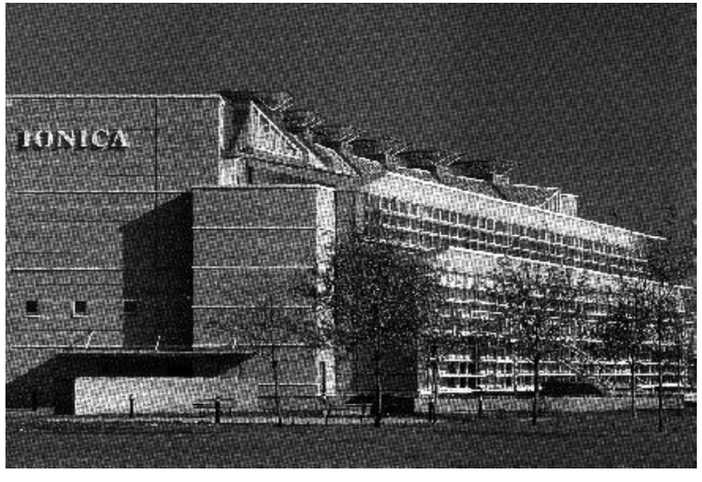
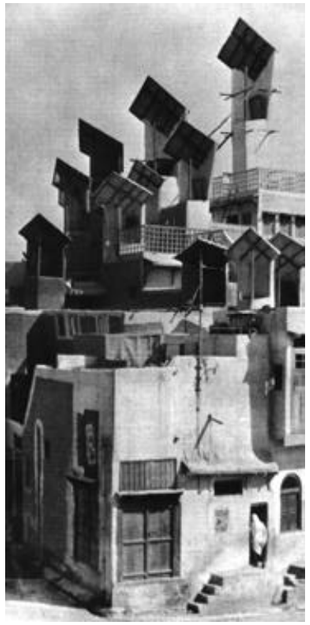
NATURAL VENTILATION

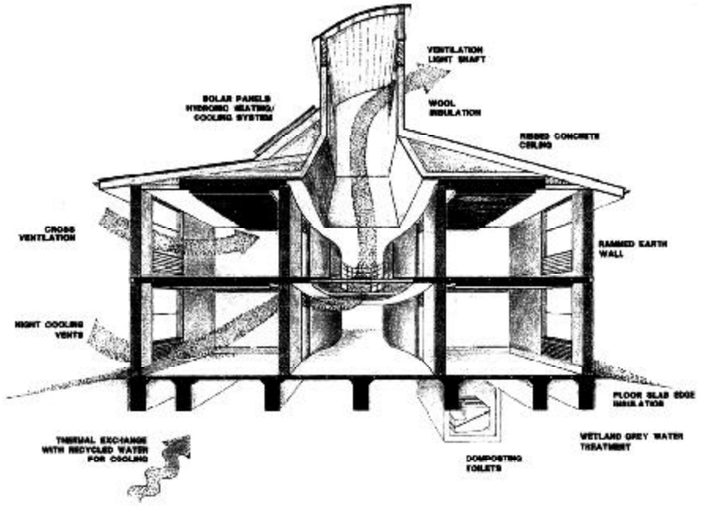


13. Ionica Headquarters, Cambridge, England
RH Partnership, 1994

Before the creation of modern mechanical systems, all buildings were naturally ventilated. With the advent of these systems, architects and engineers began substituting mechanical ventialation for natural ventilation. The interiors of contemporary buildings became hermitically sealed containers, without operable windows. Designers reveled in their control over the interior environment. After several decades



