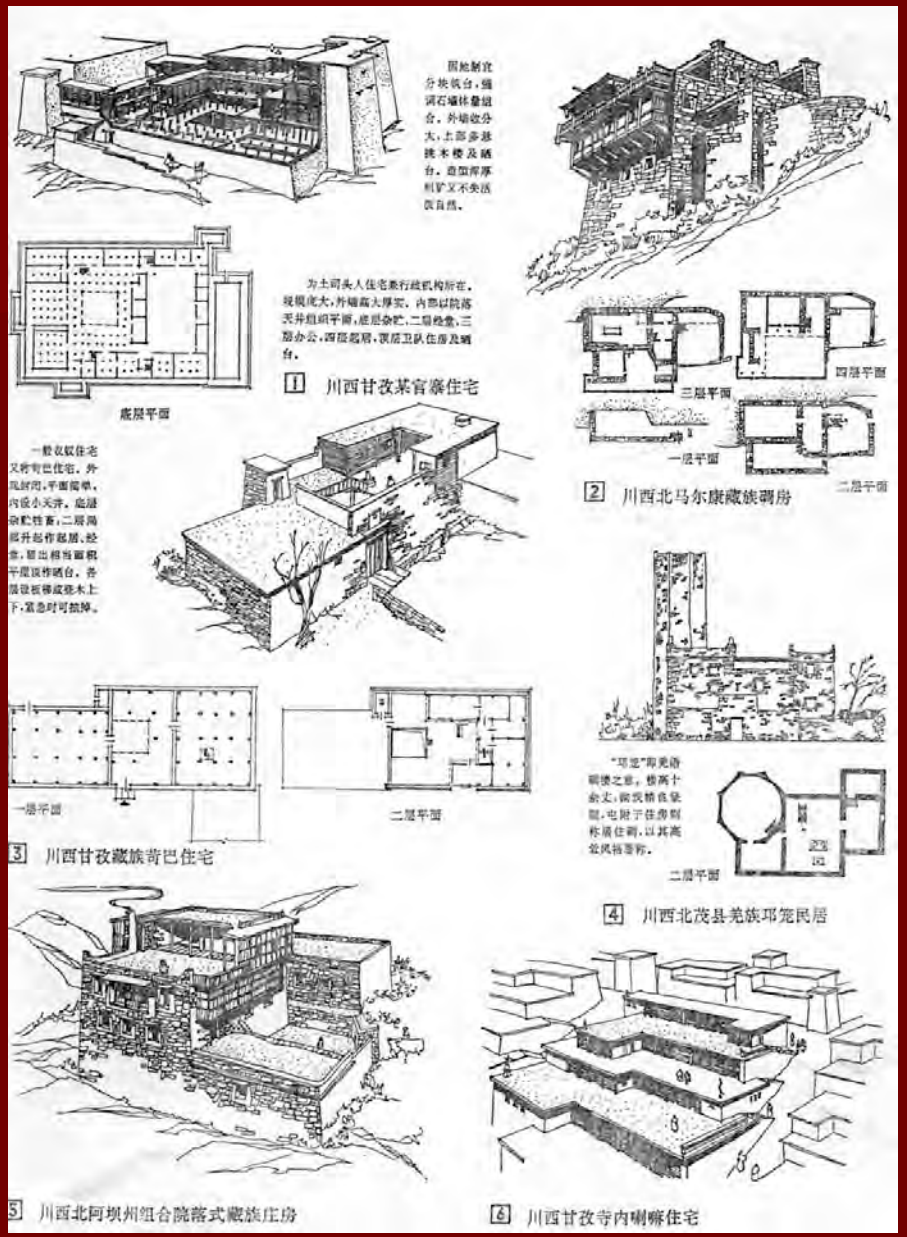
INTRODUCTION TO ECO – SUSTAINABLE TECHNOLOGIES IN THE TIBETAN ENVIRONMENTAL AND CULTURAL CONTEXT

BY
MARCO DIMIZIANI AND ANDREA DELL'ANGELO

ASIA ONLUS

THE TIBETAN ENVIRONMENT AND ITS SPIRITUAL IDENTITY

- Tibetan architecture is a classic example of integration with the environment for its use of materials, orientation, distribution and organization of internal spaces in relationship to the external space, adapting to a great variety of local conditions.
- A popular saying states that “every ten *li* (5 km) the sky is different” and customs change from valley to valley.
- The territory of Tibet is a geographical symbol and, as for many nomadic peoples, the environment reflects the sacred and spiritual view of nature with its inhabitants and is transformed into daily practices and into building traditions linked to the great number of micro-climates, varieties of vegetation and inhabited areas.



LOCAL TRADITIONAL ARCHITECTURAL EXAMPLES

STONE CONSTRUCTIONS IN EASTERN TIBET

- Traditional settlements of the rural population in Tibet consist of groups of houses or villages usually situated on the south side of the mountain slopes. A family house is a quadrangular structure with walls of stone cemented with mud or unbaked clay bricks, a flat roof/terrace supported internally by pillars; the ground floor has no windows and is used as a stable or store-room; the first floor is lived in during the winter and the second, which is under the terrace, is lived in during the summer.
- The openings are mainly on the east and south sides where the entry door is positioned while they are extremely reduced on the north side where the bathroom area is located.
- The dimensions of the windows guarantee a high level of illumination in a space which generally does not have much depth.

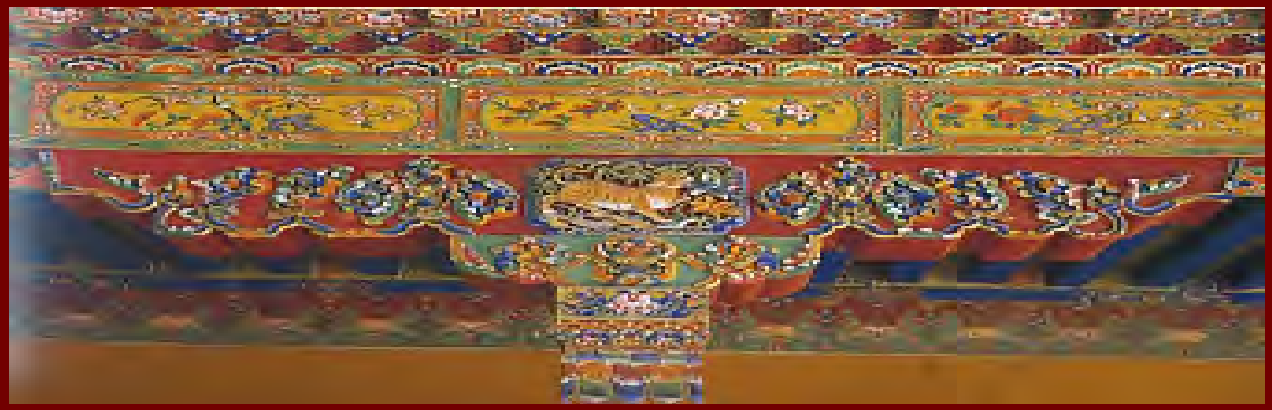
TRADITIONAL HOUSES IN GAMTHOG VILLAGE - KHAM

For centuries Tibetan architecture has followed the rules of Sa-Che, a science which studies the characteristics of the energies of the area (rivers, trees, rocks, mountains, roads) and the positive or negative influence they may have on the environment and on the beings that live there.

DECORATIVE ELEMENTS

The east-west axis of the building is developed and there is a large side to the south which corresponds to the front of the building on which there are a host of decorative elements that are most characteristic of the tradition such as window frames, cornices and the portico.

DETAIL OF CARVED WOOD DECORATIONS



TRADITIONAL TIBETAN HOUSE

Ut-sang VILLAGE

TRADITIONAL CONSTRUCTING METHODOLOGY

TRADITIONAL CONSTRUCTING METHODOLOGY

- Nomad tent is realized with yak whool fabric and heat with an earth stove which keep the tent warm for several hours. The same system is used in the house built with earth where the bed is constructed with earth and heat by the passage of the kitchen smoke, a system similar to the "*ipocausto*" of the roman thermae.
- The hole in the tent is for the illumination but also to keep contact with the divinities and spirit of the sky.
- The black tents are always set up on the southern site of the valley to be protected from the north winds and from the evil influences.

TRADITION - INNOVATION

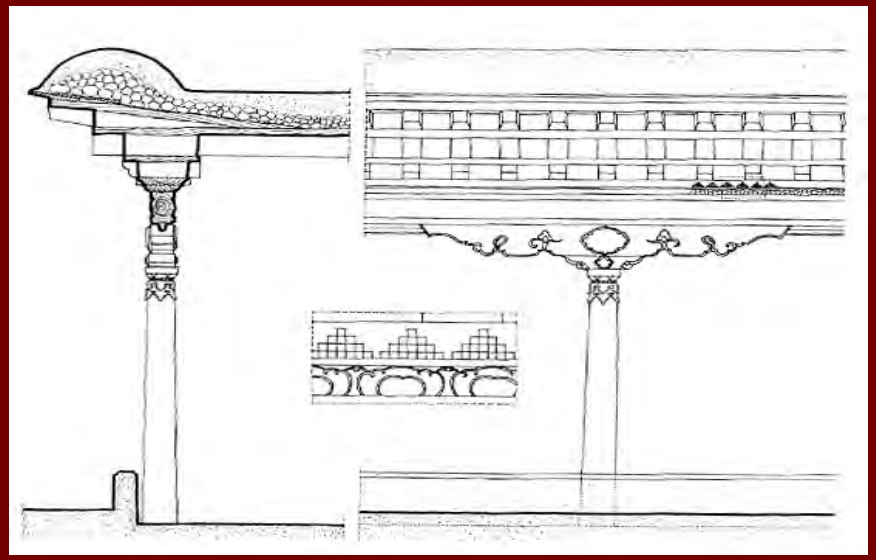
REINTERPRETATION OF TRADITION IN NEW BUILDING

Today the Tibetan architectural tradition is interpreted as the mere application of decorations in fibrocement, of painted cornices in reinforced cement and the imitation of forms and materials that had a meaning as long as they are linked to a tradition and local knowledge and that are, instead, reintroduced in regions that are very different such as Amdo and Kham, in multi-storey buildings which have devastate many historical cities of Tibet.

