

# Bond Program Building Our Future



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## A PATH TO A NET-ZERO BUILDING

### Fall/Spring

On a typical fall/spring day in Newberg Oregon, students arrive at PCC Newberg for their first classes of the day. The night before, the natural ventilation louvers in the building were opened part of the night to fill the building with cool fresh air and exhaust any built-up heat through the top of the stacks. The interior of the building is comfortably cool and with the outdoor air temperature below 55°, the natural ventilation louvers are closed. During daytime hours, the classrooms are daylight only.

By mid-day, the outside temperature has warmed up and when the CO2 monitors indicate fresh air is needed, the louvers automatically open to bring in outside air and exhaust the old air through the stacks. Additional heat in the classrooms created by computers and students is absorbed by the thermal mass of the concrete slab and the shear walls keeping the building a comfortable temperature. Throughout the day, rooftop solar panels are generating electricity to meet the building's needs. As the sun sets, the high efficiency lights in the classroom turn on. Outside air continues to be brought in through the natural ventilation louvers.

### Winter

On a cold winter day, students dressed in long pants and sweaters arrive for morning classes. The natural ventilation louvers are closed and the rooftop Air-to-Water Heat Pump circulates 90° water through the concrete slab, radiating warmth to the occupants. Due to the super-insulated building envelope, heat loss over-night has been minimal. Additionally, the thermal mass of the building's concrete shear walls has released much of its heat into the building to keep the building warm.

From morning until evening, outdoor temperatures remain below 55° but, due to the full classrooms, CO2 levels are rising. Heat Recovery Ventilators located in the stacks turn on to bring fresh outside air to the classrooms. The cool air is tempered by heat extracted from the air being exhausted from the rooms. The concrete slab continues to radiate warmth to the building's occupants using water heated by exhaust heat pulled from the equipment in the telecom room.

### Summer

At the height of summer, students arrive to a cool building dressed in shorts and t-shirts. The night before, the louvers automatically opened as outdoor temperatures dropped, bringing in cool fresh air and pre-cooling the building's thermal mass. Small motors in the ventilation turbines flushed old air and heat out of the building. With moderate, early morning temperatures, the louvers remain open to bring in fresh air for the first part of the day. As the day heats up, the louvers automatically close and fresh air is again brought in from the Heat Recovery Ventilators. As the day continues, teachers turn fans on as needed to keep the classrooms and commons area comfortable. During the few times of the summer when temperatures are extreme, if the building becomes uncomfortably warm, a call to PCC's Facilities Maintenance Service will allow the Air to Water Heat Pump to create cool water to run through the concrete slab to cool occupants and bring temperatures back into a comfortable range.