The Utilidor:

The End of Honeybuckets and Water Hauling

With the utilidor system underway, honeybucket and water hauling will be a thing of the past in Barrow within three years. By then the final phase of the utilidor should be complete and universal indoor plumbing on top of the world will be a reality.

Making available a sewage and water system to an entire town hundreds of miles above the Arctic Circle is far from a spit and shovel operation. Plumbing systems common to other areas of the world would become city-sized popsicle molds if buried in Barrow. Beneath the tundra's surface the frozen ground would freeze solid any water in standard underground pipes and keep it frozen 12 months of the year.

The utilidor system, on the other hand, will keep pipes warm without thawing the frozen ground around them. The secret is a well-insulated tunnel that is being buried beneath Barrow and Browerville streets. Inside the tunnel tough polyethylene pipes will circulate warm water to houses and take away sewage. In addition, television, telephone and electric cables will enjoy the underground corridor's protection. The only utility left out of the utilidor will be Barrow's natural gas lines which are being buried separately for obvious reasons.

The warm water pipes in the utilidor will act like a giant radiator keeping the inside temperature around 40 degrees above zero. Insulation on the tunnel walls plus waterproof sealing and a vapor barrier will keep the mild inside temperatures from melting the frozen ground outside.

Besides room for pipes and cables, the utilidor has been designed with space for servicemen to get in and make repairs. With an inside height of six feet and a width that tapers from five feet at the top to six feet at the bottom, repairmen will be working in much more than a crawl space.

But utilidor repairmen, like their Maytag counterparts, should be the loneliest men in town according to Frank Moolin and Associates, the Anchorage firm which designed the utilidor and is overseeing its construction. Moolin's Barrow Project Manager Chuck Tabola says there is very little that can break down inside the utilidor.

"The utilidor has been designed to eliminate the need for major maintenance. The polyethylene pipe going in it is the toughest material on the market. Sections are molecularly fused by heat, so you can't even see a seam. Each section of the utilidor is insulated with styrofoam and wrapped with a waterproof vapor barrier and then surrounded by non-frost susceptible gravel."

The utilidor design also counters the Arctic soil's urge to pop buried objects back above ground. The tapered design of the tunnel wedges it into the frozen ground. The widest end is placed some twelve feet below the surface. This is well below levels affected by seasonal freezing and thawing that eventually spits objects onto the surface. In this way, the Moolin engineers say, the utilidor is locked in place.

Backing up their calculations are results from a utilidor test section buried last spring. Surrounded by three hundred monitors that measure temperature changes to a hundredth of a degree, pressure monitors that measure any stress on the tunnel walls, control points that read any deflection or rotation of the tunnel, this test section has been checked every month for the slightest signs of movement up, down or sideways. Frank Moolin Quality Control Engineer John Sahlfeld says the monitors have not shown more than a hundredth of a degree change in any direction or as he puts it, "that utilidor hasn't moved a freckle."

Utilidor construction will be done in three phases. Phase one, which is going on now, involves burying the utilidor in an area east of Barrow called Block A and then under the streets of Browerville. In phase one these two sections will be linked with an above-ground lagoon crossing that will follow the outer lagoon dam. Three pump stations will also be built to supply the extra push to propel water and sewage through the utilidor system.

Phase two involves hooking up the utilidor's service lines and phase three will bring the utilidor into Barrow proper complete the system.

Phase one began last spring and Sahlfeld says the utilidor is now nearly complete in Block A. That area is slated for new Borough housing construction in the near future. As every Browerville resident can see by the closed streets and heavy construction work in their neighborhood, phase one is moving along.

Wherever it goes, huge square ditches ten feet deep and ten feet wide are required to bury the utilidor. You don't dig such a ditch in permafrost. You cut it. To do that the North Slope Borough has enlisted a large rock saw, a machine that looks like a chain saw for King Kong stuck on a bulldozer. It is one of seven machines of its kind in the world.

The rock saw can trim a channel 14 inches wide and up to 17 feet deep at a rate between 500 and 1200 feet a day. Its speed is affected by how much ice is in the ground. Although it is called a rock saw it likes to saw through ice better. In soils with high ice content it cranks up to its highest speed.

The ground in Browerville has more gravel and less ice, so the rock saw is moving at a slower pace. It cuts its narrow channel on either side of the planned utilidor ditch. Carefully controlled blasting is used to break up the soil between these outside cuts. Then a typical diesel shovel can clean out the rubble. The end result is a ditch cut so clean and square it looks like it was made through jello.