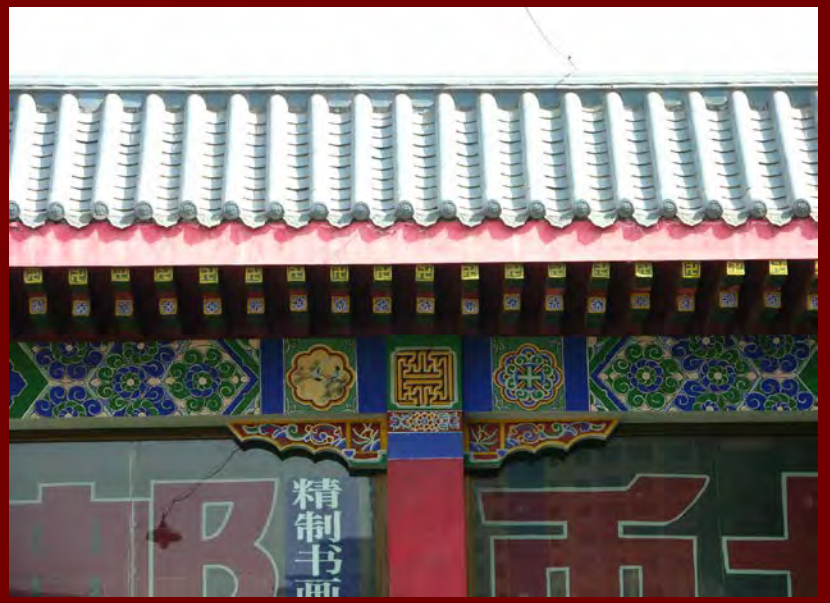
REINTERPRETATION OF TRADITION IN NEW BUILDING

TRADITIONAL DECORATION

TRADITIONAL DECORATION



CONTEMPORARY INTERPRETATION



TRADITIONAL COLLEGE BUILDINGS

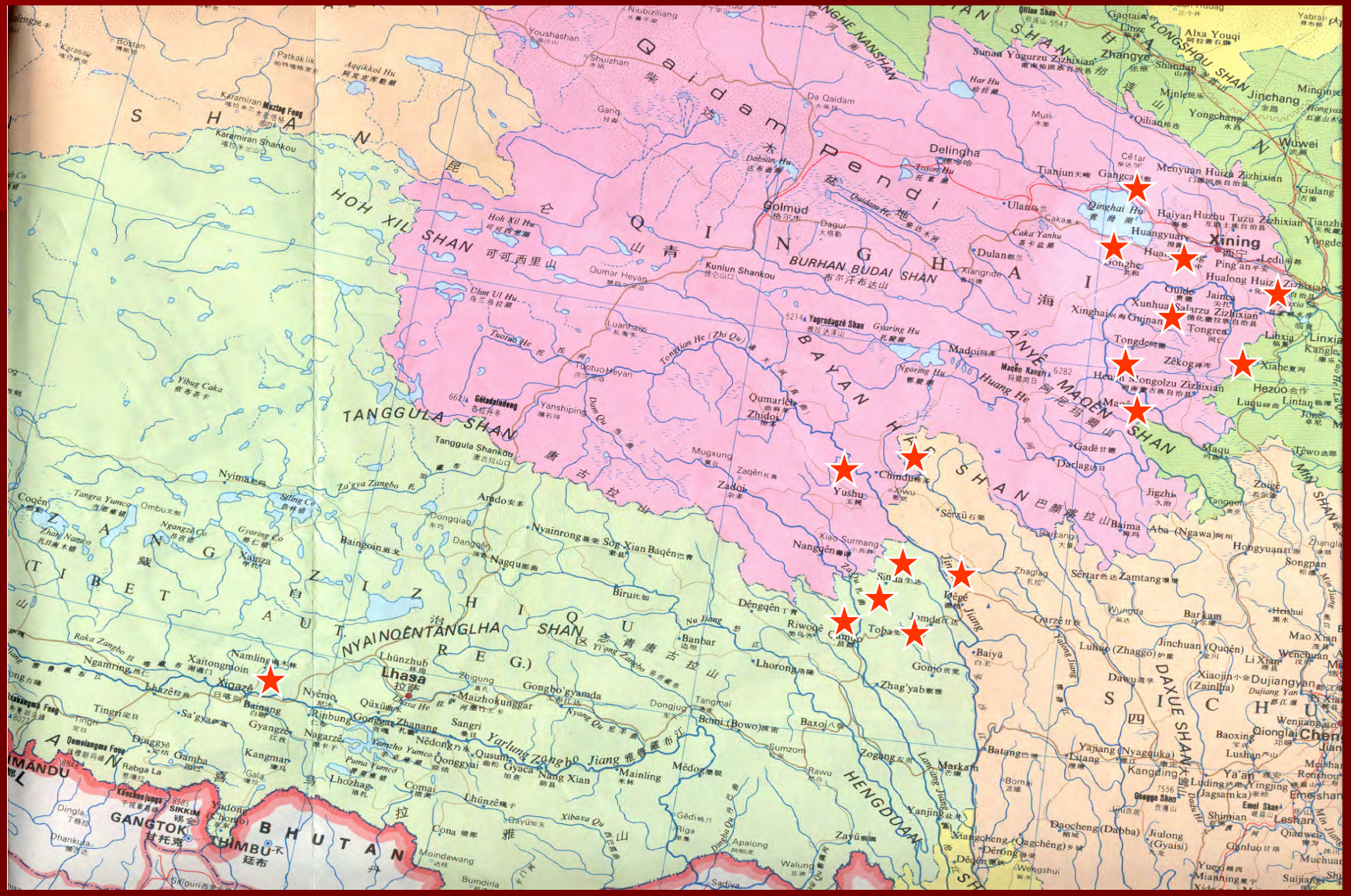
NEW TRADITIONAL BUILDINGS SOLUTIONS EXAMPLES

NEW TRADITIONAL BUILDING SOLUTIONS

ASIA'S ACTVITIES IN TIBET

- ASIA is a non-governmental organization founded in 1988 by Prof. Namkhai Norbu in order to promote economic, social, health and cultural development of the peoples and the minorities whose ethnic and cultural survival is threatened in Asia and with particular attention to the countries in the Himalayan area.
- Since 1993, ASIA has been working in the Tibetan Autonomous Region, in Qinghai, in Sichuan and in Gansu and has carried out more than 150 development projects.
- During this time ASIA has worked in the sectors of education, setting up 15 Tibetan primary and middle schools in remote areas. Training, concentrating on the training of Tibetan teachers and on students at the middle and high schools and universities. Health, building 10 hospitals of which 4 use Tibetan medicine and the others Western medicine

PROJECTS LOCATIONS ☆



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Methodology of ASIA's interventions for the preservation of the Tibetan Cultural Heritage.

- The construction of boarding schools in remote areas populated by nomads or by farmers.
- Restoration of dilapidated pre-existing school buildings built according to Chinese architectural characteristics.
- Construction of Buddhist or Bonpo study colleges.
- Restoration of temples, monasteries, murals
- Publication of unpublished texts and manuscripts
- Courses of Tibetan language and of methodology for traditional teaching

Tangghan village school - AMDO realized in 1999

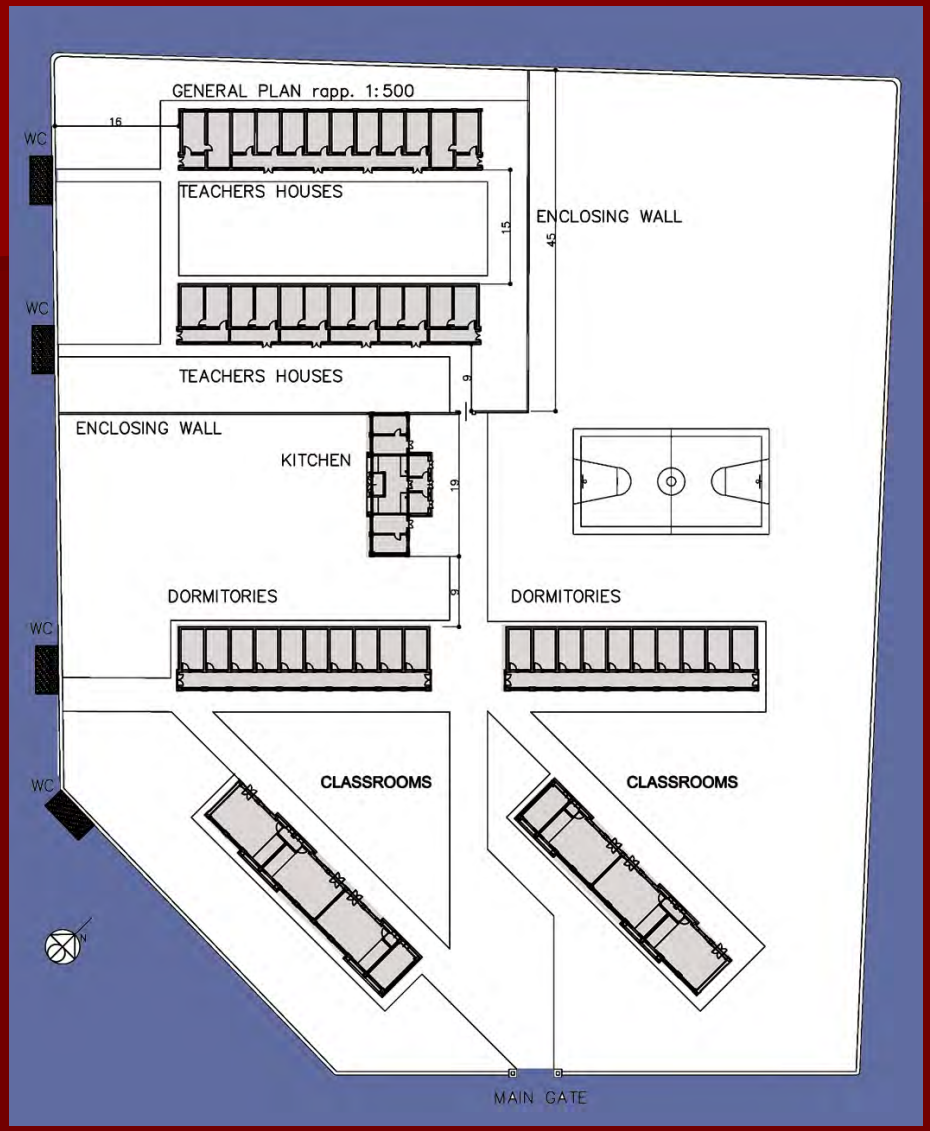
The awareness that the preservation of a culture passes most of all through respect of the values that inspired it has brought us to favor project solutions which make eco-compatibility a constant factor which is emphasized for three main reasons: the first is that ASIA operates in remote areas where the environment is prevalently natural; the second is that in the absence of traditional sources of energy (electricity, gas, coal), the only way of heating schools and hospitals at costs that can be supported by local communities is the energy of the sun; the third is linked to the attempt to make administrators and users aware of environmental themes in order to promote sustainable knowledge that will be considered as a cultural characteristic alternative to the current one.

Tangghan village school - AMDO

Before intervention

After intervention

GENERAL PLAN



- All the building is a solar system within which the structure component play a double function, the traditional one to define a space and the solar one to collect, store and distribute the heat
- The windows do not allowed only the entrance of light and air but capture the heat. The walls do not have only the function to define a space but store and irradiate thermic energy. The building's components for which the main function was strucutral or esthetical, become instruments for the solar heating.

Tangghan village school - AMDO

Light-weight buildings, structures in reinforced concrete, sloping roofs, use of ceramic tiling and most of all the total indifference to positioning (all of which are building characteristics suitable for tropical hot-wet climates) have replaced Tibetan constructions in stone, earth and wood.