14. Rooftop windscoops, Sind District, West Pakistan
In use since 1,500 a.d.



15. Environmental Design Office Building
Charles Stuart University, Australia
Marci - Webster Mannison, 1998

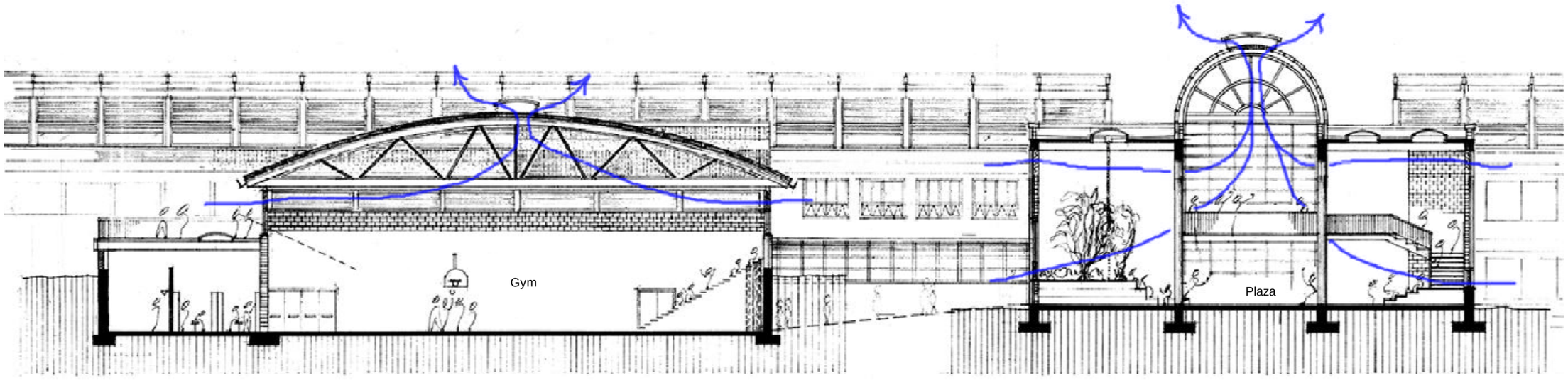
16. Open Air School, Amsterdam, Netherlands
Johannes Duiker, 1930

of this, however, people began to question the desireability of this design approach. The lack of fresh air, connection to the outside, and individual control over one's environment seemed to have negative emotional, physical and psychological effects. Within the past several years there has been a movement to reintegrate natural ventilation into the built environment.

Fresh air, like fresh water, is a fundamental human need. People are healthier, work more effectively, and are more engaged when their places of work or habitation are naturally ventilated. In a school environment this is particularly important. Naturally vented schools provide a greater degree of stimulation through natural fluctuations of air movement and temperature, which cannot be duplicated by an artificial mechanical system. Students are more likely to stay alert and awake in a climatically dynamic environment.

It is common knowledge that the flu and other diseases spread rapidly in winter due to peoples' confinement to closed rooms. This is particularly so in schools. Infections and illness are less likely to spread in a naturally vented building, decreasing the amount of absenteeism.

In the Sun School most rooms are naturally vented.

