

Sustainability in the School Building Type

Arch 384
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11 pages

Introduction

For many architects, sustainability is the equivalent of high-tech energy systems and recycled materials. Sustainable architecture in recent years has been shaped by the ever-expanding array of technological advances.

Unlike commercial buildings, institutions such as colleges carry much greater responsibility. It is not only didactic in its programme, it also serves as an example to the local community and future development. Colleges have a dual function to fulfill – first to continue a tradition of scholarship, and second to foster new ideas, discoveries and invention.

College of the Desert Teaching and Administration Building seeks to derive a sustainable architecture that responds to the landscape, climate, history and technology. It creates a harmonious and optimal learning environment for students, faculty and the community at large, bridging technology with local traditions.

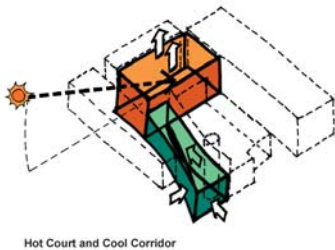
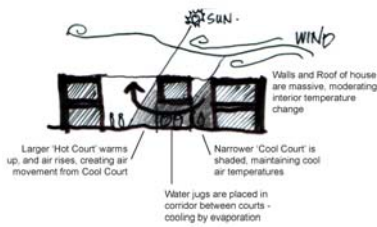
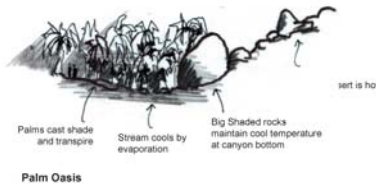
Traditions

Past experience in places of extreme climates has long influenced architectural expression to sustain human settlement. Socially, the courtyard building type of the college encapsulates the community strategy of the College of the Desert campus. Environmentally, it responds to the

established network of courtyard and covered walkways that provide shade in the hot and arid climate of Palm Desert.

Inspirations

Seeking a poetic and sustainable solution, inspirations are drawn from natural landscape and traditions in the region. Deep slot canyons provide clues to the cooling potential of thermal mass and shade. Nearby palm oases illustrate the cooling and humidification created by evaporation. A study of traditional courtyard houses showed how controlled convection could drive a passive ventilation system.

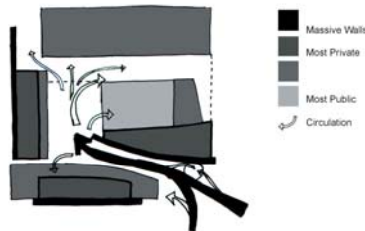


Courtyard Systems

These sustainable strategies are incorporated into the college building through a courtyard system that comprises of a cool corridor and a hot court. The combination of traditional courtyard form with sustainable strategies results in comfortable exterior microclimates, therefore mechanical system and cooling energy requirement are minimized.

The cool corridor directs summer winds past the water wall through the main entrance, bringing people and natural elements into the heart of the building. The water wall conditions the incoming air through evaporation and humidification. From the cool corridor, people, air and water flow into the hot court. The hot court is the gathering space for college community. All program elements: the classrooms, offices and auditorium are accessed from this

central node. The air brought in by wind heats up and rises, causing cross ventilation to take place in the single loaded wings of the building.



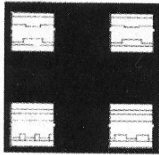
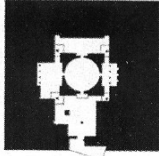
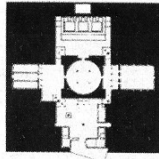
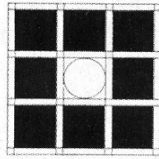
Circulation and Public / Private

Building program responds to the courtyards in various ways. The structured administration and office wings act as a shield, protecting the public and student pavilions from harsh southern and western sunlight. The public auditorium opens out to the hot court, for functions and evening lectures. Classrooms are located on the north side to take full advantage of indirect light.

Druk White Lotus School



The concept of a poetic and sustainable architectural resolution is best exemplified by Druk White Lotus School, designed by Arup Architects and Engineers. Phase I of the project - the nursery and infant school was completed in September 2001.