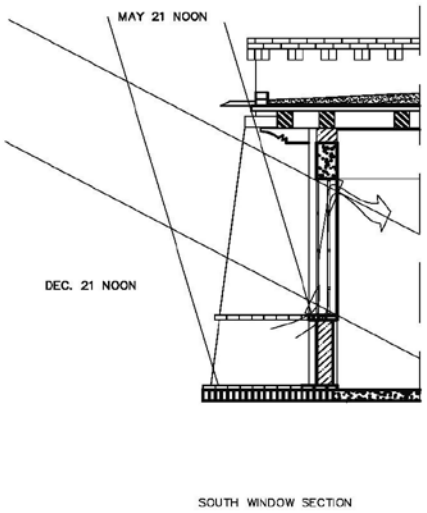
Before intervention

After intervention

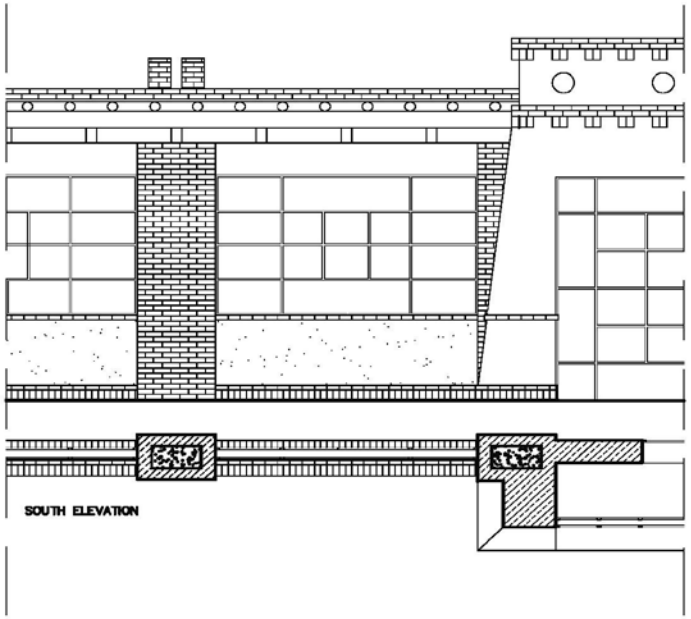
NORTH SIDE ELEVATION DURING CONSTRUCTION WORKS

Regarding the choice of construction materials, the criteria of availability on site is mainly followed for two reasons: the first is that the materials that are available in the area are the most used and are therefore well-known to local workmen. The second reason is that transport costs cut into the final cost of the product as much as 70% without considering the general energy cost.

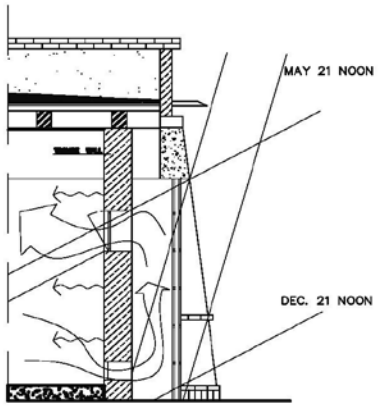
SOUTH FACADE SECTIONS SHOWING TROMBE WALL



SOUTH WINDOW SECTION



SOUTH ELEVATION



TROMBE WALL SECTION

- The new buildings have been rotated to South offering the maximum windows collecting surface to solar direct radiation, while the restoring building South East front has been protected by a glazed corridor working as a greenhouse.
- At the latitude 36° N, each sq.m. of glass surface, collect from October to March, more than 4 Kwh.
- In this way the windows and the “Trombe wall”, a dark coloured massive wall placed directly behind a glazed, South facing solar aperture, receive an amount of thermal energy of 71.88 Kwh that, considering the 6% absorbing heat loss of the glass, reaches a solar heat gain of 61.57 Kwh.

South facade with the Trombe wall

- The total heat storage capacity of one classroom is 19.64 Kwh/°C, this thermal mass is employed to tame the indoor air temperature fluctuations by storing solar energy for later release and by avoiding overheating during the day.

GREENHOUSE CORRIDOR

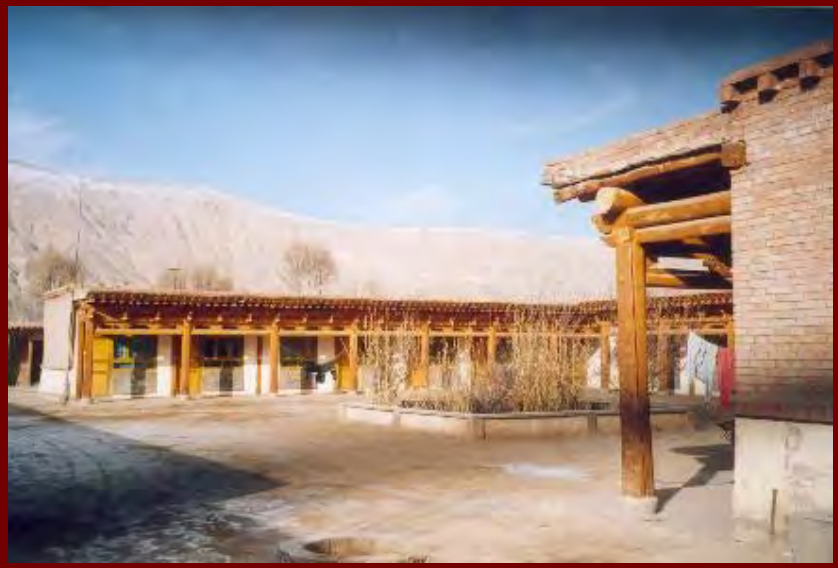
SOUTH FACADE DETAIL

- the restoring building South East front has been protected by a glazed corridor working as a greenhouse

Dongche village school - AMDO realized in 1997

This school, is the first intervention done by ASIA (1993-1997). Attention has been given to the traditional architectural features but no bio climatic techniques have been applied here.

Dongche village school - AMDO 1997



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Gamthog village school - Kham realized in 2000

In Gamthog, (1996-2000), ASIA built an hospital, a school and restored old military chinese buildings, through the destruction of the roof and the reconstruction of wooden second floors according to the local Tibetan style.

Hospital in Gamthog village - Kham 1997

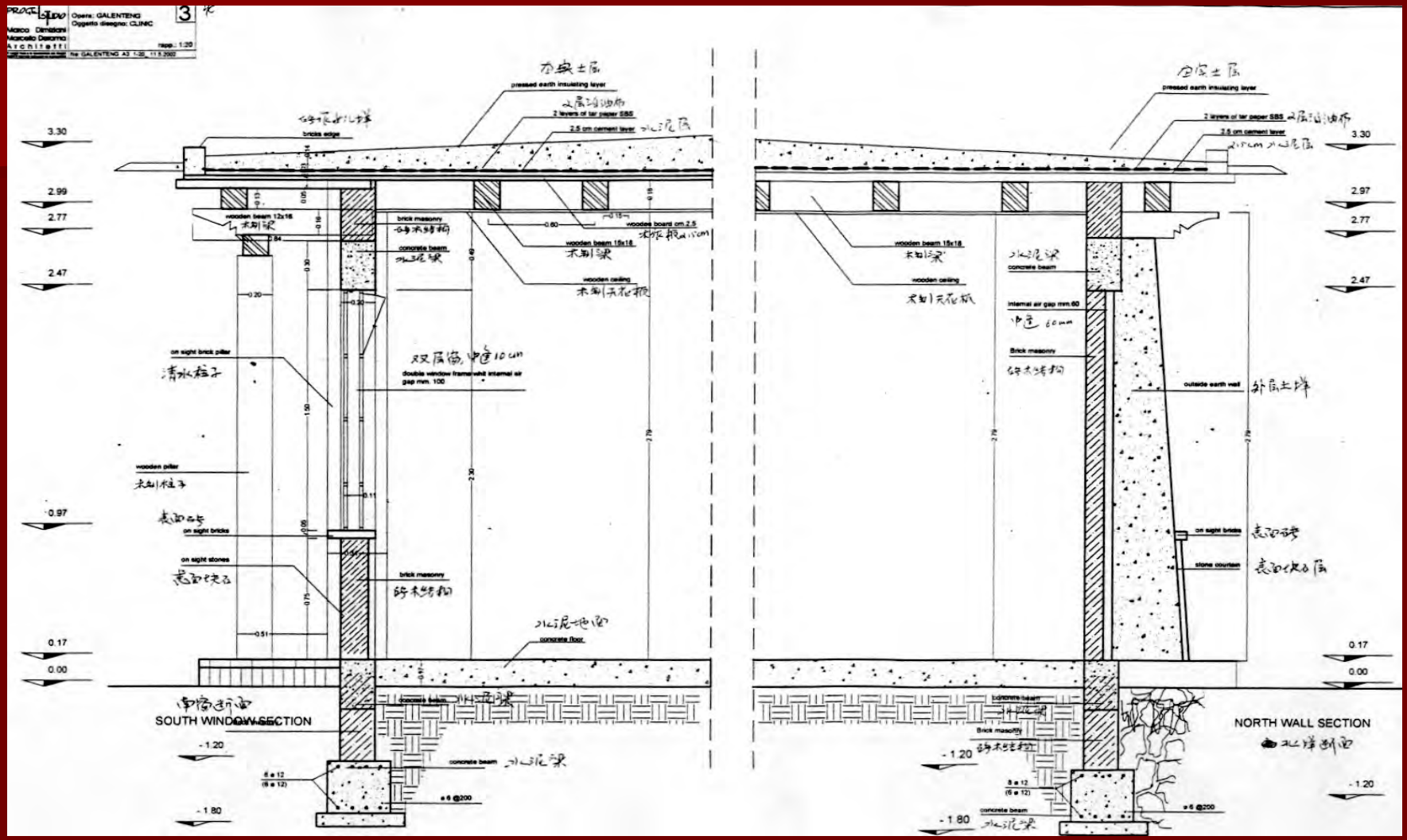
Hospital in Gamthog village

Aerial view of Gamthog village. The river is the Dri chu which separate the TAR from the Sichuan

Galenteng clinic in Derge county, realized in 2001

- The clinic has been built in a nomadic vilage at 3.700 m
- In the clinic, there are 4 rooms, one for Tibetan medicine, one for Western medicine, one inpatient and the doctor room

NORTH AND SOUTH CROSS SECTIONS



Galenteng clinic in Derge county, realized in 2001

The south facade, prevalently glazed, is shaded by a wooden decorated structure to avoid overheating of the rooms.

