

DESIGN EXAMPLES FOR HOT WATER TEMPERATURE MAINTENANCE APPLICATIONS

SCHOOL

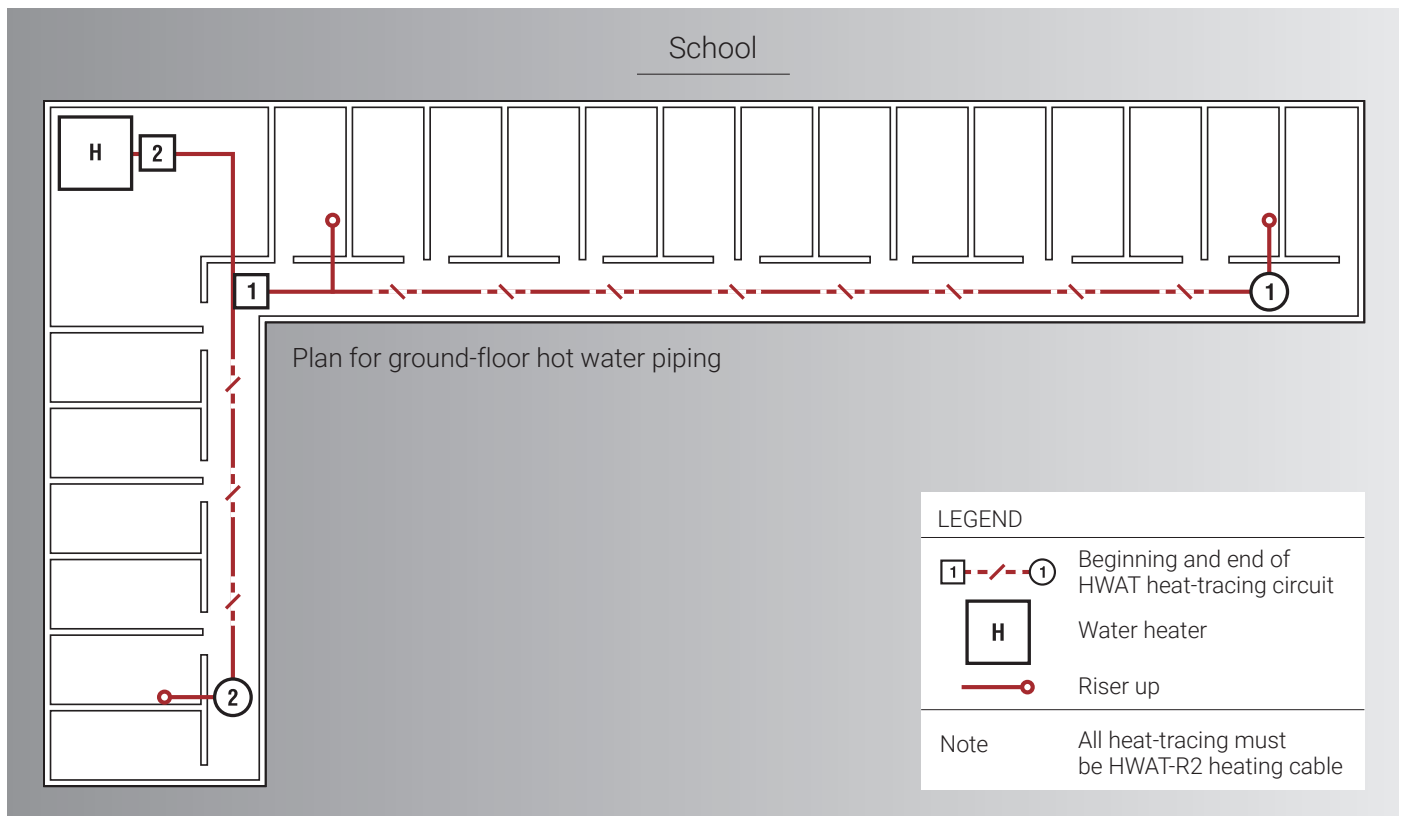
The plumbing engineer was laying out the piping for the domestic hot water system for a three-story high school. The engineer did not believe it necessary to recirculate the risers and was going to run two recirculation loops, one for each wing, in the ground-floor ceiling space. However, the engineer decided that the return lines would have to take the same route as the supply lines. In this situation, the engineer knew the nVent RAYCHEM Hot Water Temperature Maintenance System (HWAT) would provide the more economical design. Furthermore, the client had indicated the possibility of extending either wing at some time in the future. The engineer knew that by using HWAT products, the system could be easily expanded if and when the client decided to do so.

