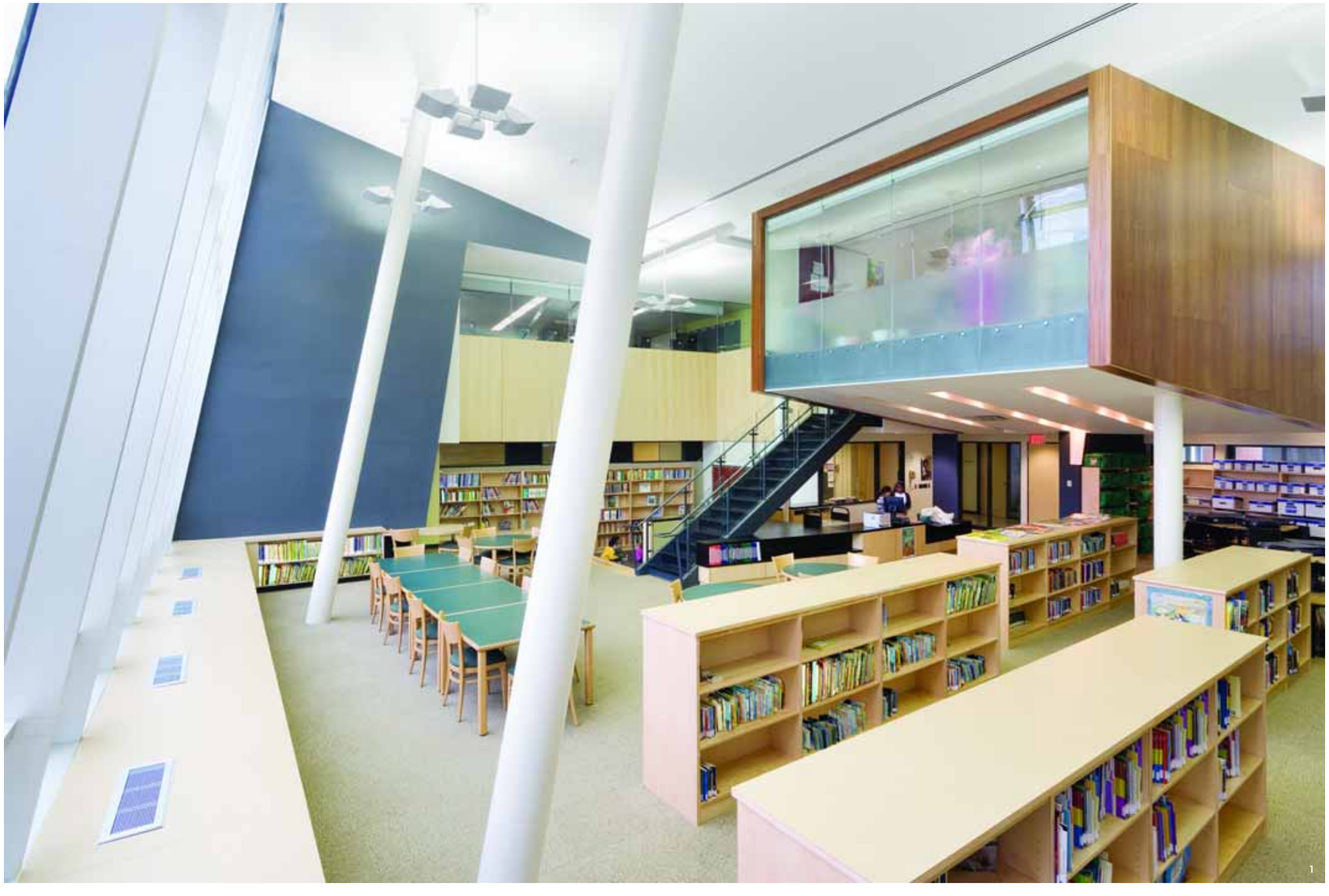
MECHANICAL Stantec Engineering [formerly Keen Engineering Co. Ltd.], Toronto **ELECTRICAL** Mulvey and Banani International Inc., Toronto
CIVIL ENGINEER RV Anderson Associates, Toronto **LANDSCAPE** Elias + Associates Inc., Toronto **INTERIORS** Baird Sampson Neuert Architects, Toronto
CONTRACTOR Struct-Con Construction Ltd., Brampton, ON **PHOTOS** Tom Arban, Toronto



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THE LIBRARY IS ACCESSIBLE DIRECTLY FROM THE MAIN ENTRANCE OF THE SCHOOL. THE DOUBLE HEIGHT SPACE RECEIVES AMPLE DAYLIGHT FROM THE ADJACENT COURTYARD AND IS ANIMATED BY SLOPING STRUCTURAL ELEMENTS AND A SUSPENDED RESOURCE ROOM [1]. OUTSIDE THE MAIN ENTRANCE, A GENEROUS PORCH CREATES A COVERED AREA FOR STUDENTS WAITING FOR BUSES [2].