Into the ditch go prefabricated utilidor sections hoisted by crane. Once in, they are connected and the joints sealed. The walls of the utilidor sections are made of wood six inches thick. Insulation is wrapped around the walls and sealed with a sheet of polyethylene. A special gravel is then packed around the utilidor. This gravel is labeled Non-Frost Susceptible (NFS) because it is so low in water content that it resists any freezing and thawing movements. This NFS gravel is produced at the Barrow gravel pit by sending regular pebbled rock through a gas-fired drier.

Large, metal manhole units are placed at intervals in the utilidor to assure ready access to all areas. Cut off valves are similarly spaced to allow service to one section without shutting down the whole system. Corners and intersections are made through special metal junction units.

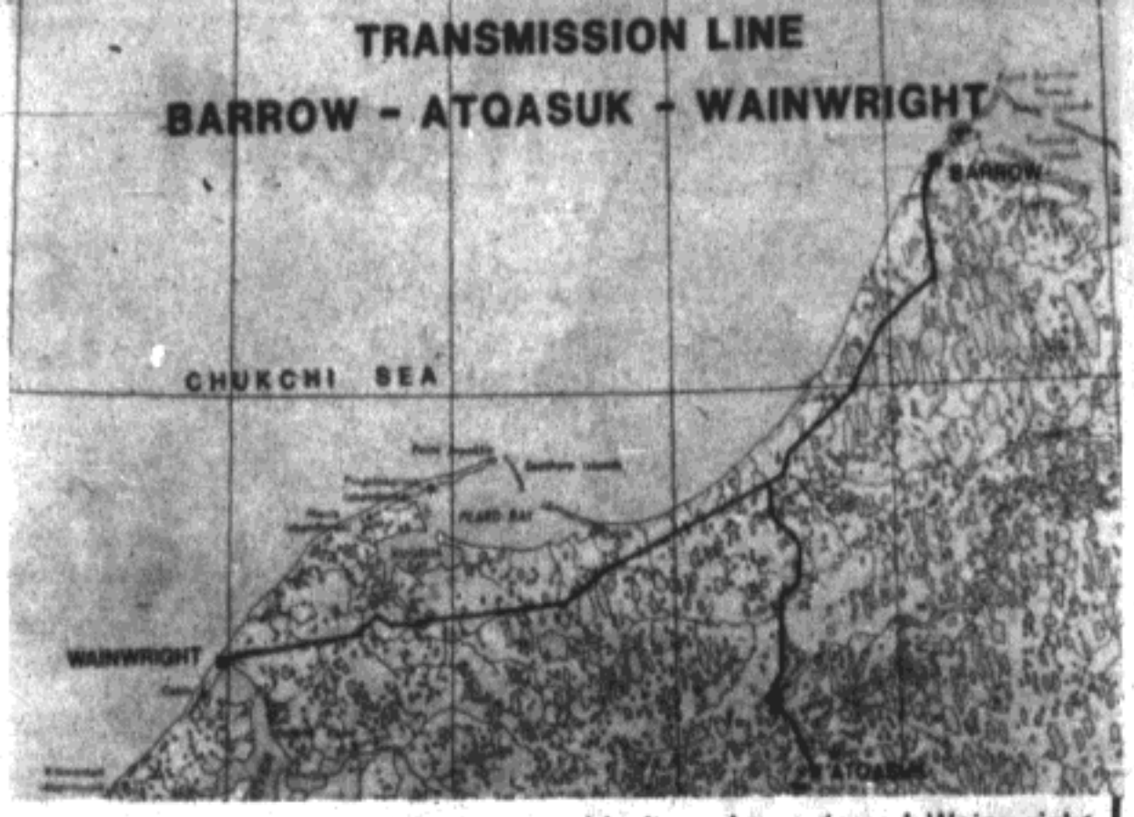
Firmly entrenched, the utilidor is then invaded by the men who will put its interior plumbing together. The polyethylene pipe needed to fill several sections of the utilidor was packed tight into one of the sections when it was lowered into the ditch. From there workmen can pull the pipe out one-by-one and fuse them with the help of another special machine.