The high school required a maintain temperature of 115°F. nVent RAYCHEM HWAT-R2 and two HWAT-ECO-GF electronic controllers were chosen to maintain 115°F during normal operation and to have the ability during the weekend, when

the school is unoccupied, to occasionally elevate the water temperature above 140°F or to maintain a lower temperature for energy savings.

The engineer thought it would be useful to be able to isolate either wing for maintenance, so it was decided to run two separate circuits, each to be operated independently with a HWAT-ECO-GF. The plumbing engineer noted the pipes to be traced with HWAT heating cables on the drawings. He then inserted the standard clauses to provide, install, and test the HWAT system, and called out the correct thicknesses of fiberglass insulation, in Division 15 of the specification.

The electrical engineer noticed that in the electrical drawings, junction boxes were located near each power connection. It was decided to power both circuits from the same panel. Circuit breaker sizes and steady-state current were calculated and included on a table in the electrical drawings. The need for a ground-fault protection device in each circuit was noted on the electrical drawings.



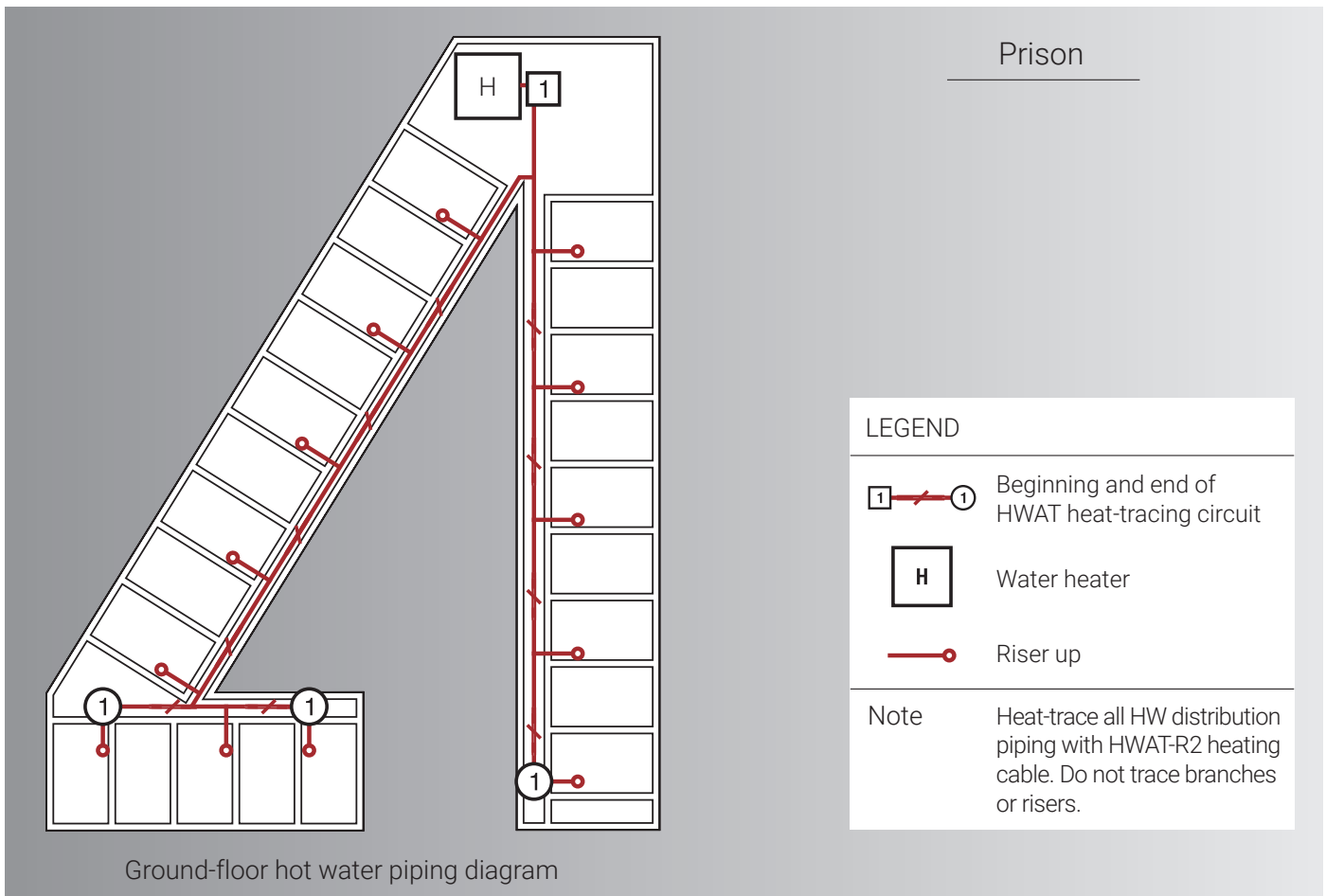
PRISON

Reviewing the architectural drawings, the plumbing engineer observed that the design consisted of about a dozen two-story “pods” arranged around an expanse of open space. For security reasons, the County had requested that mechanical equipment and piping, and the associated pipe openings, be kept to an absolute minimum. The layout of the cells in each pod did not allow any “shortcut” for return piping for a recirculation loop; it would have to follow the same corridor as the supply piping. The plumbing engineer knew from experience that in these kinds of situations, the HWAT system would be more economical than recirculation.

For the prison application, HWAT-R2 and one HWAT-ECO-GF controller were selected to maintain 105°F. Each pod would be provided with a separate water heater and it was not considered necessary to heat trace the risers. Upon measuring the length of the ground-floor piping, the plumbing engineer found it was possible to trace the entire piping in each pod with a single HWAT-R2 circuit and stay within the capacity of a 15 amp ground-fault circuit breaker. This would allow the heating cable to be conveniently powered from the electrical panel in the mechanical room.