2

The first of a new generation of high performance 'green schools' by the Toronto District School Board, Thomas L. Wells is intended to serve as a model demonstrating sustainable design principles and an enhanced learning environment.

With the conviction that architecture can play an instrumental role in the education of children, the school is designed as a terrain for engagement with learning, society and the environment. The classrooms are grouped around courtyards, a central library, and a multi-purpose room, maximizing green space on the compact site and providing a transparent, stimulating place of growth for young learners as well as a sense of civic focus for residents of the surrounding community. As such, the project advocates an enhanced role for schools, one in which members of the broader community can meet both for learning and social activities.

The first public school in Canada to have received a silver rating under the Canada Green Building Council's Leadership in Energy and Environmental Design rating system, the building is conceived as a 'system of systems,' integrating architectural design with environmental performance.

A central north-south spine organizes the school as a three-dimensional social landscape. Major community spaces and wings of south-facing classrooms are arrayed along the spine to facilitate way finding and create places of spontaneous interaction.

A gracious entry porch with a circular opening for daylighting of office windows provides cover for groups of students waiting for buses. It also shades glazing to the gym/multipurpose room, which is located adjacent to the front entrance to invite community access for public events and

Ground floor plan

1 Gymnasium/Multi-purpose room
2 Stage
3 Service court
4 Staff lounge
5 Administration
6 Offices
7 Kindergarten
8 Classrooms

activities. A system of top lights to this "big room" provides even natural day lighting as well as effective passive ventilation.

A double height, top lit, entry lobby featuring a cascading stair facilitates visual as well as physical interconnection between levels of the school. It also leads directly to the library at the centre of the plan and two resource rooms that can be used for public meetings. One is suspended like a tree house in the double height library.

Technical as well as creative design research has been a key part of the design process. The configuration of the building maximizes exterior play space as well as solar exposure for classrooms. South-facing classroom facades are designed for daylighting effectiveness and sun control.

Large classroom windows are deeply recessed and fitted out with light shelves calibrated through computer modelling to shade high summer sun and reflect low winter solar rays deep into the building. Below the light shelves, projected window boxes have small openings and an intimate scale to inspire children's imaginations.

Classroom lighting is fitted with sensors to turn off lights when daylight is sufficient and high- and low-level opening windows provide effective passive ventilation as an alternative to the mechanical cooling system.

Materials and systems have been selected to promote long term durability as well as indoor air quality. The hollow pre-cast concrete and masonry structure provides insulated thermal mass to harvest passive solar energy in winter and slow down heat build up in the summer. The cores in the slabs function as return air ducts for the unique displacement ventilation system, which injects low velocity fresh air into classrooms through benches next to the corridor and draws it across radiant floor heating in the floor to return air grilles above the windows. *[continued p.54]*

North elevation

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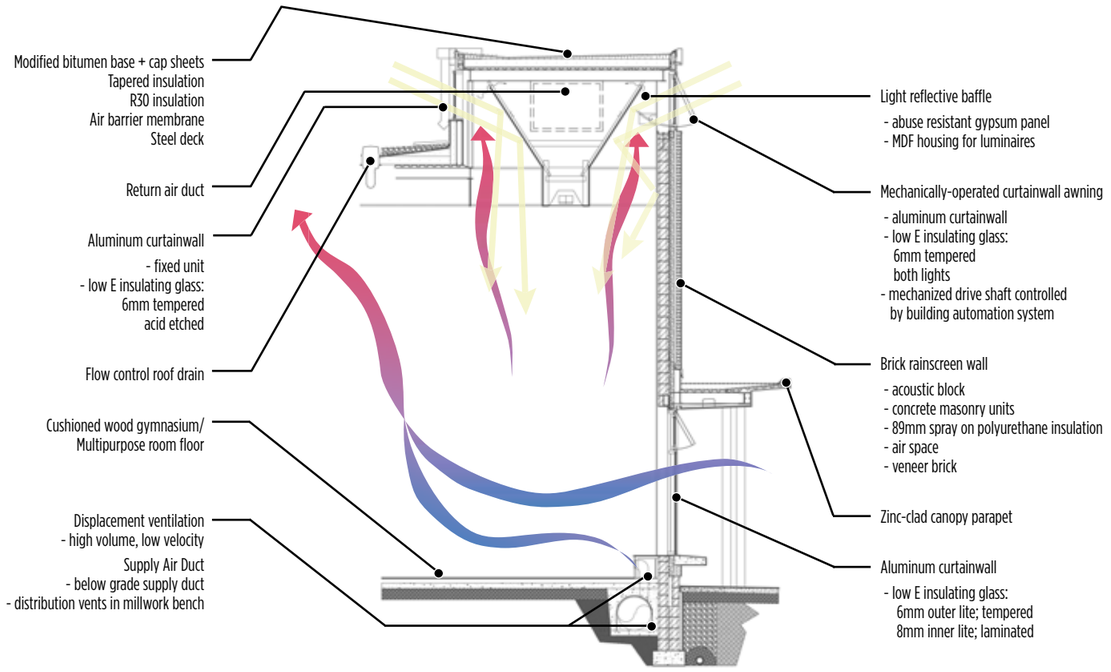
CLASSROOMS ARE ORGANIZED AROUND COURTYARDS, ENSURING EACH RECEIVES AMPLE DAYLIGHT AND NATURAL VENTILATION THROUGH OPERABLE WINDOWS. RADIANT HEATING IN THE FLOOR SLABS ELIMINATES THE NEED FOR RADIATORS BELOW THE WINDOWS [3]. THE COURTYARD PLANNING REINFORCES THE SENSE OF THE SCHOOL AS A COMMUNITY RELATING ONE PART OF THE BUILDING TO ANOTHER, AND CONNECTING INDOOR AND OUTDOOR ACTIVITIES [4-5]. TOP LIGHTING MAKES THE DOUBLE HEIGHT MAIN ENTRY A BRIGHT AND WELCOMING SPACE [6].

