Yanzhou People's Hospital (Shandong Province)
Green Hospital Design

GGHH Agenda Goals

- Building

Hospital Goals

- Create a patient-centered hospital, which is humanized, digitized, energy-efficient and environment friendly.
- Divide the function districts rationally for different medical functions.

The Issue

The project of the Yanzhou People's Hospital is located in Xicheng District, Yanzhou City, Shandong Province. The area for the new hospital is rectangular in shape, 600 meters from north to south and 300 meters from east to west. It is mostly flat with convenient transportation.

The Hospital Architecture System Research Branch of Chinese Hospital Association (CHA) and the "Green Hospitals" leading group have established a five-year plan to promote green hospital development.

As a member of the association, Yanzhou People's Hospital has actively participated in green hospital development.

The design of Yanzhou People's Hospital was jointly completed by Shandong Architecture Design Institute, Taiwan Xuchangji Architectural Office and Beijing Shengdi International Architecture & Engineering CO. LTD. This is the biggest project in Shandong Province to use Ground-Source heat pump technology. It is also the first Third-level First-class hospital (high) in Shandong Province that adopts constant temperature and humidity technology in large-sized comprehensive ward buildings.

Fig1 The Yanzhou People's Hospital

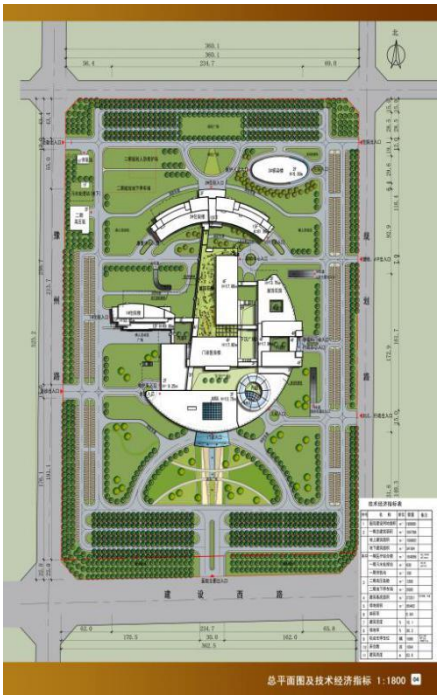

Fig2 The general plane figure

Sustainability Strategy Implemented

1. Highlight Ground-Source heat pump technology and constant temperature and humidity technology.
2. Embodied design philosophy includes harmonization and humanization, garden and zoology, information intellectualizing, energy-conservation and environment friendship and sustainability.

3. According to the surrounding environment, determine the position of the hospital's main entrances, and entrances of wards and emergency room, locate infectious diseases ward at the downwind of the hospital with separate entrance.
4. Based on flow lines, divide the hospital into three medical functional districts: outpatient clinic, medico-technical department and wards. Medico-technical department positions between the other two functional districts convenient for sharing medical resources.
5. Using arc shape in the design instead of the traditional rigid hospital style.
6. Centralized layout spares space for more green space creating a better healing environment. Internal courtyards are designed for better natural lighting and ventilation.
7. Entrances to different functional districts connect with different roads reducing hospital cross-infection among the districts.
8. The hospital has a total construction area of 184,000 square meters. It is composed of several medical function districts. Considering the position of different medical function districts, the design meets the requirements of them and allows medical processes are implemented smoothly, which creates a comfortable medical environment for both patients and doctors.

Implement Process

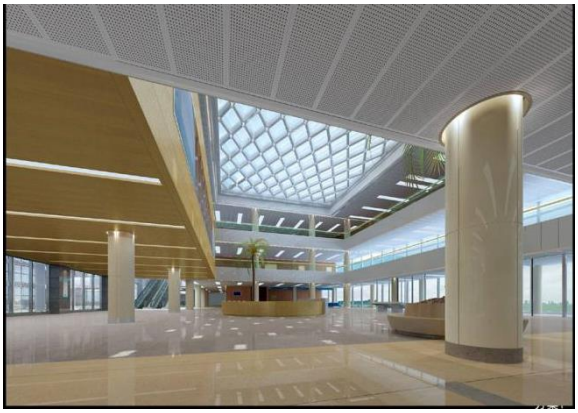

Fig3 Effect sketch of outpatient hall

Fig4 Effect sketch of hospital greening

1. Using energy-saving design and adopting energy-saving materials in building envelope, including roof, wall, doors and windows.
2. The overall green hospital design
   2.1 The hospital green area.
   2.2 Design of roof garden.
   2.3 Permeable pavement.
   2.4 Using spray cooling system to improve outdoor thermal environment.
   2.5 Using water cooling technology, taking advantages of water, such as rivers, waterscape and fountains, to reduce heat-island intensity and improve outdoor environmental comfort.
   2.6 Natural ventilation, based on local climate characteristics and the overall hospital design, improving wind environment through rational layout of buildings, water bodies and green area, for the purpose of reducing heat-island intensity by natural wind in summer.
3. Ground-source heat pump, by testing the soil's thermal properties, it was concluded that ground-source heat pump applies to the project.

4. Independent temperature and humidity control air conditioning system.

Fig5 Ground-source heat pump system-1

Fig6 Ground-source heat pump system-2

Progress Achieved

1. Ground-source heat pump

   The hospital project's cold load in summer is up to 11,818kw and thermal load in winter is 6,894 kW. There are three ground-source heat pumps in the refrigerating station to afford all thermal load in winter and part of cold load in summer. The rest part of cold load in summer will be afforded by two centrifugal chillers. The design of GSHP buried pipes is based on the thermal load to meet the requirements of heating in winter. In summer, GSHPs together with the centrifugal chillers can meet the needs of cooling. Centrifugal chillers will dissipate heat through a cooling tower. Inlet and outlet water temperatures of GSHPs will be 30/35℃ in summer and 10/5℃ in winter.

Fig7 Independent temperature and humidity control air conditioning system

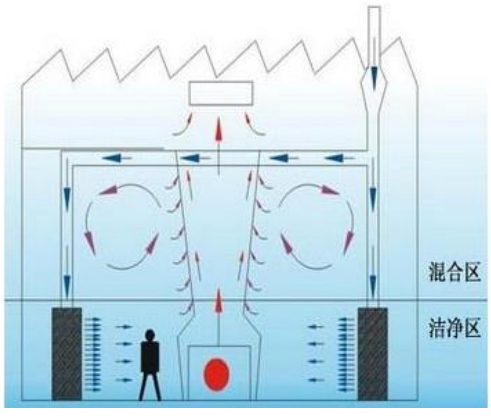

Fig8 Schematic diagram of independent temperature and humidity control air conditioning system-1

2. Independent temperature and humidity control air conditioning system

   Independent temperature and humidity control air conditioning system has advantages of low-energy consumption, constant temperature and humidity, without cross-infection, blowing sensation, noisy or odors, and the indoor air parameters is less volatile and the concentration of PM2.5 is less than 10 μg/m3. Compared to traditional air conditioning system, independent temperature and humidity control air conditioning system costs 20% more on initial construction costs but only 70% of the operation costs. Payback period of the added cost is about 5 years. In addition, the system is lifelong maintenance-free.

(Submitted by the Hospital Architecture System Research Branch of Chinese Hospital Association)

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