Because the mechanical rooms were located in isolated areas, the specification was written to connect the network of HWAT-ECO-GF controllers to the building management system (BMS) using the BMS interface. Temperature set points would be programmed into the BMS with continual feedback provided by the HWAT-ECO-GF controller through the alarm contacts, including loss of power and water heater monitoring. The plumbing engineer decided that the situation was sufficiently simple to ignore marking on the plumbing drawing the lines to be heat traced. Instead, the extent of the heat tracing could be called out in the notes. The plumbing engineer then inserted the standard clauses to provide, install, and test the HWAT system, and called out the correct thicknesses of fiberglass insulation, in Division 15 of the specification.

The electrical engineer confirmed that a 15 amp breaker was adequate, and calculated the steady-state current. A junction box was located adjacent to the beginning of the heating cable circuit, and its number and the number of the electrical panel in the table were noted. A draftsman copied the table onto the electrical drawings, along with a note calling out the need for a ground-fault protection device in each circuit.



APARTMENT BUILDING

The plumbing engineer was faced with laying out the hot water piping for the 35-story state-of-the-art apartment building. The piping was relatively complex, making it especially important to balance the system adequately. As requested by the developer, the architect had squeezed in the maximum number of residential floors by working to the minimum headroom allowed by code. The plumbing engineer was required by code to divide the building into three pressure zones. However, there would be great difficulty in running the horizontal supply and return lines necessary in each zone, given the very limited space provided above the dropped ceilings. And there was not any room for the booster heaters and pumps for the recirculation system.