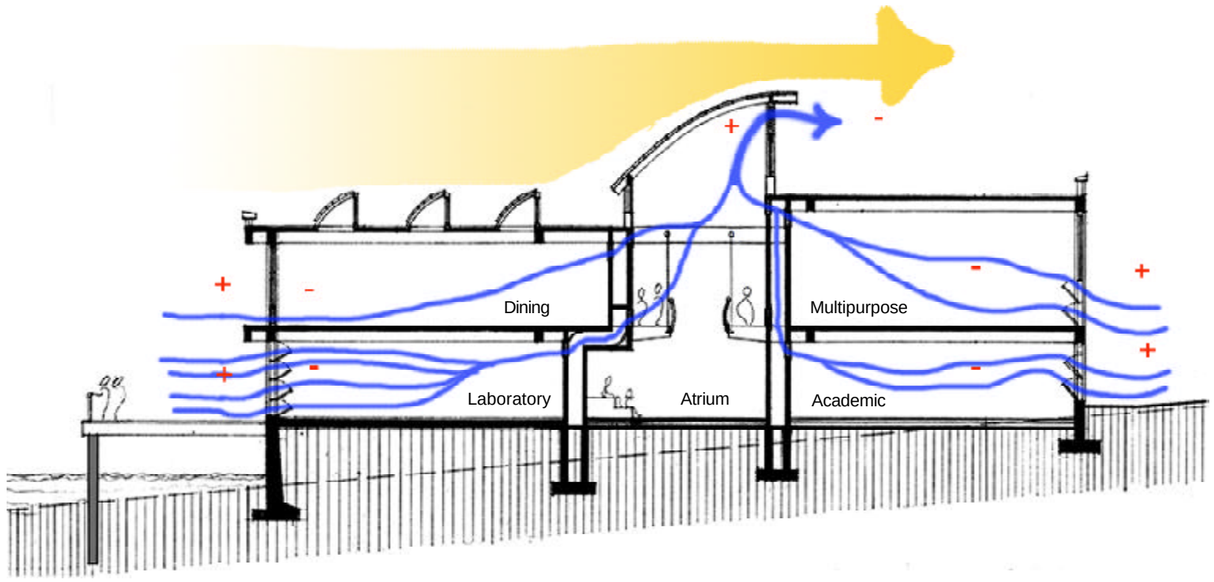


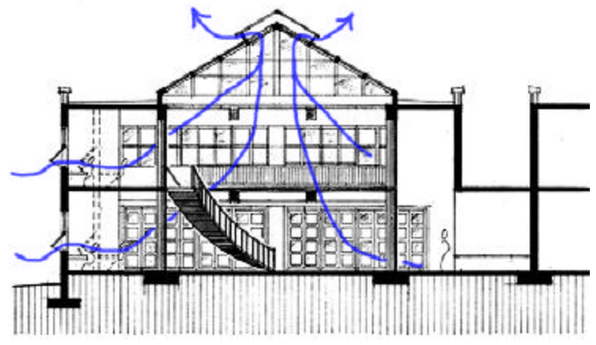
SECTION 1

In the Sun School most rooms are naturally vented. The gym, the entry spine and plaza, and the library all rely on the stack effect to vent warm air from the space. In the warmer months as warm air rises, it moves out the operable ventilation louvers located in the roof, pulling in fresh air from the ventilation louvers located in the walls. In winter this same warm air is recyled through the mechanical ventilation system, thus reducing heating costs.

In the Laboratories and Classrooms, the Atrium, and Multipurpose and Dining rooms the stack effect plus the Bernoulli effect produce natural ventilation. The curved form of the atrium roof takes advantage of the southern summer breezes, and creates a negative pressure zone on the north side of the atrium peak. This negative pressure draws air in through the operable hopper windows, through the interior rooms, into the cavity walls, then into the atrium interior and out the operable louvers located below the atrium roof. A continuous cycle is created.

In the Library the stack effect is primarily responsible for natrural ventilation. Warm air rises to the operable ventilation louvers at the peak of the skylight and vents out, drawing in fresh air through the hopper and awning





Library

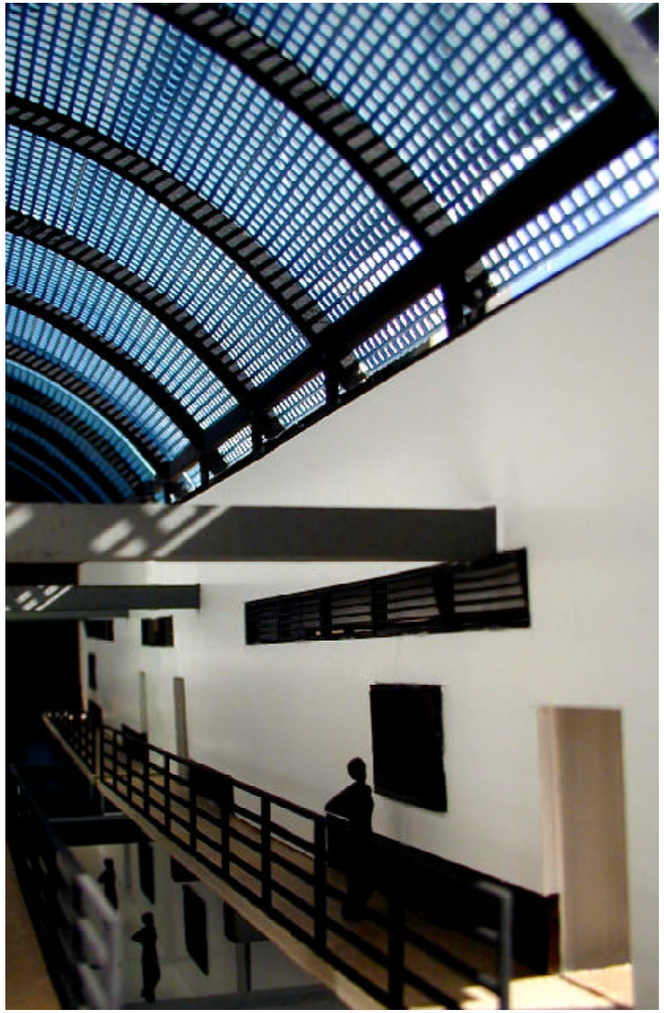
SECTION 2

windows. Hopper and awning windows are used throughout the school because they provide rain protection as well as ventilation. In a school setting where windows are routinely left open, hopper and awning windows provide rain protection without the need for constant monitoring. In particular, awning windows are used in the Library reading coves because they permit the reader uninterrupted reading space, versus hopper windows which would intrude upon that reading space.