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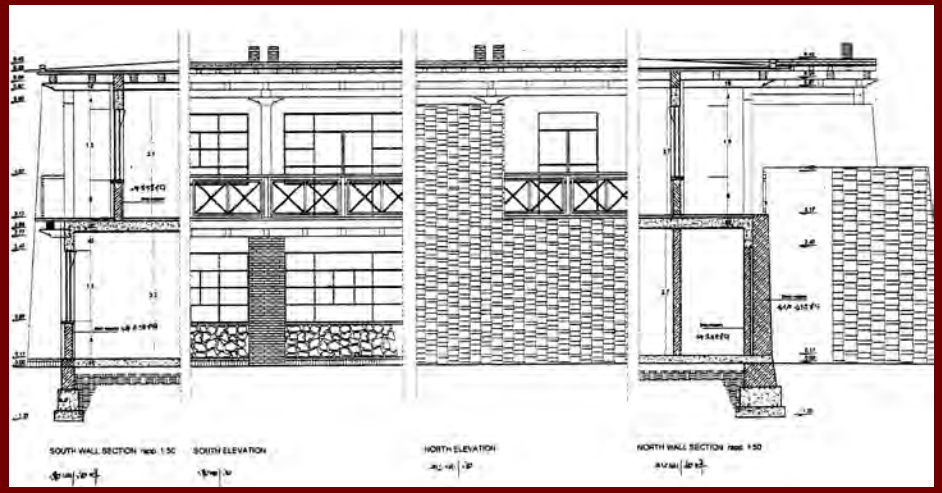
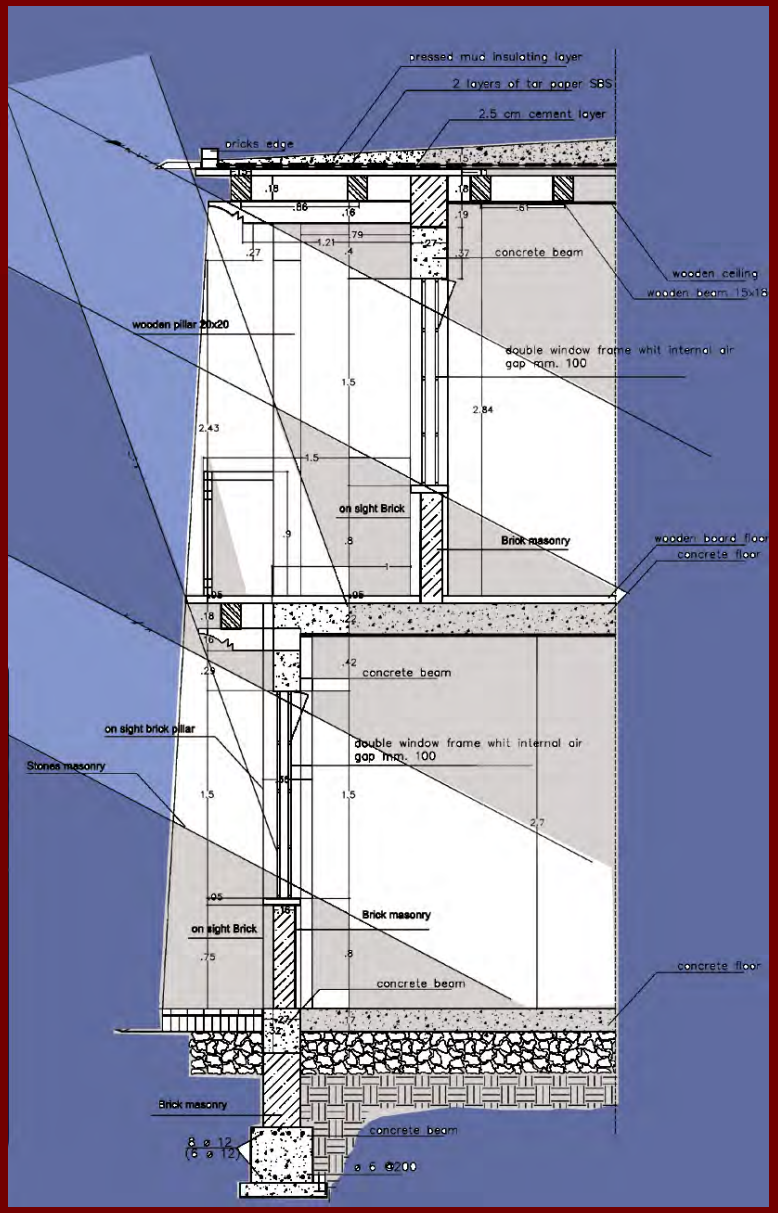
Korlondo xian clinic Kham Eastern Tibet

Before intervention

After intervention

SECTIONS- ELEVATIONS OF SOUTH AND NORTH SIDES





NORTH ENTRANCE VIEW

Khorlondo clinic roof details

SHALA VILLAGE SCHOOL - NYNTA SHAN BULT IN 2000

Before intervention

After intervention

Shala was a small nomadic school with 30 students and classes were held inside a stable. After the intervention of ASIA, more than 300 students are regularly following the classes from the 1° to the 6° grade

SHALA VILLAGE SCHOOL - NYNTA SHAN - 2005

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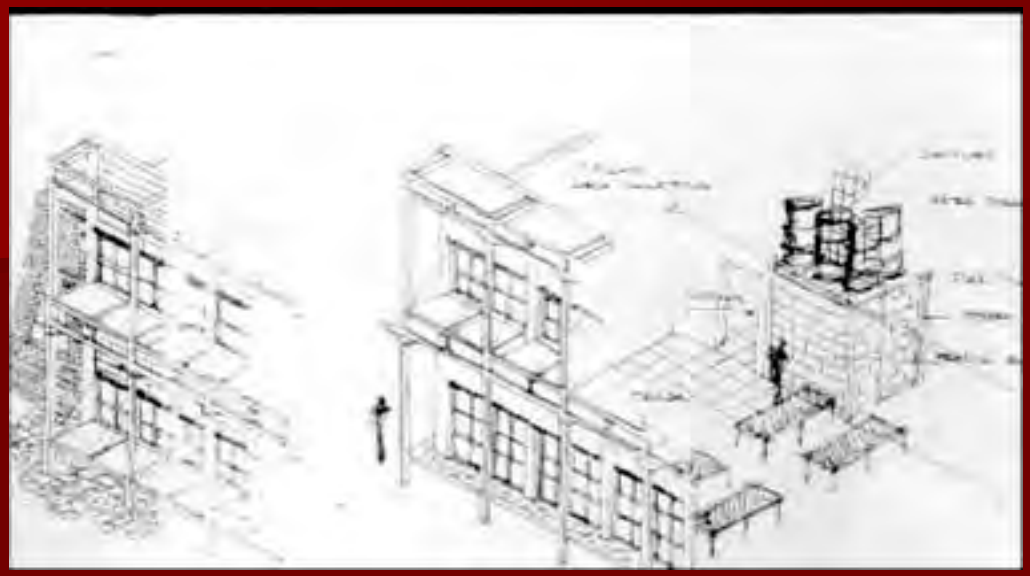
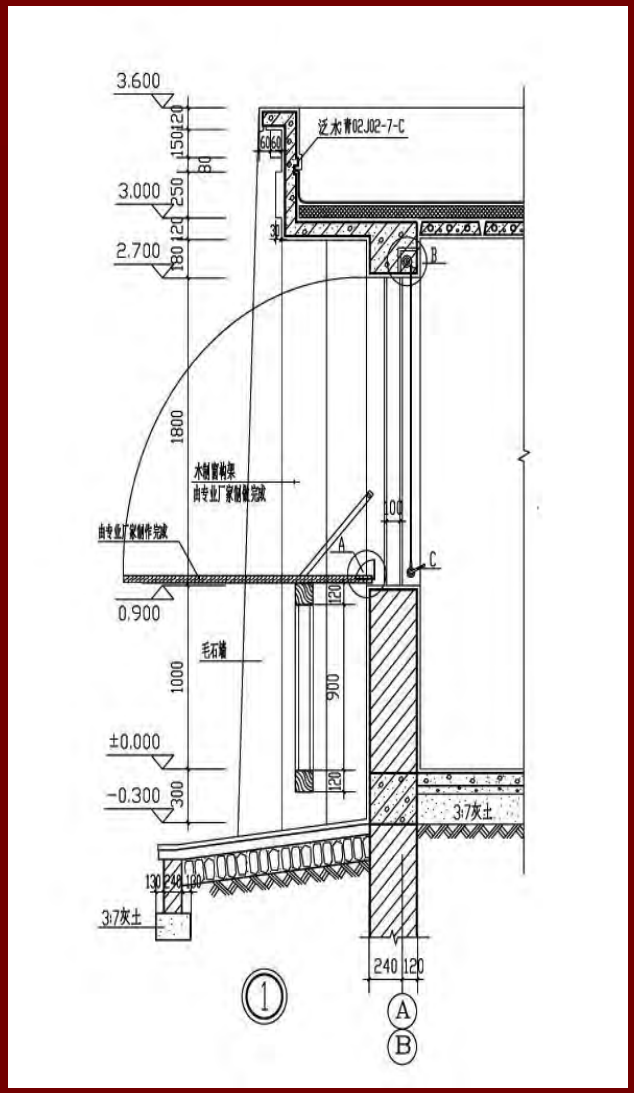
SHALA VILLAGE SCHOOL - NYNTA SHAN



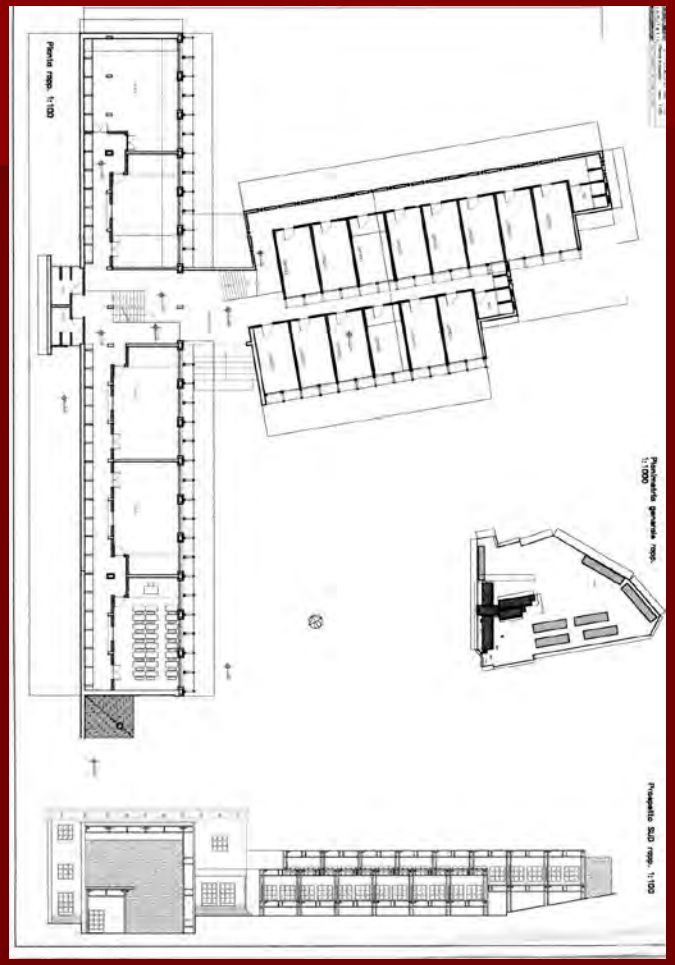
- The most frequently adopted choice for the building framework has been weight bearing walls made of an external side in brickwork, stone or earth, a cavity within the wall which in some cases is ventilated or filled with insulating material and an inner lining of large filled bricks which are also used for the dividing walls in order to take complete advantage of thermal capacity, the control of which is of fundamental importance in a bio-climatic construction.

SHALA VILLAGE SCHOOL - NYNTA SHAN

The introduction of glass areas, Trombe walls, systems of direct heat gain, insulation of the skin and control of the ventilation have brought about an increase in the glass surfaced collectors in the south, the creation of filter spaces in the north, the necessity to protect the points of entry by setting up a buffer zone, control of the height of the collector surfaces according to the depth of the building, systems for reflecting solar radiation and mobile insulation of the glass surfaces to reduce heat dispersion at night.

