

HVAC System - a project



Shrujan is a not-for-profit making Trust. Shrujan began modestly as a small project sponsored by members of the extended Shroff family. Any income that is generated is returned to the project. Chandaben Shroff developed a unique, sustainable means of income generation for village women. She got the local women to produce saris with exclusive embroideries. The profits were re-invested into building the organization. Currently Shrujan works with 16 different styles of embroidery, done by 3,500 women across 100 villages. The following article describes a project by the Shrujan Trust at Paddhar village, Kutch, Gujarat, for upliftment and empowerment of the local craftsmen. The project includes buildings for training, manufacturing, storage and exhibition of handicraft products. The products are to be maintained at specific temperature and humidity.

We have suggested innovative systems for reduction in load coupled with high efficiency refrigeration systems. The entire exercise is aimed at

providing thermal comfort to the occupants using minimum amounts of energy or water mostly by natural means or if absolutely necessary by using air conditioners & dehumidifiers with high energy efficiency.

General Description

Our approach would be to suggest load reduction methods coupled with high efficiency refrigeration system. The result would be a cool, comfortable and healthy environment at 30% to 50% less energy cost.

Major proposals are outlined as under:

- Summer cooling and winter heating will be provided by a thermal storage system comprising underground storage of water that would absorb the heat from the structures and used that stored energy to warm the occupied areas in the winter. No refrigeration or heating energy needed.
- A special system with redundancies will be designed that will maintain temperature and humidity

conditions stable in the secure storage/exhibition areas.

- Ventilation systems using wind towers to keep discomfort away in work areas. This in addition to structure cooling/heating.
- The auditorium will have a two tier cooling system. A dehumidifier will carry the latent and fresh air load, while cooling will be done by cool (not cold) air supplied under the seats.

The above services shall cover the following items as and where required:

Load Reduction

- Natural Cooling
- Wind Tower

Improving Indoor Air Quality

- Treated Fresh Air System

Energy Saving Through Increased EER

- 2-Tier Cooling

List of System Groups

Structure Cooling System –

Direct structure cooling system is used on the area which directly expose to sun like roof and open area, outside



Julius Teles, is Design Manager in Panasia Engineers Pvt. Ltd., Mumbai. An HVAC & Structure Cooling Expert, he has a professional experience of 18 years. He has many projects to his credit.



| Particulars | Installed System |
|------------------------------|--|
| Temporary Exhibition Gallery | a. Fresh Air Dehumidifier (3 TR) |
| Conference | a. 1.5 TR High-Wall AC - 4 Nos |
| | b. Fresh air from wind tower (200 CFM) |
| Auditorium | a. Comby Unit (7 TR) (5000 CFM) |
| | b. Provision for fresh air dehumidifier in future (5 TR) |
| | c. Fresh air from wind tower 2000 CFM |
| Total Admin. Area | a. Provision for fresh air dehumidifier in future (5 TR) |
| | b. 1.5 TR Hi-wall units (2 Nos) |
| Library / Curatorial | a. Fresh Air Dehumidifier. (3 TR) |
| DCOW / store arrival | a. Fresh Air Dehumidifier. (3 TR) |
| Gallery | a. Fresh air dehumidifier. (5 TR)- 2 Nos |
| Gallery | a. Fresh Air Dehumidifier. (5 TR)- 2 Nos |
| Main Storage | a. Fresh Air Dehumidifier. (5 TR)- 1No |
| Terrace | a. Direct structure cooling |

Piping for Structure Cooling



Wind Tower

gallery area etc. This system maintains the MRT of the room is between 30-35°C. This temperature is equivalent to the skin temperature. Hence this condition can be assumed to be 'neutral'. This means that neither there will be any radiant heat transferred from the structure to the human body and neither there will be any heat loss from the human body to the cooled structure. Hence the simulation predicts that the system can successfully eliminate any radiant heat gain from the structure.

Dehumidified Fresh Air System

This system will provide fresh dehumidified outside air without mixing with return air to the breathing

zone of the occupancies. Since we are treating outside air to the low dew point and supplying near breathing zone the quantity of air required will be less as compared to conventional system. This system will reduce the CO₂ level inside the room and compared to conventional Air conditioning system.