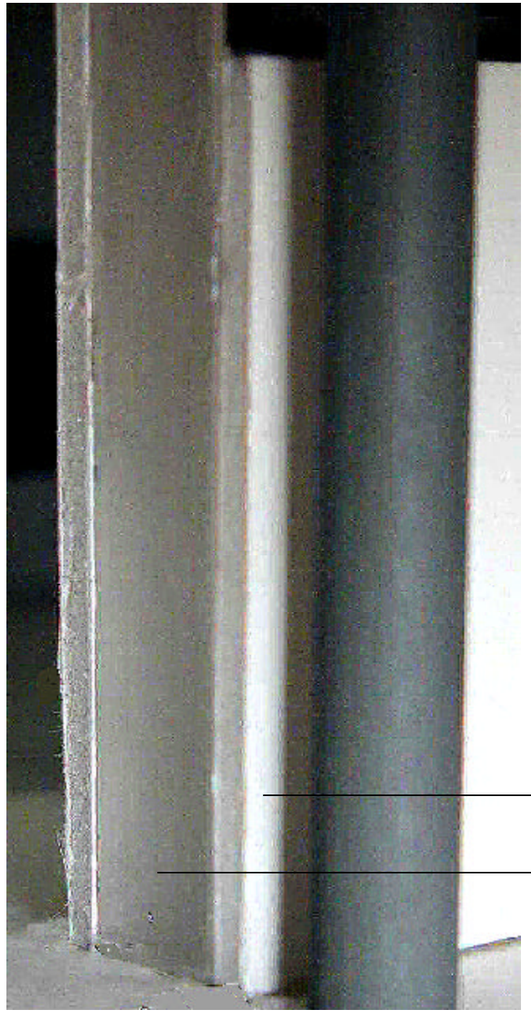
The challenge in natural ventilation is to coordinate it with the mechanical ventilation system. This is accomplished through a decentralized mechanical system using variable/constant air volume units. In the laboratory and classroom wings, a mechanical room services two or three classrooms. A student or teacher can open the windows without affecting the remaining classrooms. The associated mechanical unit senses the change in climate and responds accordingly. Wasted mechanical energy is minimized and the students and teacher remain comfortable.

SECTION 3

By opening and shutting windows the students become active participants in the climate control system of the school.



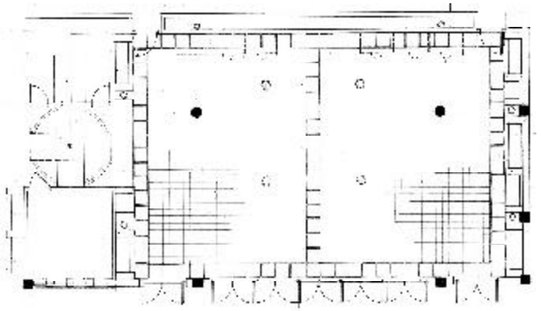
Ventilation louvers in Atrium



Cavity wall at Classroom threshold

The cavity wall ventilation louvers are clearly visible in the Classrooms and Atrium, as well as the operable louver at the Atrium peak. At the threshold to each Classroom and Laboratory, the cavity wall material changes from concrete block to glass block. This change of material calls attention to the cavity wall, encouraging a student to inquire about it. What is inside the wall? Perhaps a student may make a connection between the louvers and operable windows, formulating in their minds the workings of the natural ventilation system. Thus the Architecture of the school teaches.

Access to the two foot wide cavity wall is at the threshold as well. Maintenance can be performed with minimal difficulty.

