



Breaking Down Barriers

2021 UMC SETS GEOTHERMAL STANDARDS



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Story by Rick Bostian and Stephen Webb

With the release of the 2021 UMC®, IAPMO became the first international code-development organization to provide regulatory guidelines in a mechanical code for installing geothermal energy systems used for HVAC and heating water.

These provisions break down barriers hindering the growth of these technologies. Local codes lack direction, with planners wanting to know

things like "If it's not in the code, what do we do?" or "Whose jurisdiction is this?"

By providing answers to questions like these, IAPMO is educating developers, assets managers, designers, code officials and others about the benefits of geothermal energy and making it easier to consider them — which is less likely to happen if geothermal isn't in the code.

Geothermal Takes Off

While living in caves to avoid temperature extremes is early evidence of geothermal

energy use by humans for heating and cooling, it wasn't until the early 1940s that the heat pump was invented to harness that energy for residential use, followed by the first commercial application later that same decade.

The principle behind this technology, which has basically remained unchanged, relies on the fact that below a certain depth, the Earth maintains a constant temperature of around 50 degrees Fahrenheit. Transferred to water in loops of underground pipes the temperature is ideal for water source heat pumps to heat or cool on demand.

The availability of low-cost fossil fuel and DX Condensing units as a standard practice, geothermal languished until the oil crisis of the '70s when the closed loop heat pump system took off in the U.S. using cooling in the building to offset heating.

Subsequent years the use of geothermal loops increased to eliminate or substantially reduce the dependence on a boiler or a cooling tower improving system efficiency and elimination of fossil fuel.

Driven by innovations like these, the availability of state and federal tax credits, and the desire to contain energy costs by converting to more sustainable sources, the geothermal heat pump market in the U.S. is itself heating up and is projected to surpass \$2 billion annually by 2024.

Geothermal Code Evolution

Hugo Aguilar, IAPMO's senior vice president of Codes and Standards, points out that while "heat pumps using the earth or a body of water" were touched on in the *2012 Uniform Mechanical Code (UMC)*, no specifications for them were included. The *2021 UMC*, on the other hand, "has an entire appendix with specifications for geothermal applications that includes sections on groundwater, closed loop, open loop and direct exchange systems."

According to Aguilar, the *2024 UMC* will add another application known as ATL (Ambient Temperature Loop), which he describes as "a hybrid solution that is essentially a modification of traditional geothermal systems." Featuring a central heat pump and a variety of heat sources and heat sinks, District ATL distributes geothermal energy



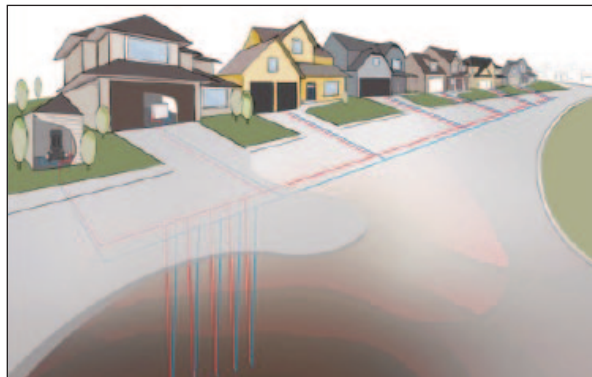
Left: Geothermal one building, one loop.

Lower left: Multiple homes common loop(s).

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to and among buildings through a closed-loop piping system. Heat exchangers in each building then transfer that energy to their own systems for use with HVAC and hot water heating.

The Potential of District ATL

District ATL is a multibuilding geothermal loop functioning like the base Water Source Heat Pump system in that each building can heat or cool as required. Called a 5G or Fifth Generation District it is the first bi-directional District to heat and cool with one set of pipe.

This permits those in "environmental neighborhoods" to share energy while maintaining control of their own energy use. For example, waste heat rejected by an office building's AC system can be used by a neighboring residential development for preheating water, lowering the cost of energy and reducing the district's need to purchase new sources.