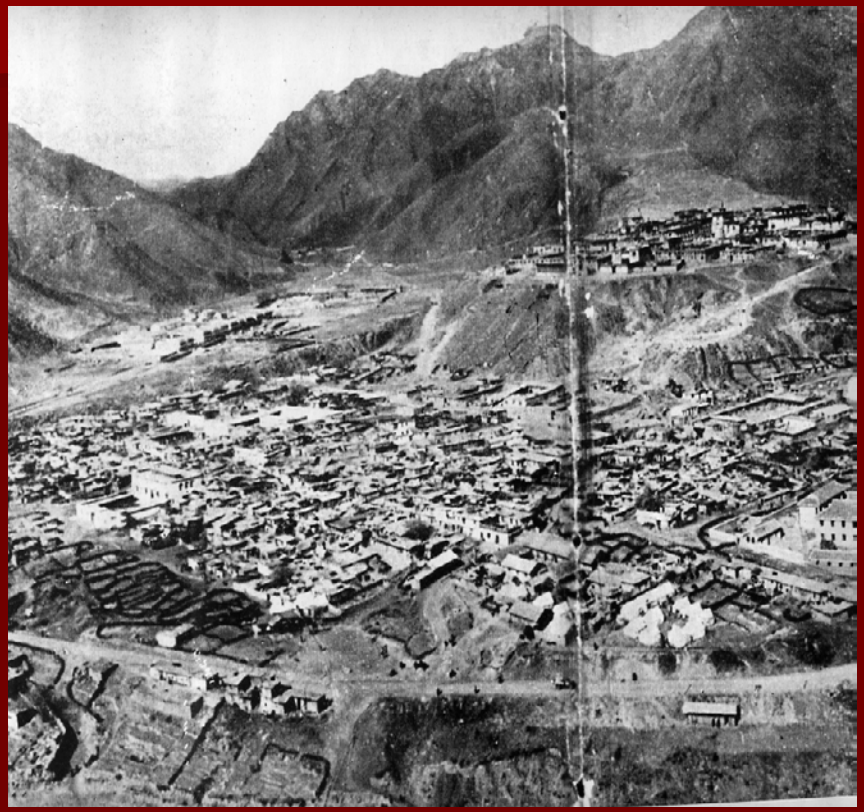


Medicine training school in Chamdo



Aerial view of Chamdo - 2003

Aerial view of Chamdo 1960



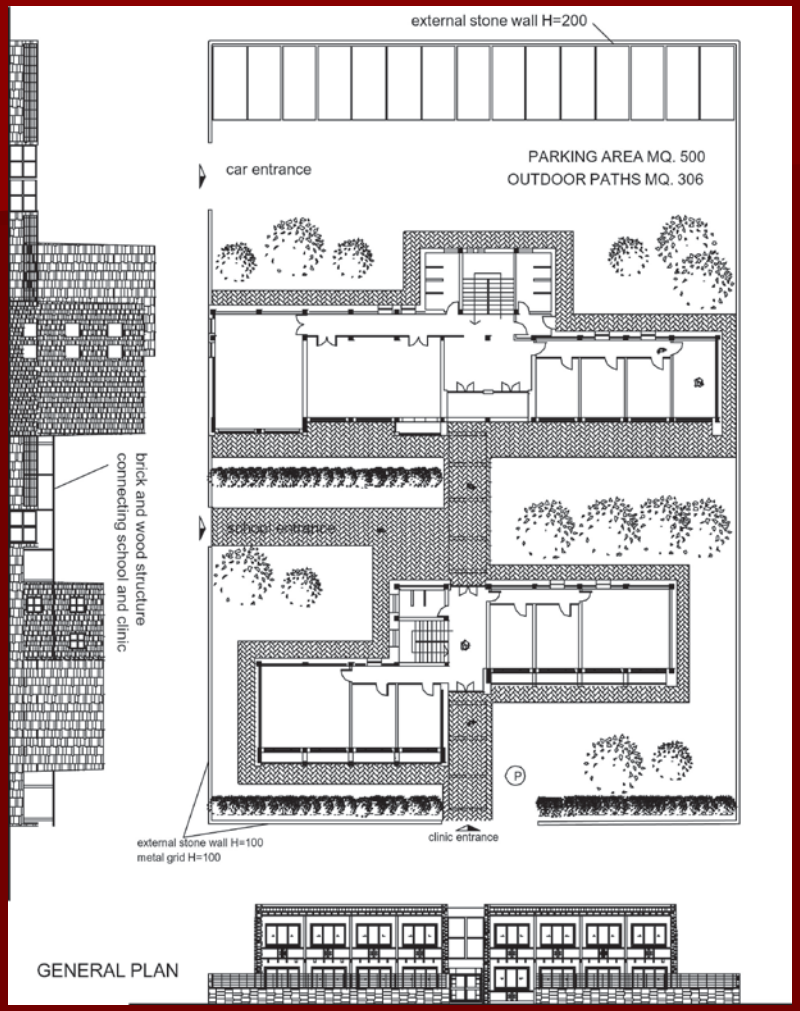
Aerial view of Chamdo 1980

Clinic in Olu Chamdo Prefecture

Olu clinic was a xiang clinic nearly abandoned. The local people requested to ASIA to intervene and also to improve the quality of the health services. Actually the clinic is run by 4 doctors.

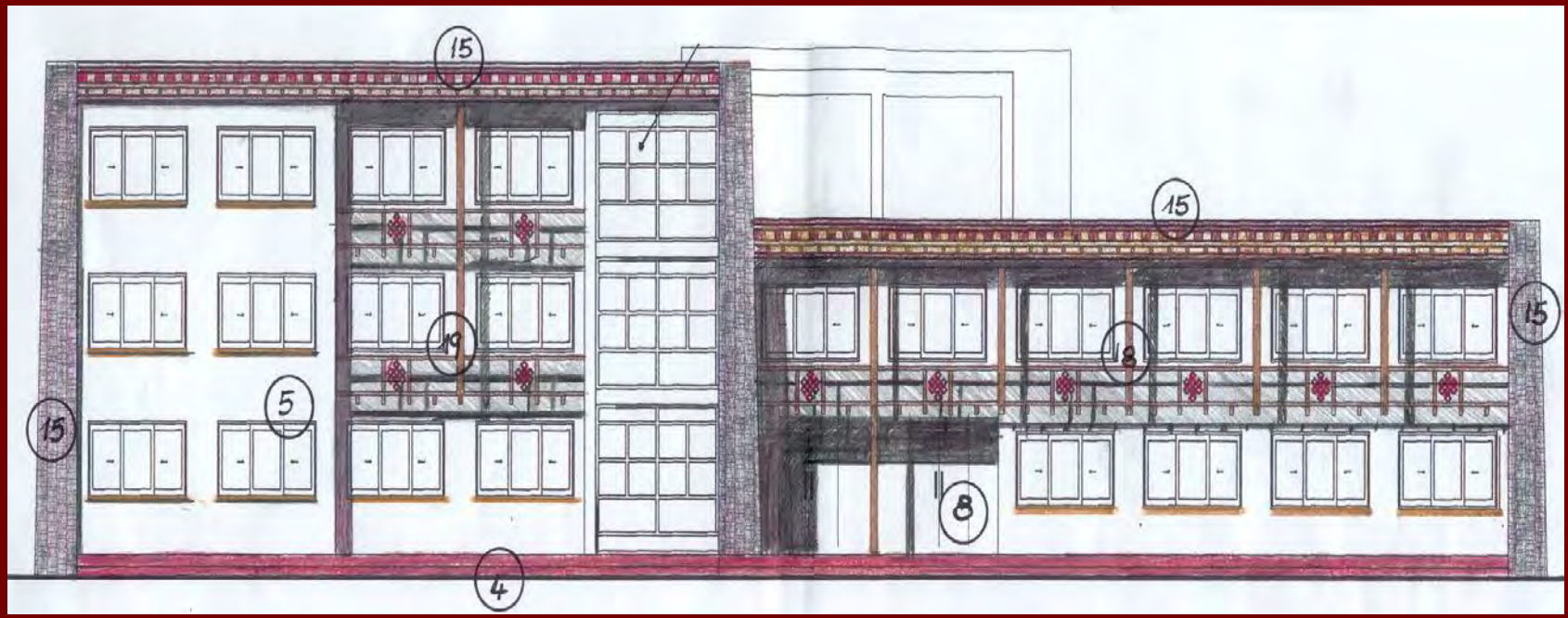
Before intervention

GENERAL PLAN AND THE REALIZED INTERVENTION IN OLU XIANG - CHAMDO

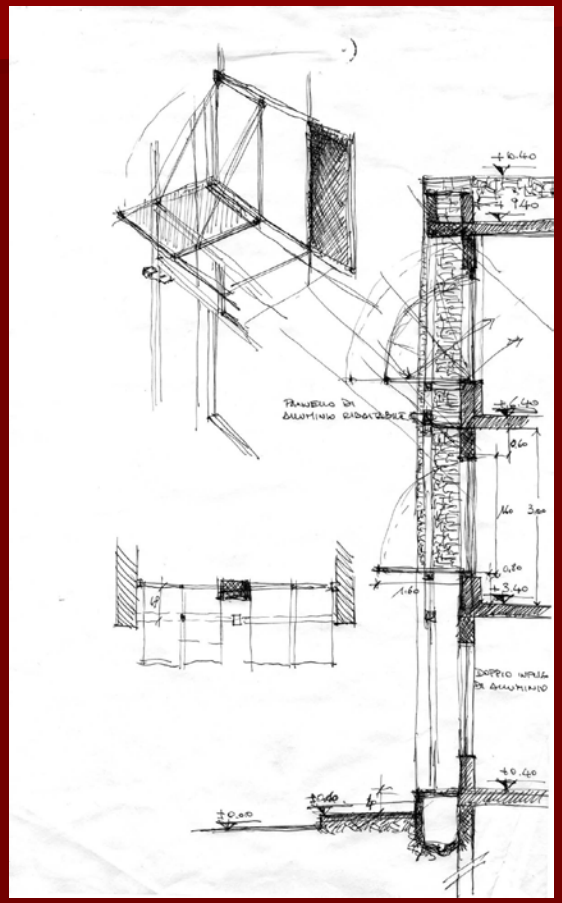


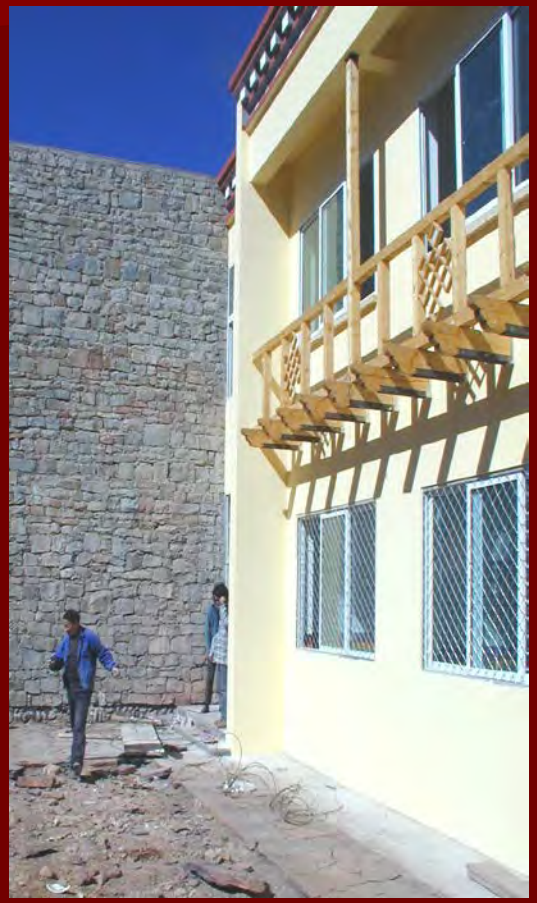
SOUTH ELEVATION OLU TRAINING CENTER - CHAMDO