6



Section, daylighting and ventilation at gymnasium

NATURAL "TOP-LIGHT" DAYLIGHTING AND VENTILATION PARTLY SERVICE THE GYMNASIUM, WHICH ALSO DOUBLES AS A MULTI-PURPOSE ROOM [7].

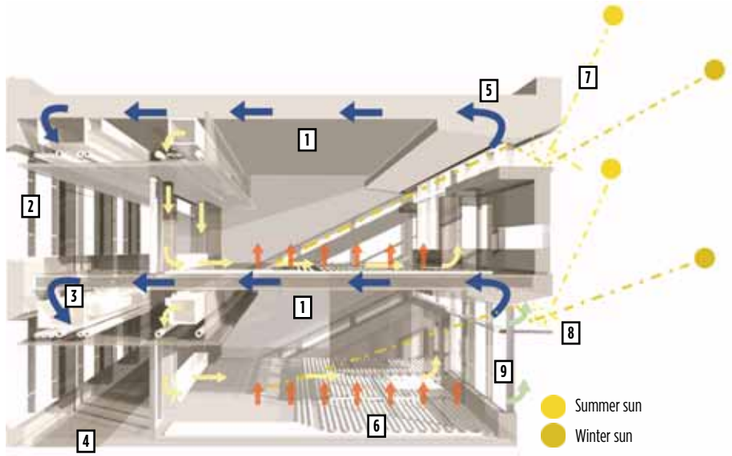
MATERIALS

Structure
- Structural steel with precast concrete hollowcore deck by Coreslab Structures

Exterior
- Rainscreen of acoustic block, concrete masonry units, polyurethane insulation, air space and brick veneer, architectural concrete block; zinc siding by Rheinzink [supplied by Engineered Assemblies Inc.]; aluminum-framed windows and curtainwall by Oldcastle Glass with mechanized and remote window operators, tubular skylights by Velux; modified bitumen roofing, built-up roofing, tapered insulation, R30 Roxul mineral fibre insulation, air barrier membrane, steel deck

HVAC
- York air handlers with variable frequency drives by Danfoss, high volume-low velocity displacement ventilation, below grade air supply duct; Rehau radiant floor heating system

Interior
- Low VOC paint by ICI, carpet tile by InterfaceFLOR, cushioned wood flooring, Prodema acoustic panels, operable partitions, roller shades by MechoShade Systems Inc.; daylight and occupancy sensors by Wattstopper, Lutron lighting controls



Daylighting, heating/cooling patterns

1 Return air is drawn through the hollowcore slab to corridor
2 Corridor day light penetrates into classrooms through clerestory
3 Spigot connection to return air duct
4 Durable tile flooring w/light reflective characteristics
5 Thermal mass harvests winter solar energy and slows lag time of summer heat build-up
6 Radiant floor heating provides even heat distribution and thermal efficiency
7 High performance envelope [min R20 wall/ min R40 roof] w/durable finish
8 Lightshelves and reflective planes increase daylighting w/deep penetration into the classrooms
9 Top and bottom operable vents allow for passive cooling

Quiet, comfortable and efficient, the system eliminates typical radiator cabinets below windows and suspended acoustic ceilings to cover ductwork.

In summer, heat transferred from the slabs to the return air stream is expelled, and in winter it is recovered in the central plant along with free heat from the exhaust ventilation system to bathrooms and other service areas.

The Toronto District School Board received full funding from the Commercial Building Incentive Program [CBIP], a funding grant for energy use at least 40% below the requirements of the Model National Energy Code for Buildings [MNECB].

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SOUTH ELEVATION SHOWING LIGHT SHELVES. THE CANTILEVERED SECOND FLOOR CREATES VISUAL INTEREST AND A SHELTERED MEETING AREA [8].