This machine rides on wheels so it can slide under two pieces of pipe, trim their ends so they fit perfectly and then press together. It then applies 500 degrees of heat to molecularly fuse the pipes. The process is quick. The pipes cool and the machine is wheeled on to the next section of pipe. Left behind is a pipe that looks like it has never been anything but one long pipe – a seam is nowhere to be seen.

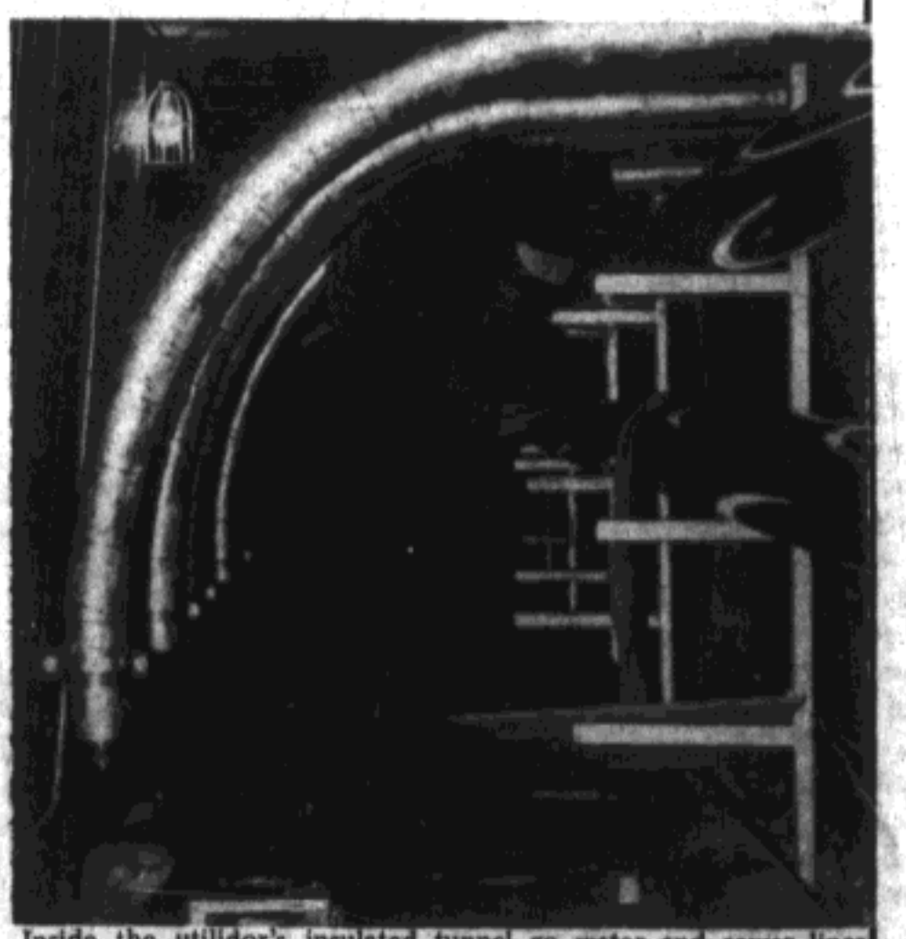
To demonstrate the toughness of polyethylene pipe, Sahlfeld picked up a scrap piece and tried to crack it apart. He bent it back and forth, back and forth like someone trying to cut a wire without any clippers. It was soon obvious that nothing was going to snap, unless it was the Quality Control Engineer's stamina. He stopped bending. The pipe was left with an obvious crease but no holes or cracks. Sahlfeld summarized, "You couldn't hurt this pipe unless you really set out to do it and had lots of help."

When houses hook into the utilidor system it will be through a heavily insulated pipe called a utiliduct. Inside the utiliduct smaller water and waste pipes and other utility cables will be kept warm without thawing the ground around it. (The utiliduct acts like a miniature version of the utilidor without the access space.) Carefully fitted through the utilidor wall the utiliduct water pipes will then be fused to the main lines by another machine that uses the same basic process as the one described above.

The end result will be universal indoor plumbing for Barrow. A dream that has been on the drawing board since Mayor Eben Hopson's day. With its realization some of the last remaining discomforts of Arctic living will disappear. And as Tabola points out it will have been accomplished through design objectives tailored for local employment, uncomplicated maintenance and easy expansion.



Route of the power line that would allow Atqasuk and Wainwright to share Barrow's gas produced electricity.



Inside the utilidor's insulated tunnel go water and sewer lines plus electric, television and telephone cables and there is still room for a workman to service the system.