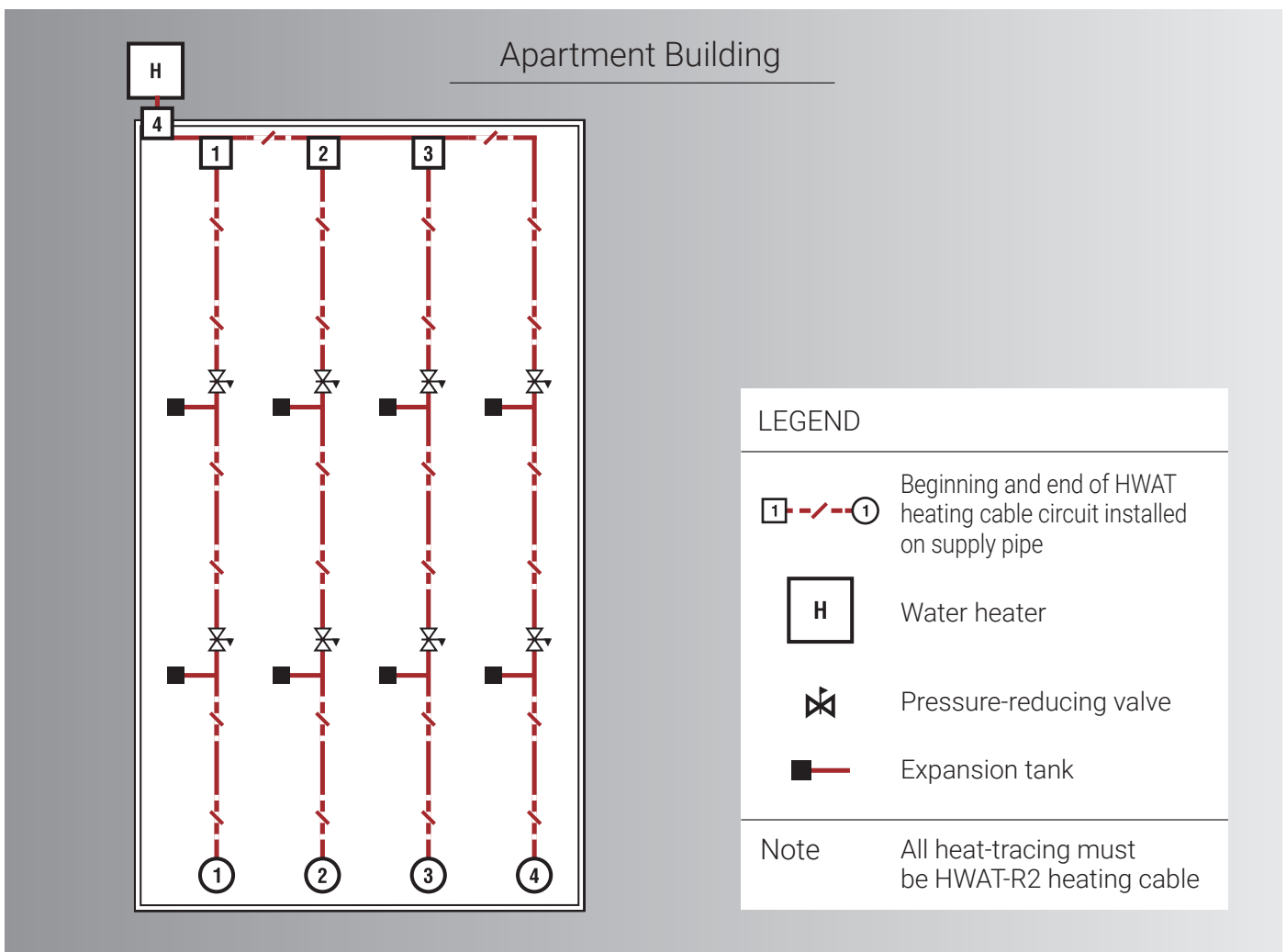
The plumbing engineer decided that an HWAT system would eliminate the need for horizontal piping and additional heaters or pumps. The risers could run continuously from top to bottom, broken only by pressure reducing valves at the 11th and 23rd floors. The plumbing engineer noted that the need for flow balancing was completely eliminated by using the HWAT system.

In order to interface with the Building Management System, the engineer selected the HWAT-ECO-GF electronic controller. Having estimated that a single circuit length on a 20 amp

circuit breaker could run the complete height of the building, the engineer marked an HWAT circuit on each of the four risers and sent copies of the plumbing drawing and the design sheet to the electrical engineer. HWAT-R2 was selected for a maximum circuit length of 500 feet with a 20 amp breaker and to maintain 120°F at a 70°F ambient temperature and a 208 supply voltage. HWAT-R2 was not selected because a high temperature heat-up cycle was not required.

Standard clauses to provide, install, and test the HWAT system were included in Division 15 of the specification. To provide pressure relief in the piping during system startup, an expansion tank was indicated on each riser at each pressure reducing valve.

The electrical engineer looked at the plumbing drawing and determined that it was most convenient to power all the circuits from the penthouse mechanical room. Junction boxes would be located at the beginning of each circuit and power run from a single panel. The electrical engineer calculated the breaker sizes and the steady-state currents. A finished table was included in the electrical drawings, along with a note calling for a ground-fault protection device in each circuit.