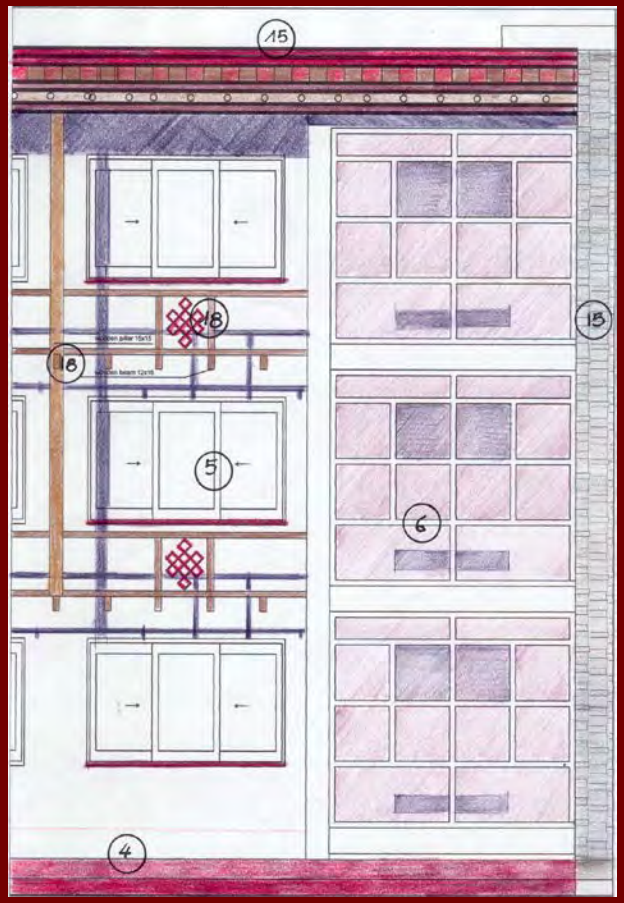
- Passive design requires consideration of solar and heat flow in every detail and component. Floor plan layout, circulation patterns, window location and the selection of wall and floor materials, all affect how well a passive design will work. The entire building is a solar energy system with many of its components having dual functions: both the traditional function of providing an enclosure, and the solar function of collecting, storing and distributing heat. Windows not only let in light and allow a view, but collect heat as well. Walls which subdivide and enclose space can also store and radiate heat. Components whose functions were primarily structural, spatial or aesthetic may double as solar heating mechanism.



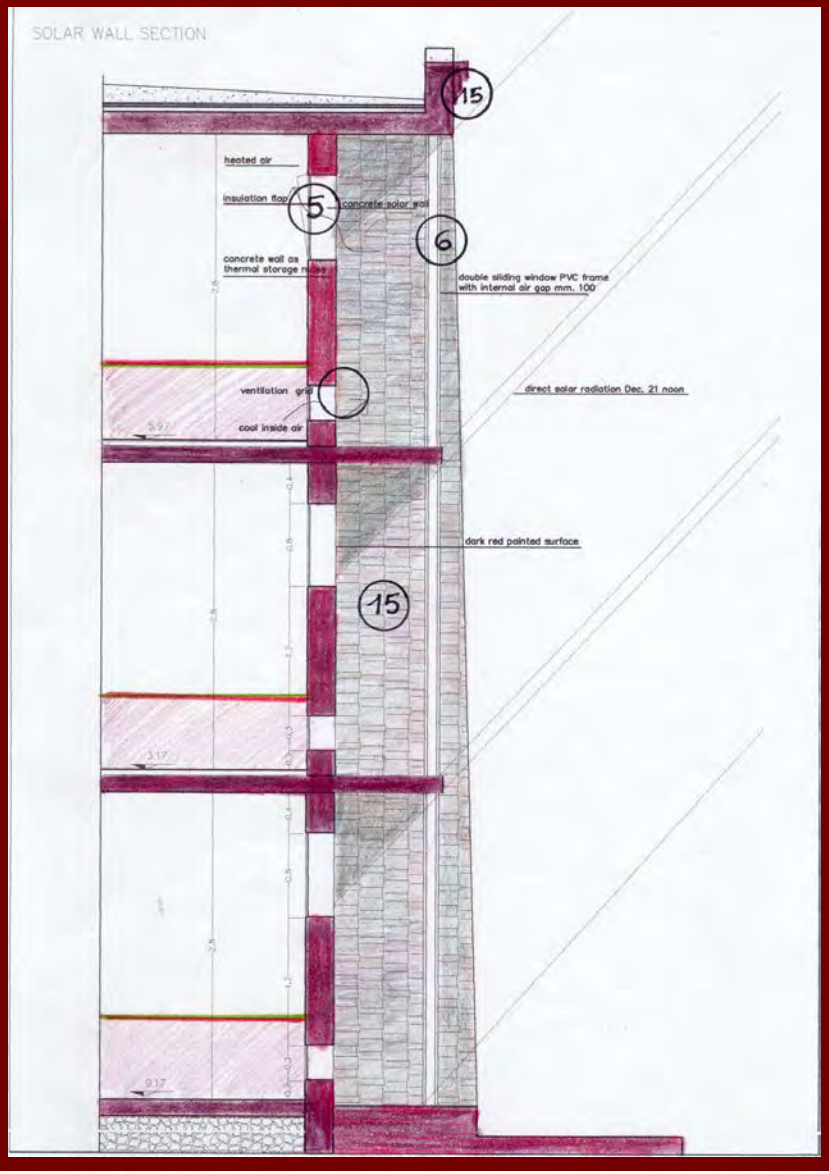
ELEVATION AND SECTIONS OF THE SOUTH FRONT OF THE TRAINING SCHOOL OF OLU XIANG- CHAMDO







TRAINING HEALTH SCHOOL IN OLU XIANG - CHAMDO



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Snowland girls school - Raja Golok Prefecture -

From 2004 till 2006, ASIA has been working to build a school only for the female student of Lhajun village. The school has been inaugurated the 4th June 2007 and actually 240 female students are enrolled.

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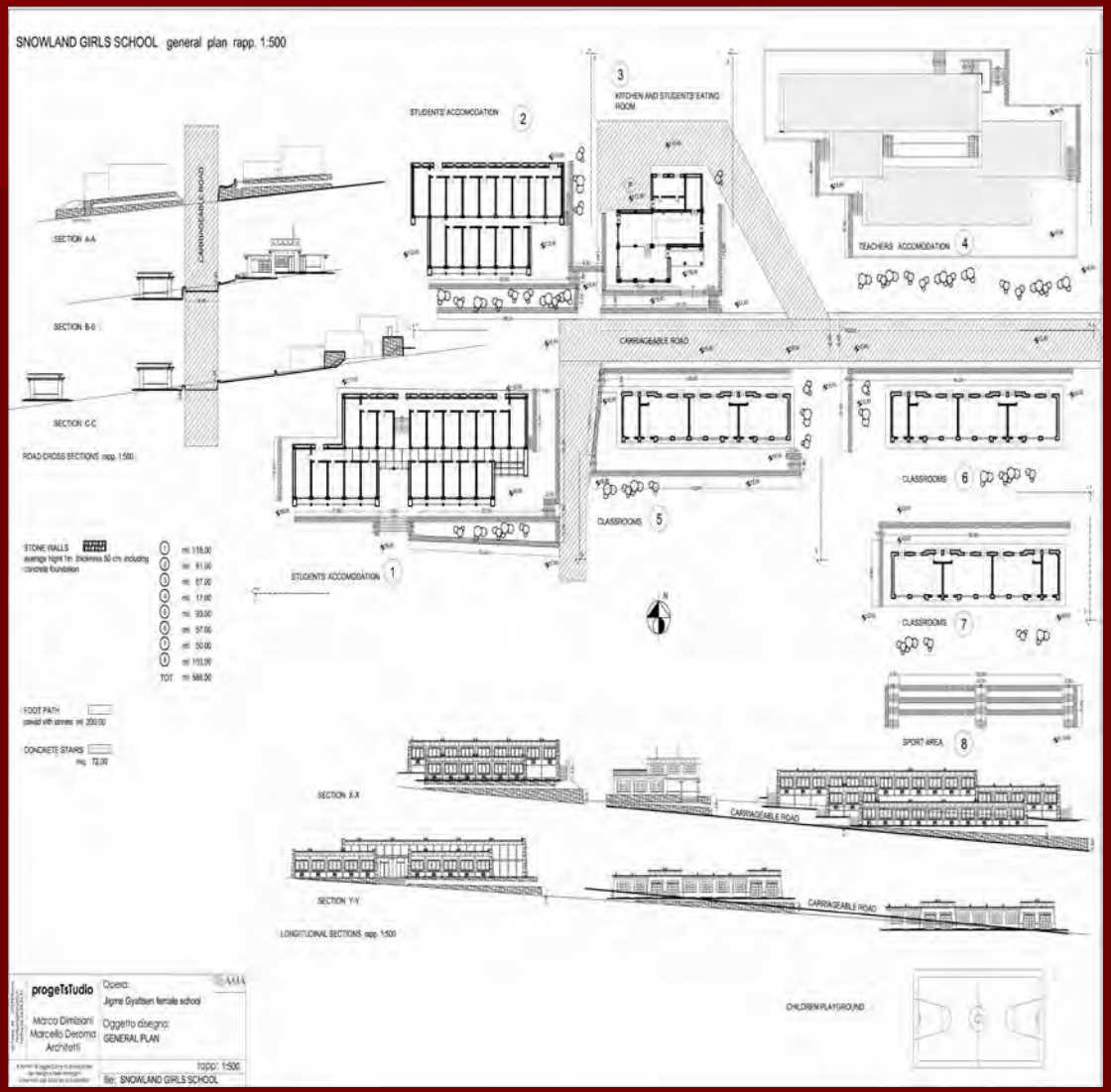
Snowland girls school - Raja Golok Prefecture -



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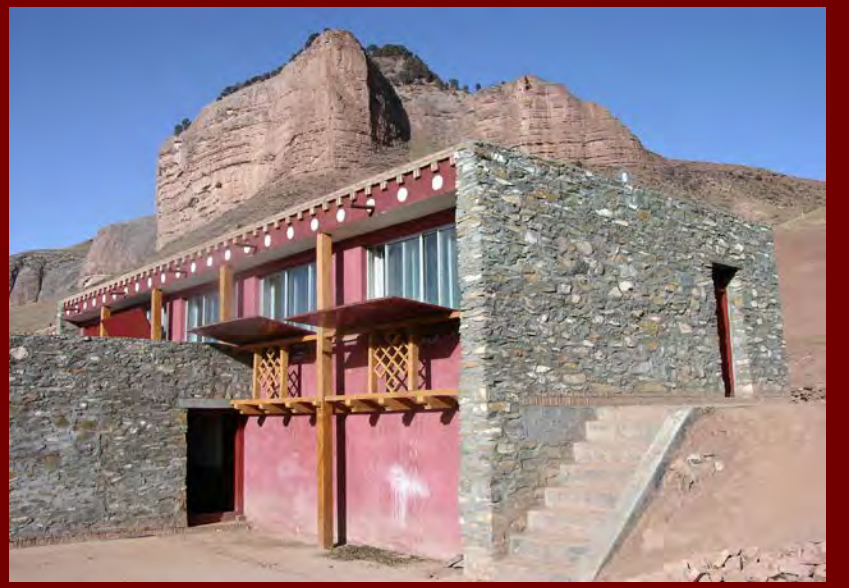

