

The Underground University

Web of tunnels provides heat & services to campus

By Colleen MacPherson



Vern Detert, Director of Operations and Maintenance in the Facilities Management Division, explains the intricate network of more than five kilometres of tunnels under the U of S.

Photo by Colleen MacPherson

Deep in the heating plant, where temperatures border on the tropical, a series of pipes snake down from the boilers and out through large openings in the concrete walls, beginning a five-kilometre journey through the underground University.

With an intricate series of interconnected tunnels, campus buildings receive their lifeblood at this time of year – heat – along with the other essentials of survival. Like a street system, complete with main thoroughfares, intersections, secondary paths and even bumps in the road, the underground University infrastructure has grown and developed right along with its more visible, above-ground counterpart.

Vern Detert, Director of Operations and Maintenance in the Facilities Management Division, said prior to the central heating system, each building on campus was heated separately. The first central heating plant was located near the Engineering Building and construction of the first tunnels under campus took place before 1920, he said. That plant, called the old power house, provided coal generated heat and has long since been incorporated into the Engineering Building as the structures lab.

“People who were here at the University in the ’60s would probably remember it,” said Detert, “but now it’s been gobbled up by Engineering. It’s probably been renovated into labs and classrooms.”

The original tunnels are still in use, distinguished from their modern counterparts by their shape. Detert said the oldest are rectangular and were built by digging out the ground and pouring about 8-inch-thick concrete floors and sides. When that set, more forms were built and the tunnel was capped, again with concrete, before being covered with earth. Some newer tunnels are round and made of pre-formed concrete, much like a culvert.

Considering their age, the tunnels are in good condition. Detert said there is the odd puddle on the floor when the water table is high or after a big rain, and there is the odd resident mouse, but overall, they hold up well.

In addition to steam pipes, the tunnels are large enough to carry other necessary services – water, electrical, telephone and even computer lines. But even with five kilometres of “walkable” tunnels and even more that are “barely walkable”, there are still some campus buildings that are aren’t connected to the tunnel system.

Detert said that while tunnels extend from the heating plant on Campus Drive east to Engineering, west all the way to Royal University Hospital (the University supplies steam to the hospital, a “very critical application”) and to most structures in-between, some buildings north of the Vet College like the General Purpose Building and the greenhouses, are serviced by buried lines and cables. For new buildings in the main campus area, access to underground services is engineered right into the design and “nobody digs until the drawings are checked and everything is marked out.”

It’s probably safe to say many people on campus are unaware of the tunnel system, but there are clues. Warmth radiating up from large manhole covers, enough to melt snow, is

an indication of a tunnel below. These covers provide both ventilation and access, said Detert. In the spring, the first grass to green up on campus grows on top of the tunnels, taking advantage of the one characteristic all the tunnels have in common.

The 18 km of steam lines on campus are maintained at an almost constant temperature of 360 degree year-round, he said. Even in summer, at least one boiler is required for hot water heaters. That kind of heat not only helps the grass get a head start in the spring but also helps prevent rust and deterioration in the lines. But even so, visual inspections are a very high priority.

Detert said the tunnels are walked weekly by steamfitters, plumbers and electricians who check for signs of wear, strange noise and leaks. There has never been a steam line failure in a tunnel and if there were, “anybody who was in the tunnel would perish. It would be a very serious situation” that would require shutting off heat to whatever buildings are connected to the line, but it’s also a scenario that illustrates the interconnectedness of the infrastructure system, a fact never lost on the director of maintenance.

“Knowing that everything you do affects everyone out there is a real eye-opener. We all have to work together to make it work, and that’s what happens over here (at FMD).”

Any work in the valve chambers in the tunnels also involves air monitoring. In some lower sections (the tops of the tunnels are between two and five feet below the surface, often deeper at valve locations), there is the risk of low oxygen levels or build-ups of hydrogen sulfide or carbon monoxide. This danger explains the tight security governing tunnel access. Until now, few people knew they existed, and even fewer are allowed inside.

One tunnel leads to nowhere

On the Lower Level of the Education Building, behind a set of locked doors, is the entrance to a tunnel that leads to...nowhere.

Vern Detert of the Facilities Management Division explained that the doors block access to what was originally to have been a pedestrian tunnel leading from Education to Commerce, and vice versa. Work on the tunnel started when the building was under construction in the late 1960s but was halted when the tunnel was about as far out from the building as the entrance ramp, he said. Apparently, there are just too many other tunnels and lines in the ground between the two buildings to proceed.

It’s too bad, Detert said. If it weren’t for the in-ground impediments, the pedestrian tunnel “would be a beautiful thing to have.”

- *MacPherson*

Heating Plant at heart of tunnel system

Dave Farion rarely worries about what to wear to work because it's shirt-sleeve weather all year round in the heating plant.

Amid a jungle of pipes, pumps and steam vents that Farion thinks would make a perfect set for an Arnold Schwarzenegger movie, the plant manager explained that the facility was built in 1953 to house three boilers. In 1957, a fourth boiler was added and just nine years later, the building was expanded to accommodate a fifth boiler and a chilling plant to provide cold water for building cooling.

A sixth boiler came on line in 1976 and there was another building addition in 1987-88 for a third chiller. When the weather is hot and the chillers are running, close to 9,000 gallons per minute is pumped from the plant out to campus buildings.

Speaking over the sound of gas burners heating water to generate steam, Farion pointed out that, on the day of the On Campus News visit, with an outside temperature of minus 19 Celsius, three boilers were on line, producing a total of 201,000 pounds of steam per hour. With all six on line, which can happen when the temperature dips into the minus 40s, the plant generates about 250,000 pounds per hour "but we're going to exceed that this year because of the new buildings (Kinesiology and Spinks Addition)".

The maximum capacity of the plant is 410,000 pounds per hour, so there's room for more demand on the heating system, he said. The chillers, on the other hand, will be sorely tested if more square footage comes on stream. Farion said preliminary work is already being done to determine the load demands of the proposed Health Sciences building but he has little doubt an additional chiller will be required.

And the University's yearly gas bill for its heating plant? Close to \$5.5 million.

— *MacPherson*