HOTEL

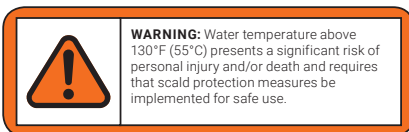
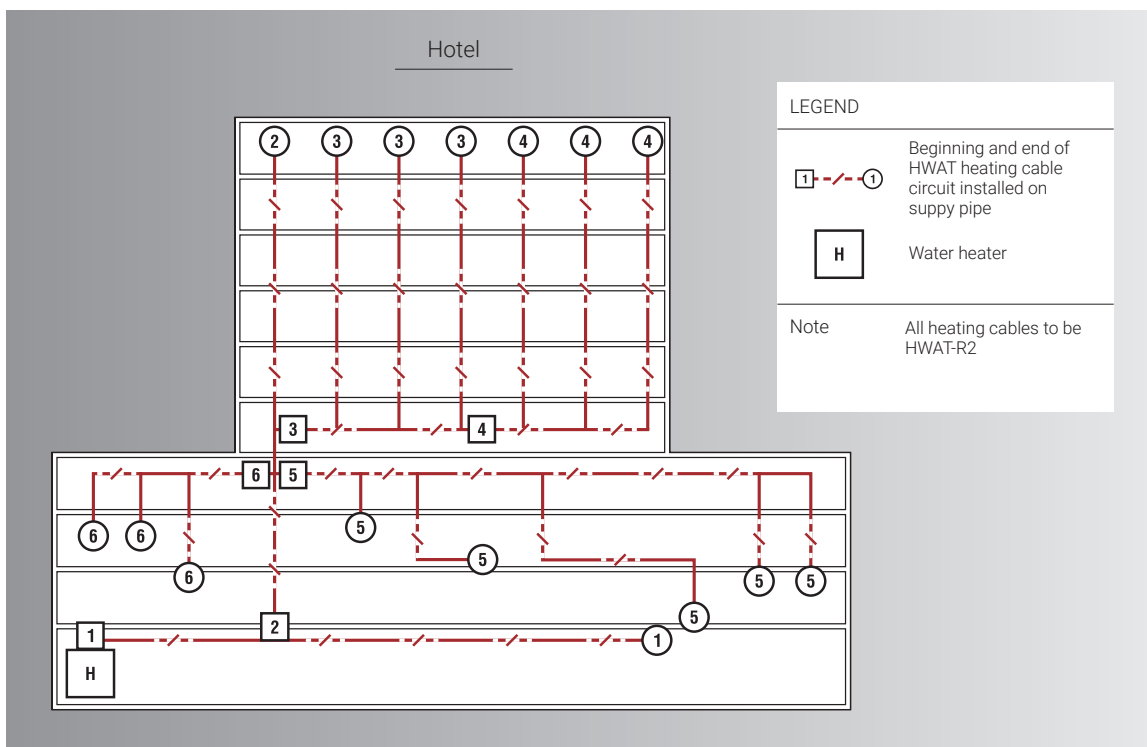
The plumbing engineer reviewed the architectural drawings for a new hotel. The building consisted of six floors of guest rooms over a commercial area containing a health club, restaurants, conference rooms, shops, offices, and a laundry. The plumbing engineer decided to deliver water from the boiler at 140°F directly to the kitchens and laundry, and to mix to 120°F for domestic hot water.

The HWAT system was chosen rather than recirculation because the owner insisted that there be no delay in getting hot water from any fixture, especially for the metered faucets on the first floor. Also, the HWAT system would accommodate all the architectural and construction changes that were bound to occur before the system was operating.

HWAT-R2 was selected for the 140°F line running out of the boiler to the kitchens and laundry, and HWAT-R2 for the 120°F domestic hot water system. After reviewing the circuit

length table, it was determined that the entire domestic hot water piping could be traced with only two HWAT-R2 circuits by utilizing a 30 amp circuit breaker. However, the plumbing engineer decided to lay out the heating cable in smaller discrete zones to facilitate partial shutdown of the system for maintenance. Given the short circuit length for each circuit, 15 amp circuit breakers were specified and the circuits were indicated on the drawing.

The electrical engineer looked at the layout of the circuits and assigned junction box and panel locations for each circuit according to the electrical drawings. The engineer calculated the breaker size and the steady-state current for each circuit. A completed table, with a note that the circuit breakers would incorporate 30 mA ground-fault protection, was then transferred to the electrical drawing.



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