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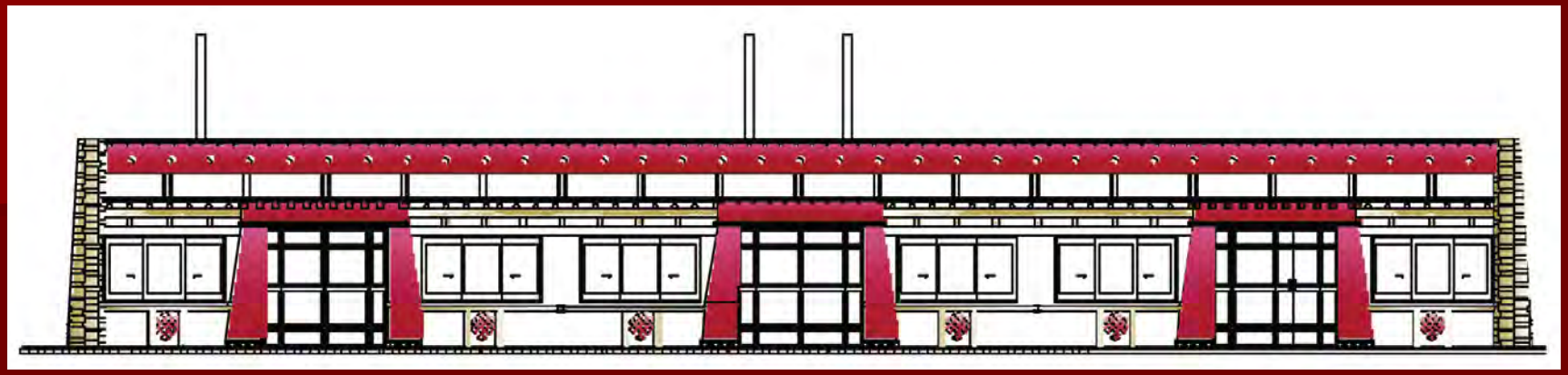
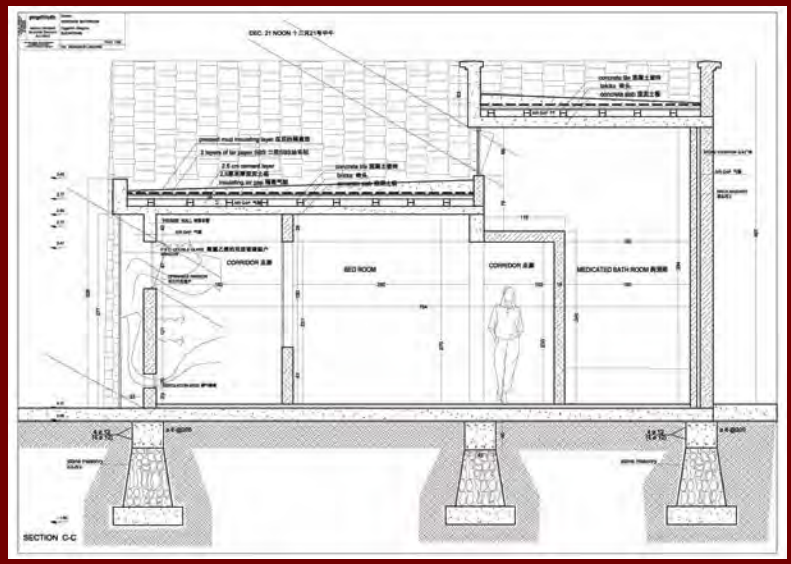
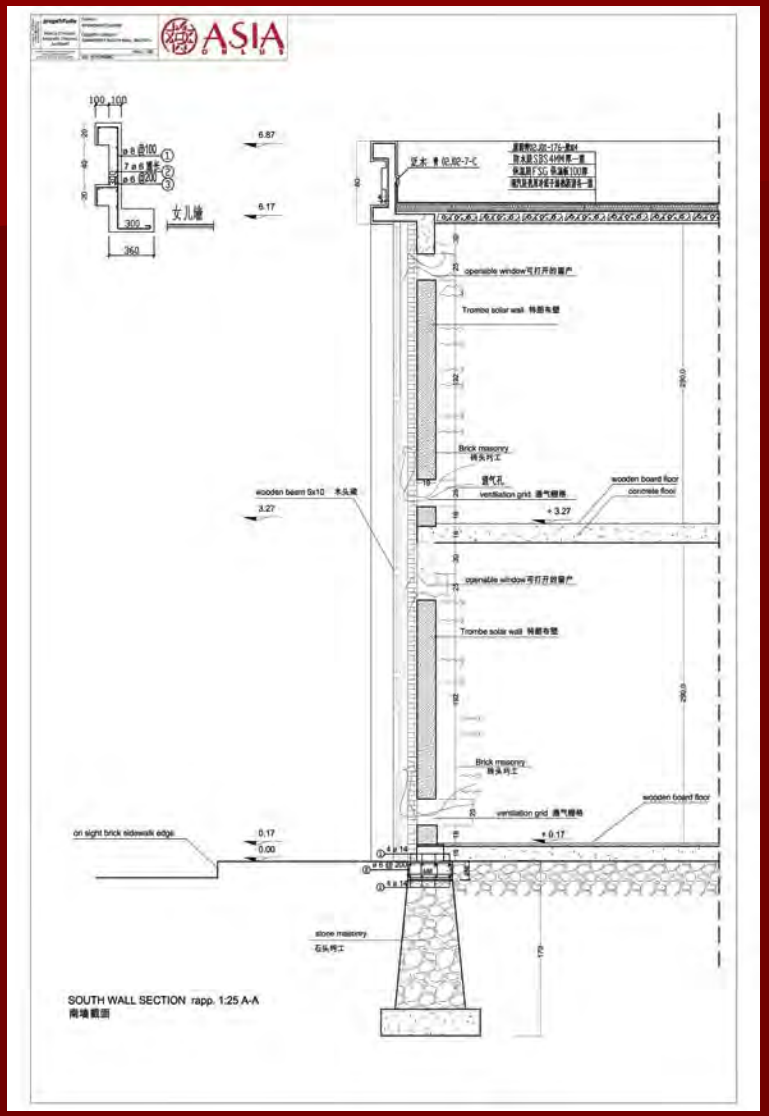
Gyaye Tibetan Clinic

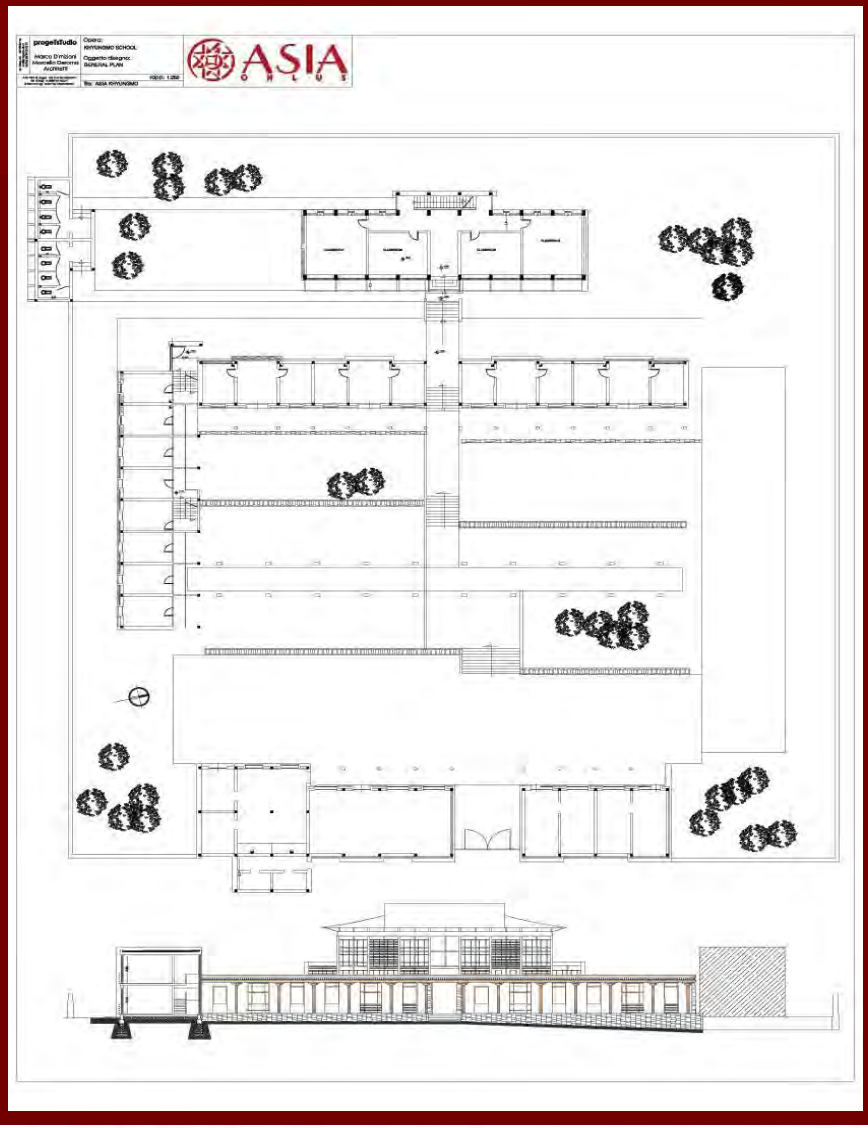


Gyaye clinic is a Tibetan traditional clinic specialized in the external therapies such as the herbal baths for the treatments of the nomadic women of the Kokonor area.