Ventilation with Wind Tower

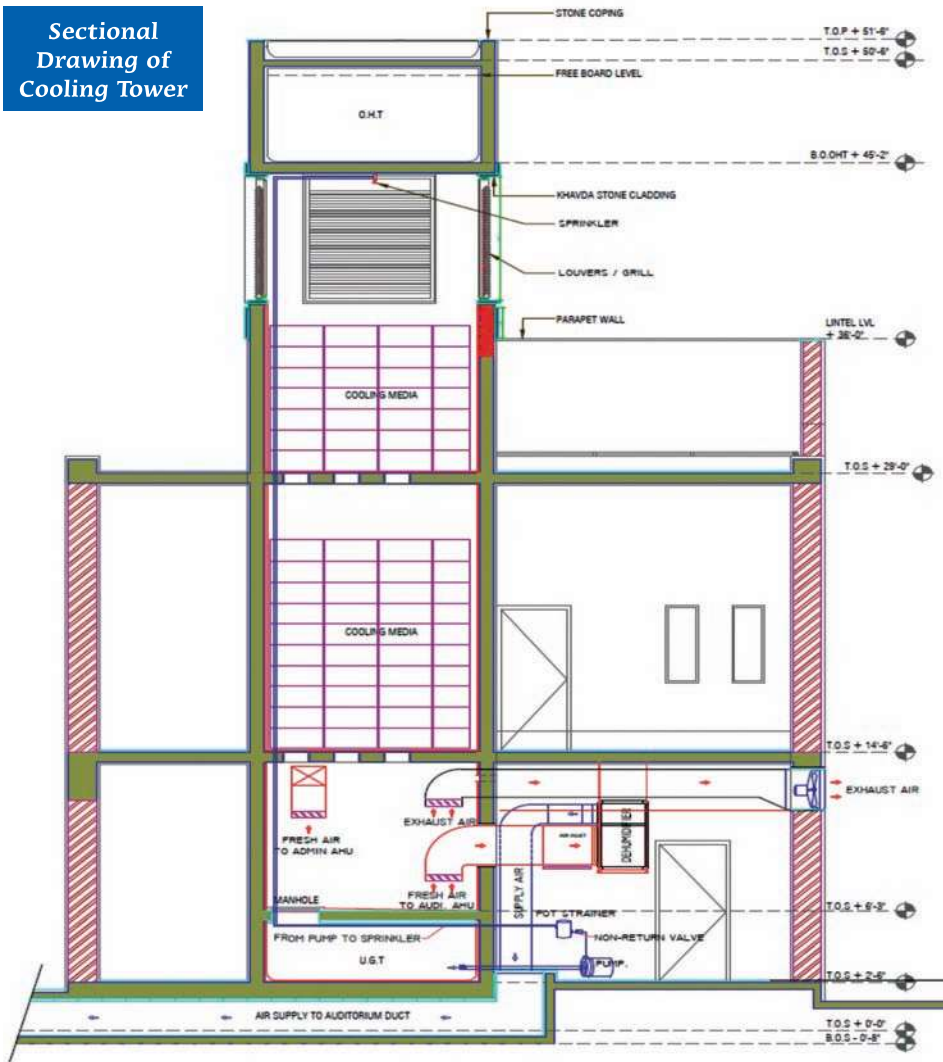
For Ventilation purpose or for maximum fresh air requirement we use Wind Tower. Here we proposed Wind Tower for area where fresh air requirement is high. Example - Auditorium, conference room and admin area. Wind towers use gravity to move cool air without any fans. They

do this by having a wet medium in the top of the tower. Since cool air is heavier than warm air, it will fall, creating its own airflow. Wind is not required, but will improve the airflow in a wind tower.

Air Conditioning Systems

- **Comby Air Conditioning:** Our Comby low humidity air conditioner is a stand-alone machine that maintains desired conditions, without any external heaters or dehumidifiers. It incorporates highly energy efficient patented dual pressure evaporator and saves over 60% energy in comparison with the conventional units with electric heaters or dehumidifiers.

Sectional Drawing of Cooling Tower



- Sensible cooling:** Since we are treating the each load separately we use the Hi-wall units or conventional DX units working at high temperature. That will provide efficient cooling as well as it will reduce the power consumptions. Systems were proposed as per particular rooms requirement of thermal comfort and to increase the productivity.

Chart in the previous page is showing installed system for particulars as required.

Conclusion

It is the first large Scale structure cooling System & natural cooling system which also is incorporating high efficiency Refrigeration for dehumidification and fresh air cooling. When fully operational it could become a watershed for green technology application.

Author wishes to express their sincere thanks to the trustees, the architects, Uday Andhrae and dedicated team of the Project. ■

AHRI: November 2014 U.S. Heating and Cooling Equipment Shipment Data Central Air Conditioners and Air-Source Heat Pumps

U.S. shipments of central air conditioners and air-source heat pumps totaled 358,479 units in November 2014, up 10.9% from 323,185 units shipped in November 2013. U.S. shipments of air conditioners increased 9.9%, to 227,523 units, up from 207,057 units shipped in November 2013. U.S. shipments of air-source heat pumps increased 12.8%, to 130,956 units, than shipped in November 2013.

Year-to-date combined shipments of central air conditioners and air-source heat pumps increased 9.0%, to 6,391,815 units, up from 5,863,559 units shipped in November 2013. Year-to-date shipments of central air conditioners increased 5.1%, to 4,221,291 units, up from 4,014,584 units shipped in 2013. The year-to-date total for heat pump shipments increased 17.4%, to 2,170,524 units, up from 1,848,975 units shipped during the same period in 2013. ■

