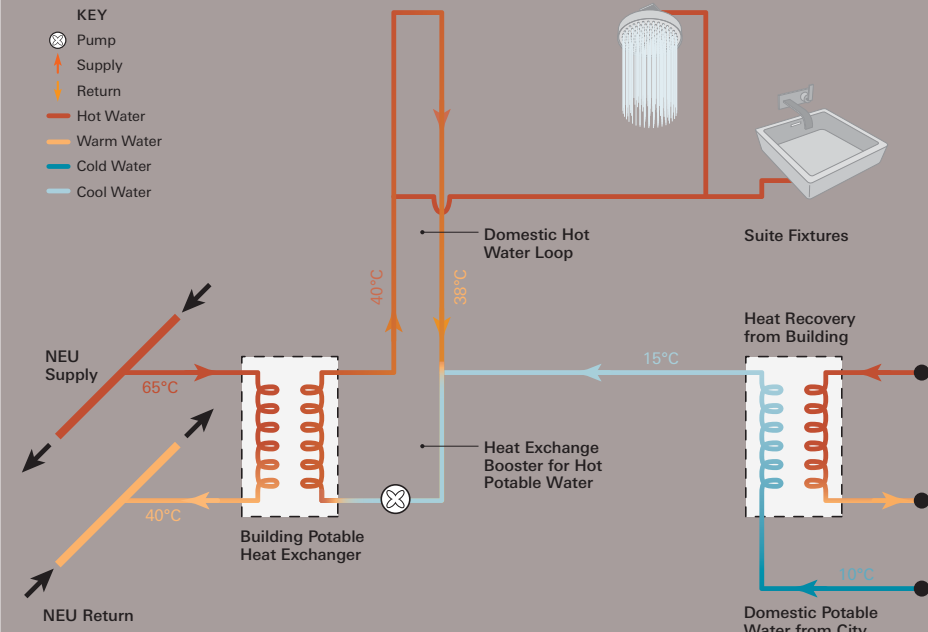


Heat Recovery and Water Pre-Heating

“If you look at the top of a typical apartment building in the winter, you’ll see misty condensation coming off the roof,” says SK Lai of Cobalt Engineering. “That’s excess heat – it’s basically being dumped into the environment and doing nothing else. In the Olympic Village, instead of dumping that heat, we put it back into the system.”

Turn on a hot water tap in Olympic Village and you feel warmth captured from a number of sources in the building: cooling systems in the suites, which extract heat during hot weather; parkades, which are warmed by cars and building activities; commercial spaces that generate heat from refrigerators, lighting, cooking and high customer volume; and on a few buildings, solar panels. Heat pumps recycle and transfer this energy, which is then used to warm potable water in a large tank with a coil running around the inside, called a heat exchanger.

Lai says Vancouver’s potable water tends to be quite cold – around seven degrees Celsius. For use in a bath or shower, energy from the Neighbourhood Energy Utility is used to bring the temperature up to 45-50 degrees. “To increase the efficiency, we use waste energy to pre-warm that water as much as possible,” says Lai. “Then we don’t have to use the [NEU] to heat the full amount, which is the savings we’re looking for.”



Heat recovered from various building activities will be used to pre-heat domestic hot water, reducing the energy required from the Neighbourhood Energy Utility.

Durable Piping

Peek inside the walls in Parcels 3 and 6 and you’ll see the way of the future. Gone are the metal pipes used by plumbers for generations.

“This is the only high-rise development that I’m aware of in North America that has done a plumbing system entirely in plastic,” says Jim Myers of Jeda Mechanical, the company that plumbed the parcels. Myers says in the past, plastic piping did not meet fire codes, but newer products (Wirsbo and Aquatherm) now do.

Myers says this makes the plumbing system more sustainable and efficient in several ways: plastic pipes last 75-100 years, where copper typically wears out in 15-20, requiring costly and wasteful re-piping of the entire building; water flows more smoothly through plastic, so pipe sizes can be reduced and walls built thinner, increasing interior space; plastic pipes are less labour intensive to install; and plastic pipes can be recycled at the end of their life.

“This is the way all projects should go,” says Myers. “This system will last the life of the building.”



With building heights in the Millennium Water development ranging up to 13 storeys tall, potable water sitting in the domestic plumbing will create positive pressure in basement water pre-heating tanks. This helps reduce the risk that potable water could ever be contaminated by heat-recovery fluid (which only circulates as high as two storeys), allowing the use of more efficient, single-walled heat exchangers.

Physics and Common Sense

Initially, there was concern that if a breach ever occurred within the heat exchanger used for water pre-heating, the potable water could become contaminated (the heating medium contains chemicals to keep the piping system clean). City officials required a double-wall heat exchanger – a system with an air gap between the heating medium and the potable water.

The trouble, says SK Lai, is that “air is known to be a very good insulating medium. Heat exchanging through an insulator is kind of a waste of time. So we worked with the City to sort this out.”

The answer turned out to be gravity. Engineers realized the heating medium would never circulate above two storeys – the highest level of commercial

space – whereas potable water will fill pipes to the top storey of each building. Therefore, the potable water system is always under significantly more pressure than the heating medium. If a breach occurs, potable water will infiltrate the heating medium – not the other way around. Based on this (plus sensitive electronic monitors), the City approved the more efficient single-wall heat exchanger.

“If you walk around the site, what you’re looking at is common sense and simplicity,” says Lai. “Sometimes being green is just coming back to the simple laws of physics.”

CHALLENGE

To all residential plumbing system designers: to adopt domestic potable water pre-heating from heat recovery systems, where applicable, using single-wall heat exchanges.