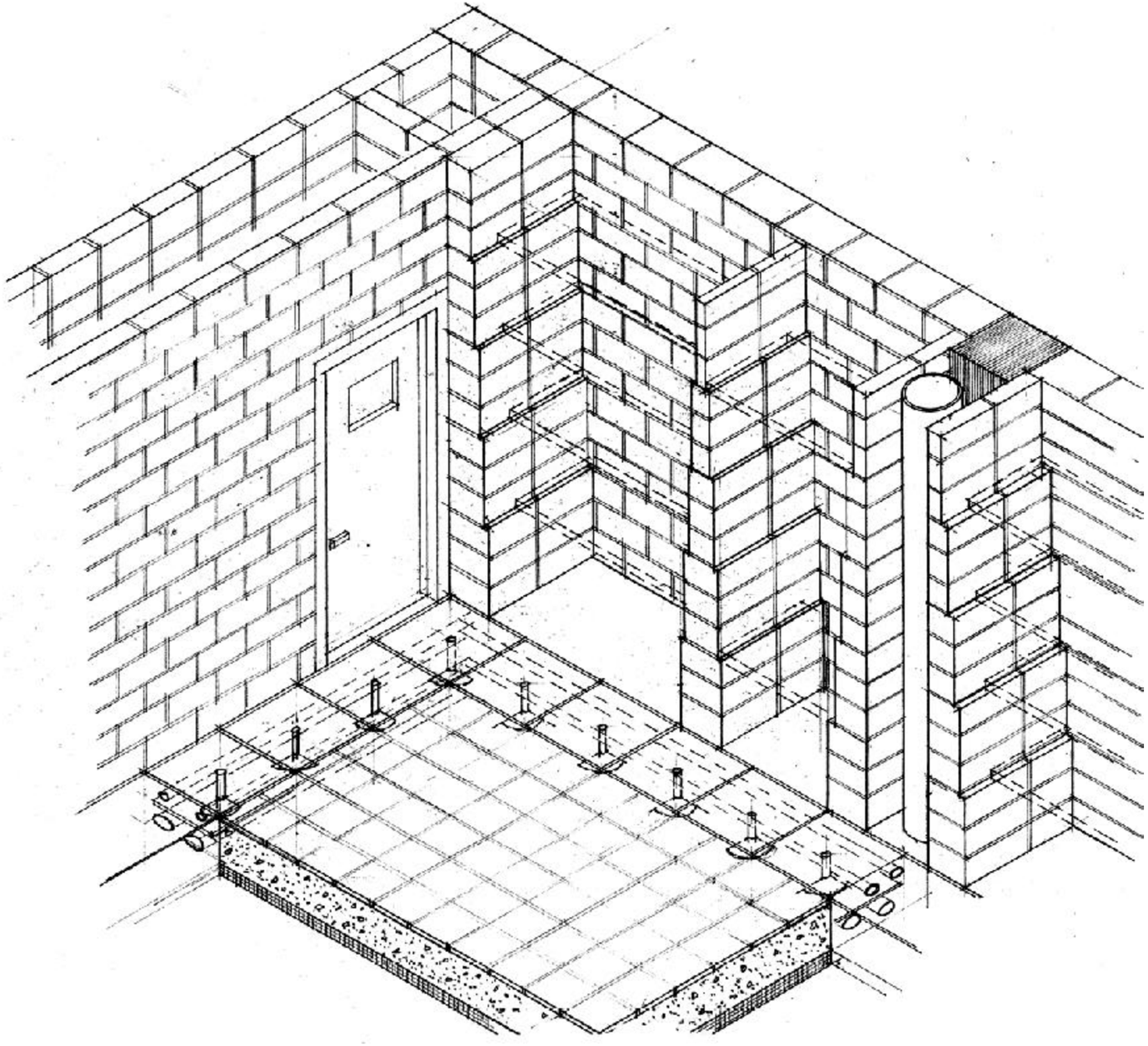


LABORATORY FLOOR PLAN

The Laboratories make much use of their floors and walls. The floors are a combination of slip resistant ceramic tile, 12” concrete thermal mass for passive solar heating, and 4” rigid foam insulation below. Solar gain during the day will be stored in the floor and released at night to reduce the heating load of the building.

A displacement mechanical ventilation system, located in the two tier raised floor, runs along the perimeter and central portion of the Lab. This is supplied from the variable air volume and/or constant volume unit located in the adjacent mechanical room. Air is returned through ceiling registers, thus flowing from floor to ceiling, the opposite of most systems in the United States today. The system is beneficial because carbon dioxide and pollutants are drawn up and away from a person’s face, replacing these pollutants with fresh air from below.

Useable walls are important in a school because they provide storage space. The Laboratory perimeter walls contain a dedicated place for supply air ducts, as well as built in storage shelves. These shelves can be partiallly adjusted by removing one or more of them to increase the vertical storage height. Their built in nature will insure that they will not be easily removed or value engineered from the building.



LABORATORY AXONOMETRIC