ST. MARY'S HOSPITAL, PIERRE

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The geothermal project at St. Mary's Hospital (Figure 1) originated with an Energy Use Analysis conducted by Kirkman, Michael and Associate in 1976. In the 1977, the U.S. Department of Energy offered grants for demonstration of geothermal energy projects. The St. Mary's Hospital was one of two hospitals selected in the United States. The project, costing about $718,000, was 75% funded by the U.S. Department of Energy.

Figure 1. St. Mary's Hospital building supplied with geothermal heat.

The system temperature was originally 106°F (41°C) from a 2,200-ft (670-m) artesian well drilled on the hospital property in 1980 (Figures 2 and 3).

Figure 2. Well house and exchanger building.

Heat is extracted from the geothermal water from three heat exchangers located inside a small building at the well site (Figure 4). The cooled geothermal water is discharged into the Missouri River located about 1,000 ft (300 m) away.

Figure 3. Well with Steve Wegman.

Figure 4. Plate heat exchanger in exchanger building..

Exchanger 1 heats the fluid in a closed loop to 100°F (38°C) for space heating. After giving up its heat in the hospital, the fluid returns to the exchanger at 75°F (24°C) for reheating. Exchangers 2 and 3 preheat domestic hot water from 55 to 100°F (38°C). A conventional oil-fired unit then heats it to the required 140°F (60°C).

Geothermal energy (115 gallons per minute of 100°F water)(7 L/s at 38°C) will provide all the space heating requirements for the new addition, supplying as much as 2 million Btus per hour (2.1 GJ/h). But, geothermal application

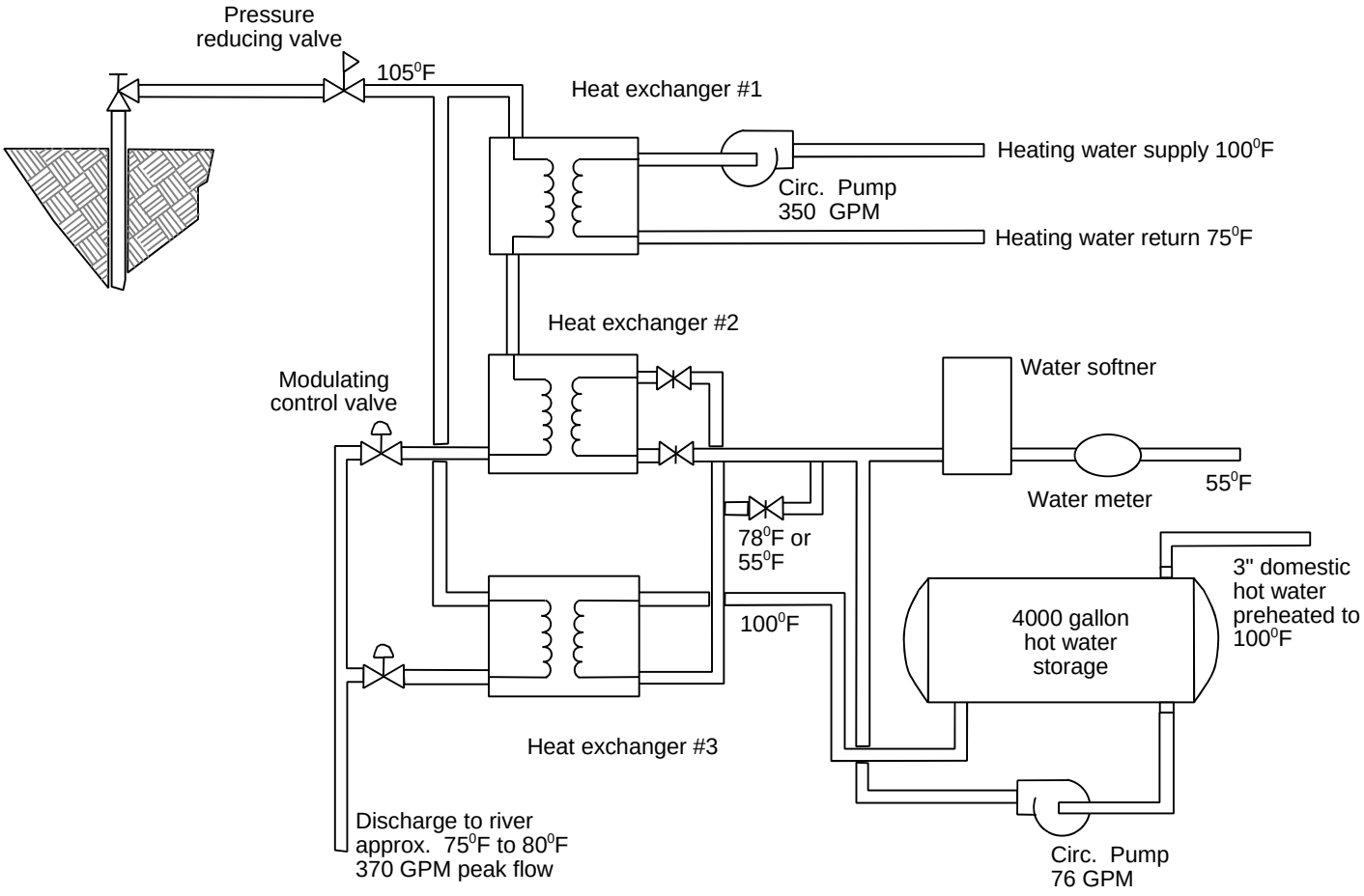

Figure 5. Well house and exchanger building schematic.

to the existing buildings is limited because the primary space heating system requires steam. Two systems were adapted: (1) a fan coil systems, which circulates 50°F (10°C), water to provide air conditioning in one section of the building Was modified to use 100°F (38°C) water to also provide heat; and (2) the fresh air ventilation system was adapted to geothermal (Figure 5). Hospitals are required to introduce a continuous flow of fresh air into the building 15,650 cubic feet (443 m^3) of air per minute from outside air temperature which can be -35°F (-37°C) in the winter. The U.S. Department of Energy was very interested in the economics of the St. Mary's experience with the 106°F (41°C) water which is considered to be marginal for heating purposes.

About 1985, St. Mary's abandon the domestic hot water portion of the project, but continued to use the space heating portion. In 1992, the geothermal well developed a leak at about 1,000 feet (300 m) below the surface. The hospital repaired the well and continues to use the geothermal water for space heating. In 1944, St. Mary's converted the existing oil-fired system to natural gas and retained the geothermal water for space heating.

Originally the project was to save $100,000 per year in oil; but, the savings was more like $25,000 per year with oil and when natural gas was installed, the savings is more like $35,000 per year.