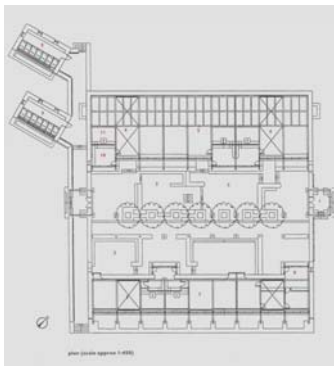


The masterplan of the school is designed based on a nine-square grid, central circle and cruciform axes, in the form of the structure of a *mandala*, “an ‘imaginary palace’ contemplated during meditation.” It also employs the progression of sacred spaces customary in the design of Buddhist monasteries. Entry sequence leads through a series of thresholds until visitors emerge in the center with access to all areas of the school, likened to the courtyard building type.

A project initiated by the people of Ladakh high in the Indian Himalayas, it is “a school that would help maintain their rich cultural traditions, based on Tibetan Buddhism, while equipping their children for a life in the 21st century”.



A Buddhist school that resembles the *gompas* – “stone monasteries that cling to the mountainsides”, the design in turn is shaped by the extreme environment and sheltered culture of Ladakh. Located in a high-altitude desert, the building is subject to extreme temperatures and strong sunlight.



Based on local monasteries, the built form consists of two pavilions that are separated by an exterior court. The nursery and the infant components flank the court on both sides, taking advantage of the morning sun from the southeast. Traditional buildings of the area inform the materials of stone and timber used in the school. All materials were sourced and processed locally.

Unlike the Buddhist school that utilizes Trombe walls to heat the dormitories at night, College of the Desert utilizes night cooling by operable vents when the school is not in use after hours.

Simultaneously blending local Buddhist culture and traditions with modern technology and academic education, the Buddhist school arrives at an architectural resolution that is both localized and sustainable.

Tulse Hill Jubilee Primary School



Sustainability was also realized in a school that enhances the quality of life within a community. The Jubilee school was designed by Monaghan Morris Architects and was completed in September 2002.

Located in London, UK, the sustainable design strategy includes the use of recycled materials, low energy consumption, optimal daylighting and improved indoor air



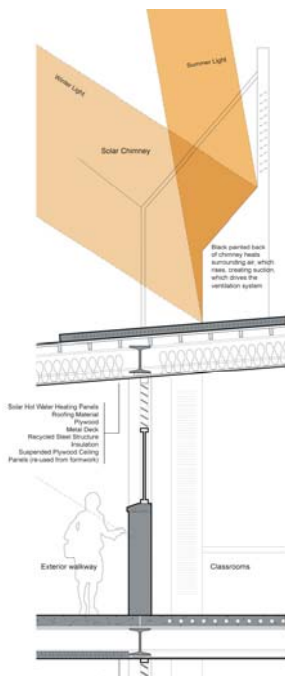
quality. These various aspects serve as precedent for the College of the Desert.



In Jubilee School, solar heat gain to the south façade is controlled by the overhangs and balconies of the classroom building. Adequate overhangs keep out direct sunlight in the summer, while allowing winter sunlight to enter all classrooms. Effective day lighting strategy was put in place to reduce electricity usage. Single-loaded corridors give access to all classrooms, bringing optimal daylight into each room from two sides through operable windows and skylights.

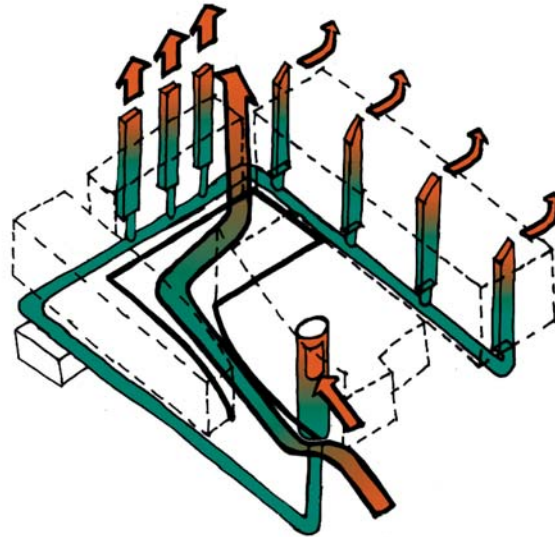


In order to maintain a cool, naturally ventilated environment, ventilation chimneys are used in addition to the overhangs and operable windows. These ventilation chimneys are hand-operated and allow occupant control of their immediate environment. Utilizing displacement ventilation strategy, fresh air is drawn from the operable windows located on the far side of the classroom and exhausted through the chimneys by stack effect.



