Task 3

Designing of solar thermal system for domestic hot water preparation in a residential building with 8 floors

1. floor 2 flats with 5 people in total

2.-8. floor 20 flats with 75 people in total

size of building 40 x 40 m, height of building 3 m / floor

heat loss for DHW preparation consider 30 %

Define solar collector area and define the collector field for July.

Size a main pipeline, use copper pipes.

Compare the sizing for a high flow system (50 l/h.m2) and low flow system (10 l/h.m2)

Check the sizing for condition to prevent steam penetration through pipeline at stagnation (total volume of piping should be identical to collector volume)

Calculate hydraulic losses of main pipeline (friction losses, local losses as addition of 1/3 of friction losses), other losses e.g. collector and heat exchanger hydraulic loss use 2 kPa for low flow, 5 kPa for high flow. Compare the influence of pipe sizing on annual electricity consumption for a circulation pump if you know efficiency 30 %.

Size a thickness of mineral wool insulation to eliminate heat losses of the pipeline to maximum 5 % of net collector annual production (consider at this stage 500 kWh/m2.a) for both system configurations (low-flow, high-flow).

Compare the costs of pipeline with heat insulation for low flow system and high flow system.

Size a safety valve, cross section of the saddle, choose relief pressure and define a maximum distance of placing the safety valve from the collectors.

Size the expansion vessel volume.

Make an annual evaluation of solar fraction and energy heat gains of the solar system by f-chart method with use of the designed components.