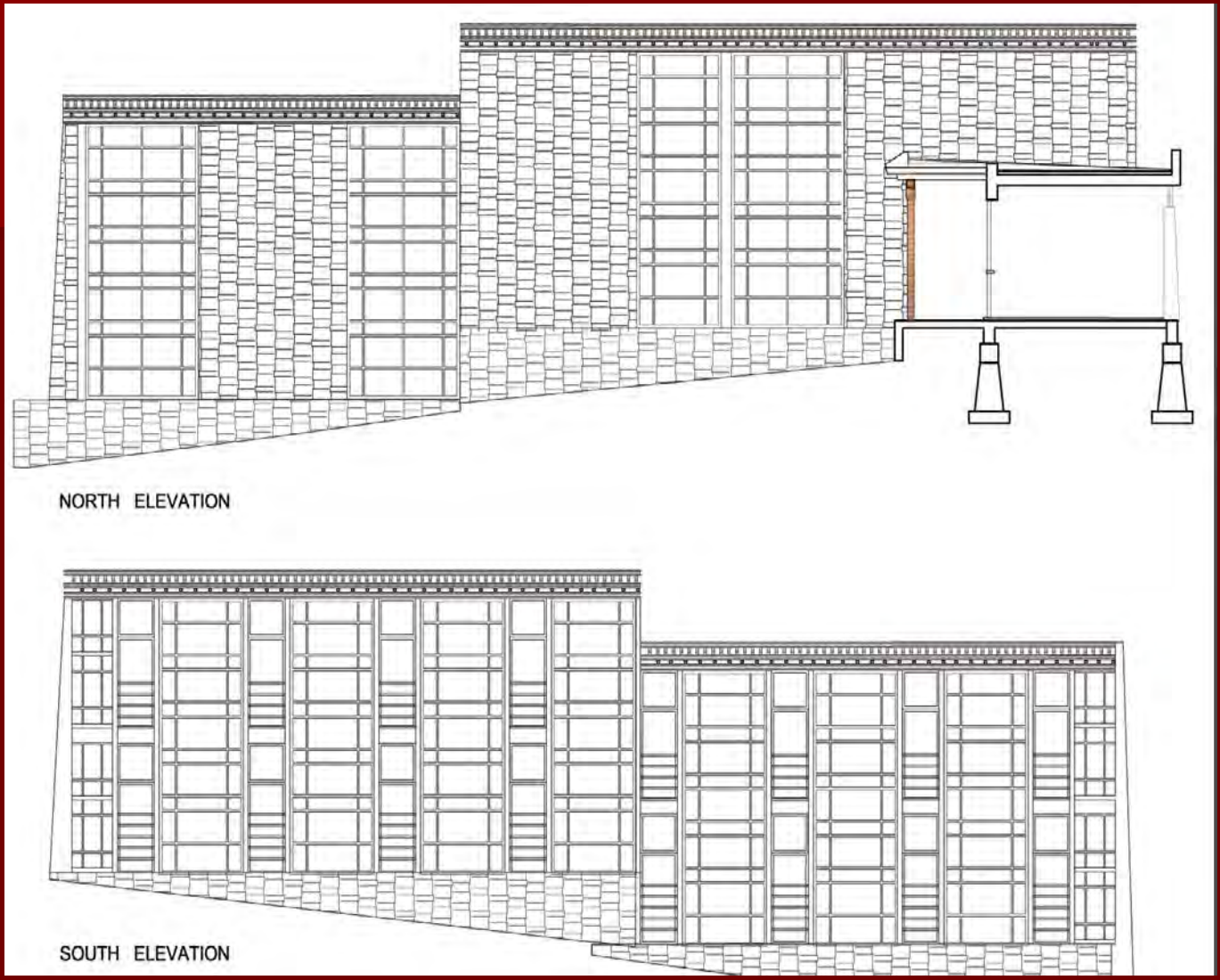


Kyungmo college - Dongche





Kyungmo college Dongche

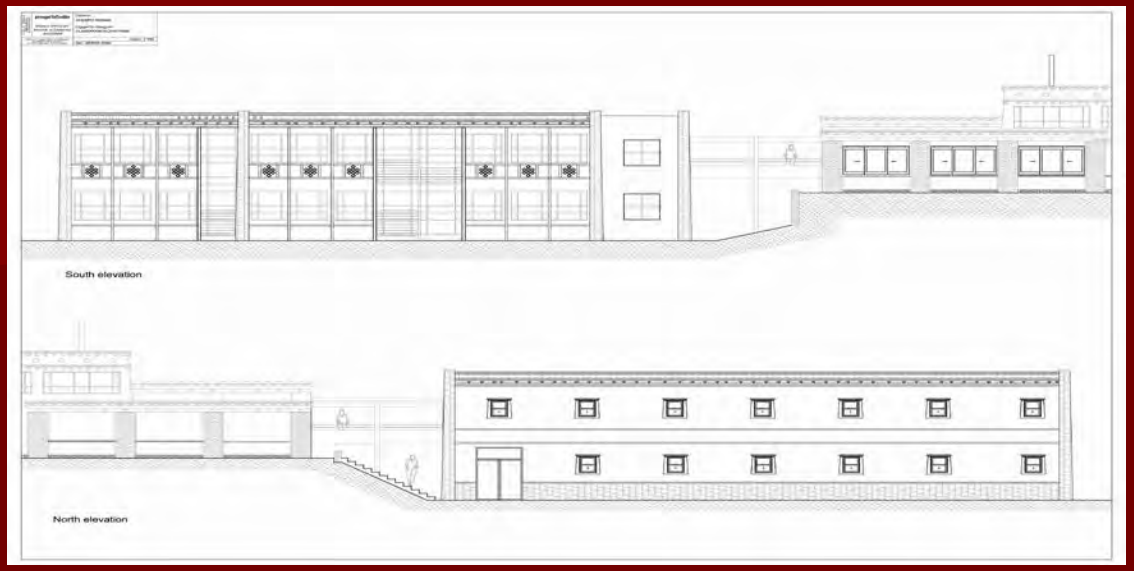


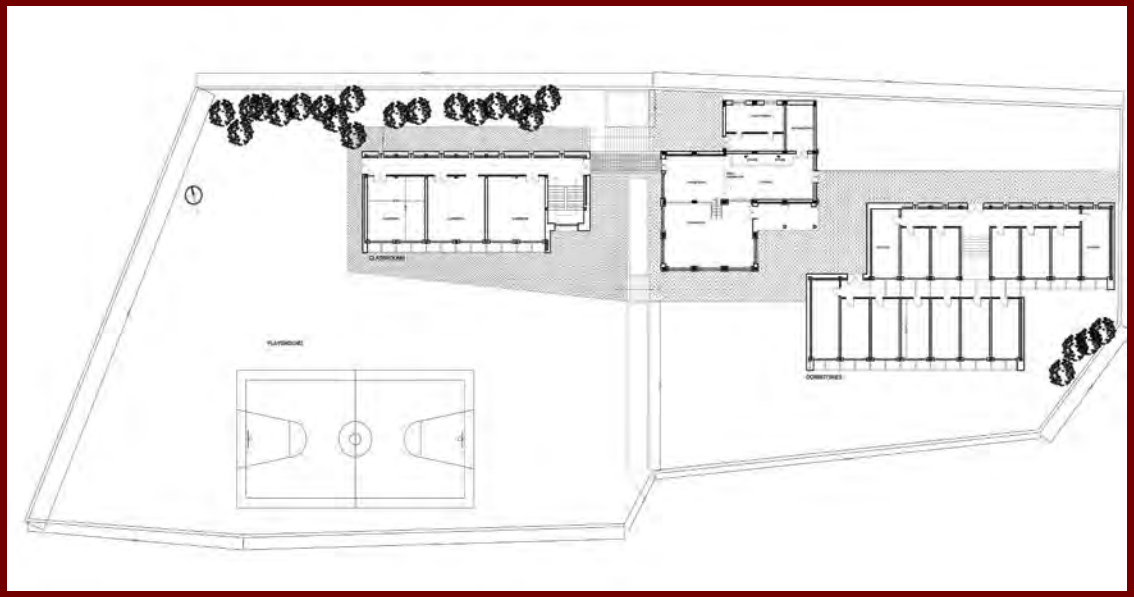
Technological innovation, the new lay-out of the buildings, the system of walkways and front elevations are elements of great discontinuity with traditional typology which is a court surrounded by arcades distributing the lodges.

At the same time we should point out that alongside traditional teaching in these colleges more and more frequently there are courses of computer, internet and other new subjects which show the need for a modernization and evolution of the basic way of thinking in order for a culture to survive. In this type of rationale innovative construction interventions should also be considered essential for the survival of the environment.

KEMPO SONAM POOR CHILDREN SCHOOL DERGE COUNTY SICHUAN

Khempo Sonam school has no accommodations and is absolutely inadequate for giving lessons to more than 100 children coming from neighbouring villages. ASIA is now planing to rebuild the school according bio climatic technologies to give sound accommodations to the Tibetan students





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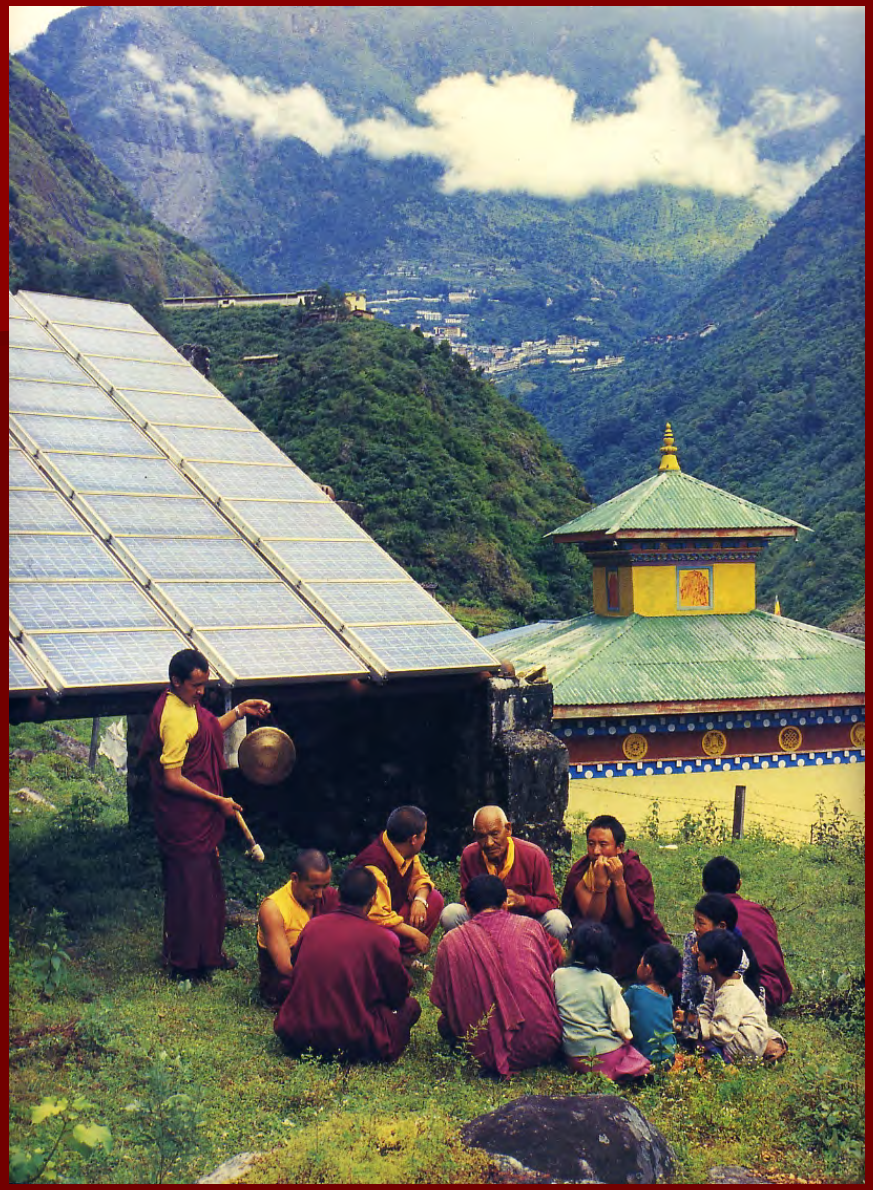

In order to contribute to the preservation of this important cultural and artistic heritage, ASIA proposes to invest more in training activities involving not only those in charge but also the local population.
The techniques of artisans in construction, in wood carving, in construction of earth and stone walls, in the use of natural colors for external painting are a heritage that today risks being lost. This heritage should be made maximum use of and revived by means of adequate training so that new work opportunities will be created for the Tibetans who by now have become more and more isolated by the seasonal Chinese workforce that pours into Tibet when the good weather arrives.
However, it will be necessary to train local workmen not only in using traditional techniques but in introducing sustainable technology able to reduce expenditure of the natural resources, optimizing energy savings and developing adequate sanitary systems and the collection of rain water.
Obviously, an effective intervention will not be able to ignore the ruling class, the local planners and project designers, and will create opportunities to arouse international awareness and to offer training on environmental impact, on responsible tourism, on sustainable construction and on saving energy in order to show the effectiveness of local approaches to development.