Likewise, in the College of the Desert, daylighting is optimized for all classrooms. Minimal southern sun exposure prevents excessive solar gain in this hot and arid climate while glazed north façade provide comfortable daylighting. Natural cross ventilation is driven by the concept of the courtyard system that consists of cool corridor and hot court. In addition, in the classroom building, ventilation chimneys assist in cross-ventilated air circulation by stack effect. These chimneys are located in the thick wall

between classrooms. Utilizing a hybrid system, air is pre-conditioned in underground pipe and is distributed mechanically throughout the building.



Convection Flows

The Jubilee School demonstrates the potential of utilizing sustainable building concepts in public institutions that improve the quality of life in its community and provide long term cost savings that public projects need.



Materials

College of the Desert is located in the Palm Desert, California - a region of unique landscape. The grand scale of the landscape consists of wide, open vistas bounded by striking mountains. It is a landscape of earth and stone, constantly changing through erosion by wind and water.

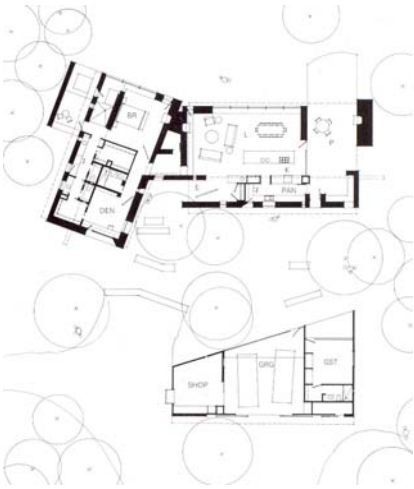
The built form and the materials of the college respond to the vast landscape and the tradition of earth buildings in the region. Massive rammed earth walls rise from the ground, like uplifted planes of sedimentary rock. These earth walls form the exterior of the administration and office wing punctuated by minimal window openings. It resembles a shield that protects the lighter, glass volumes behind. It serves as thermal mass to moderate interior temperature. Metal louver system provides shading to the glass volumes.



The work of Rick Joy provides fine examples of utilizing rammed earth as building material in hot and dry desert environment. They often possess such duality as being simultaneously contemporary and ancient. One of the works is the Palmer/Rose Residence. It is located in Tucson, Arizona, US and was completed in 1998.



Though it is a private residence of 4,350 sq. ft and not an institution, it is located in a region that has similar climate to Palm Desert. The residential complex includes a 2,500 sq.ft. one-bedroom house, a 450 sq.ft. porch and a 1,400 sq.ft. garage, shop and guesthouse.



The house is divided into two simple rectangles, containing the general living areas and the private. The rectangles are arranged to provide privacy and views. Rammed earth was used for the general structure of the building. Exposed rammed earth wall planes of 600mm thick form the volumes of the spaces and support the “butterfly” roof form. They not only serve as privacy shield for the house, but also as thermal mass facing south to mediate the high temperature at day time and the relatively low temperature at night. Soils were sourced from within the Tuscon area and were selected specifically for the colour and structural integrity.

In the Southwest, adobe and rammed earth structures are deeply rooted into the local and regional history. Learning from the local tradition, Joy created architecture that is simultaneously contemporary and ancient.

Conclusion

Learning from landscape – moderating desert extremes, College of the Desert reinforces the link to tradition, at the same time reaching for a sustainable future. Through the combination of the passive/traditional and the active/technological design strategies, the architecture inspires students both to respect their landscape, traditions and heritage, and to use new technologies in sustainable ways.

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All images are taken from the above-mentioned sources.