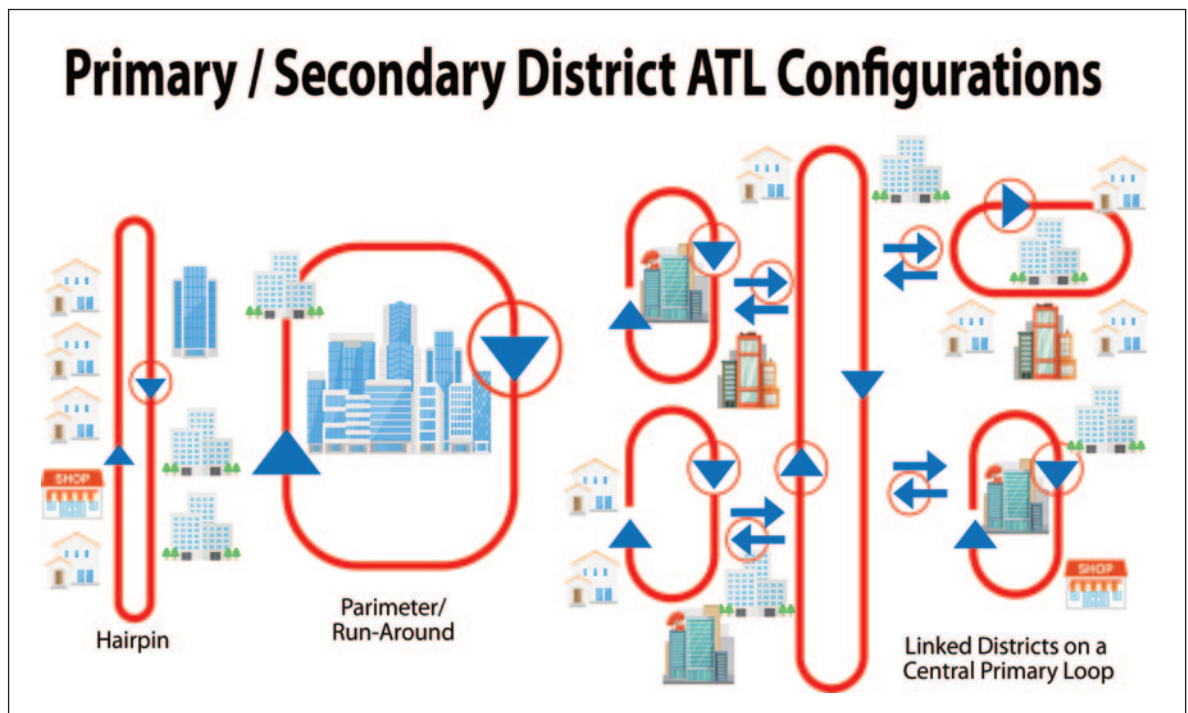
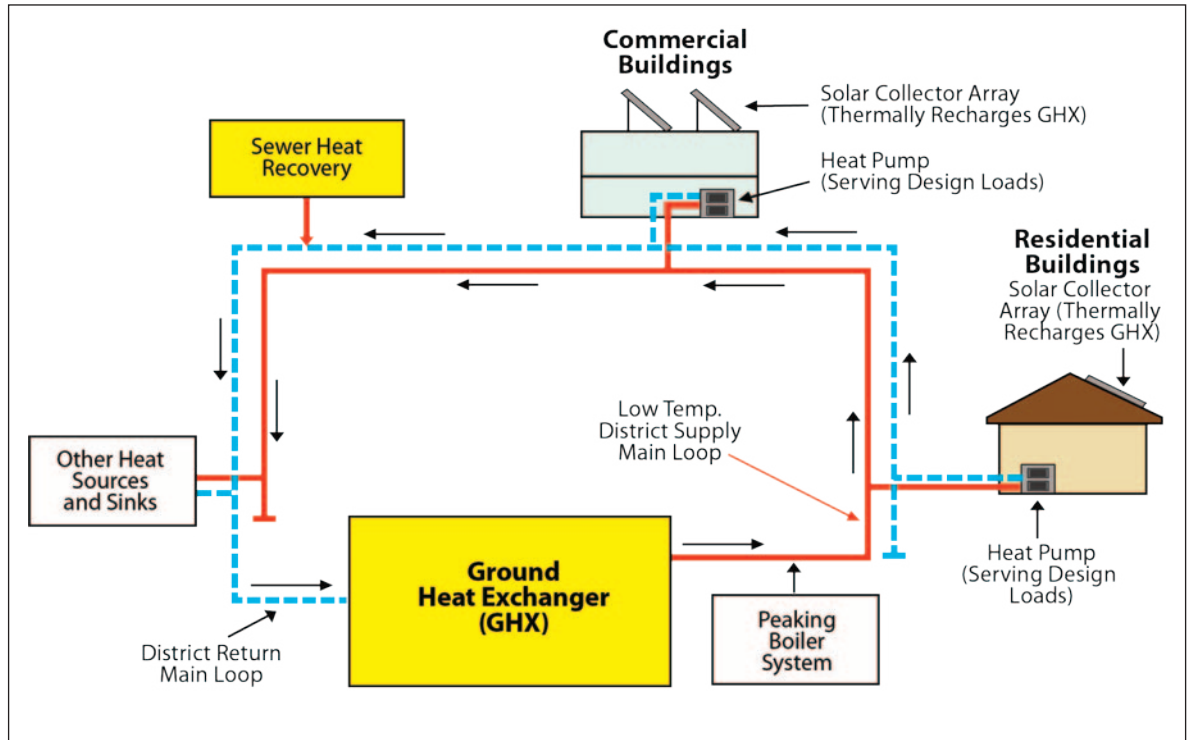
Municipalities and utilities can also take advantage of other thermal opportunities with District ATL that include granting credits to buildings that operate to the net advantage of others to encourage conservation, installing community ground loops that lower installation costs, and using recycled wastewater in order to preserve limited water resources.

Right: Concept schematic of a multisource hybrid GHP system.

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Below: Primary/secondary district ATL configurations. Thermal opportunities avoid new energy use.

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Committed to Sustainable Energy

Among sustainable energy sources, geothermal is far more efficient than wind or solar and can easily be stored and shared, giving it not just the potential for lowering the cost of energy, but the ability to actually reduce energy consumption, as well.

By bringing geothermal into the UMC, IAPMO helps overcome obstacles that stand in the way of its development. And as these systems continue to evolve, IAPMO will be keeping its ear to the ground, so to speak, to stay on top of new developments. 📧