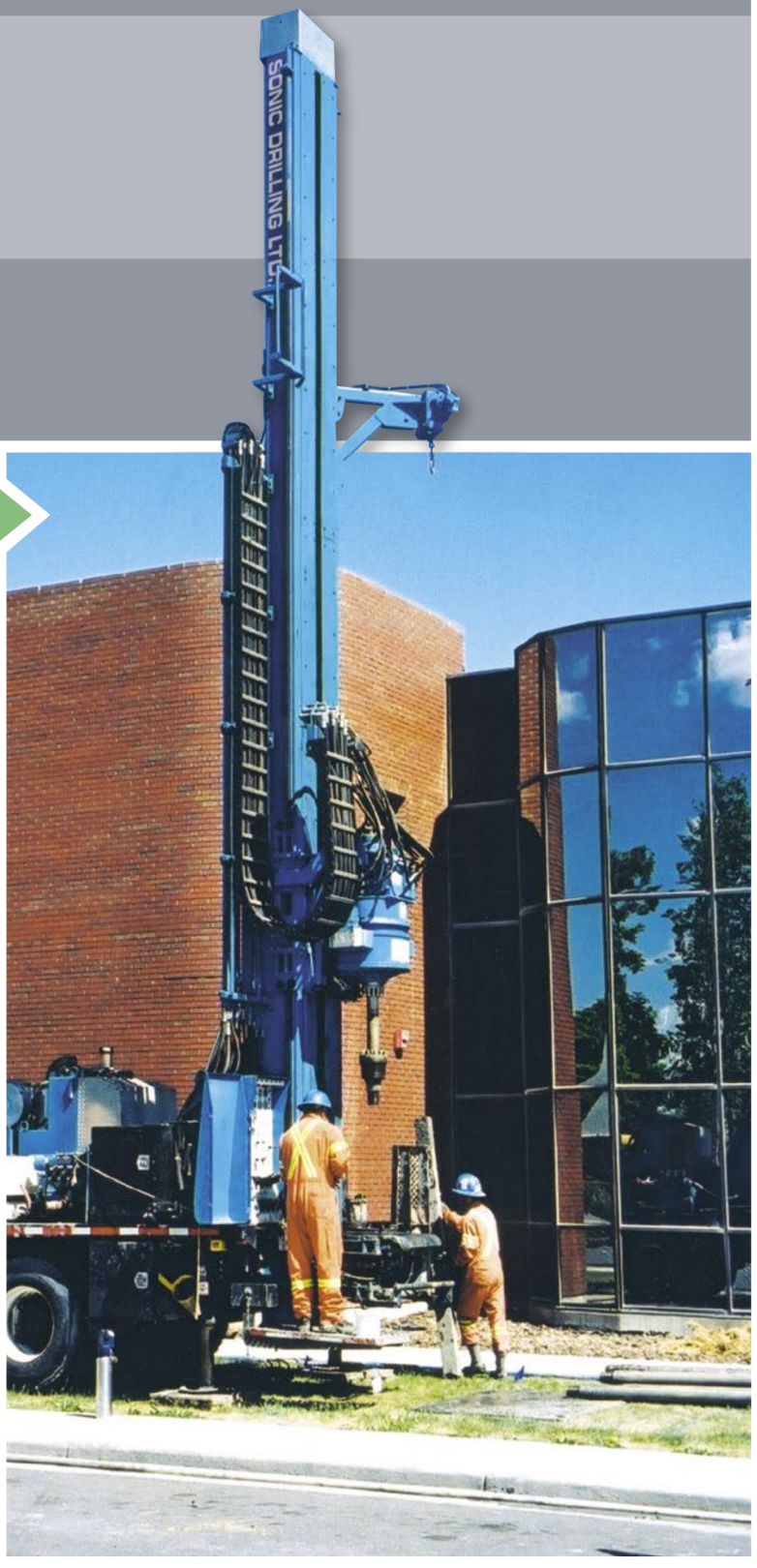
GEOTHERMAL DRILLING

SONIC™



ADVANTAGES OF SONIC DRILLING FOR GEOTHERMAL INSTALLATIONS

- Fastest drilling method on earth for geothermal installations.
- World's most advanced drilling technique.
- Patented drilling technology exclusive to Sonic Drilling Ltd.
- Holes are drilled to the desired depth by rotating and vibrating the casing at resonant sonic frequencies while keeping the bit face open with high-pressure fluid.
- Ability to:
  - simultaneously drill and case holes to full depth.
  - drill in any geological formation.
  - drill very straight holes.
  - drill without using drilling mud, which provides a much cleaner and safer work environment.
- Economical drilling rates due to the efficient sonic drilling method, especially in gravel and boulder ground where other rigs experience great difficulty due to loss of drill mud through gravel zones and where other rigs must case the hole to prevent collapse of the borehole wall.
- Full length cased hole allows for:
  - easy installation of one or a multitude of geo loops in the same hole.
  - quick and efficient installation of pre-coiled geo loops without the leading edge hanging up against the sidewall of a mud drilled borehole.
  - installation of any size geo loop or copper heat exchanger.
  - ease of grouting by the tremie line method or pressure grout method and provides accurate monitoring of the grouting process.
  - complete grout coverage around the geo loop (no need to worry about heaving sands or sidewall collapse of cobble and boulder zones).
- Steel casing is vibrated out of the ground after geo loop installation and placement of thermally enhanced grout.
- Cased hole provides the ability to deal with free-flowing hole or artesian conditions.

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ADVANCED DRILLING TECHNOLOGY

SONICOR 50K DRILL HEAD

- The patented sonic drill head, manufactured by the Sonic Drill Corporation, provides the rotation and vibration forces necessary to rapidly drill and case holes for the installation of geo loops.
- High frequency resonant vibrations are sent down the drill string to the drill bit. The operator controls the frequency to suit specific conditions of the soil/rock geology.
- Resonance magnifies the amplitude of the drill bit, which fluidizes the soil particles surrounding the ring bit, allowing for fast and easy penetration in most geological material.
- An internal air spring isolates the vibrational forces from the rest of the drill rig structure.
- High pressure water is directed through the drill head, while drilling is in progress, to remove the cuttings and keep the inside of the casing clear in order to provide an unobstructed path for the geo loop.

- The sonic drill has the outstanding ability to provide continuous core samples of any geological formation.
- The information gathered from analyzing the core samples can be used to create an accurate geological profile in order to design the most efficient loop field for site specific ground conditions.
- Samples are large enough to conduct thermal conductivity tests and the cores can be photographed or stored for future reference.

GEO LOOP INSTALLATION

Drilling in progress.

Lowering of geo loop.

Grouting of geo loop.

Completed geo loop installation.

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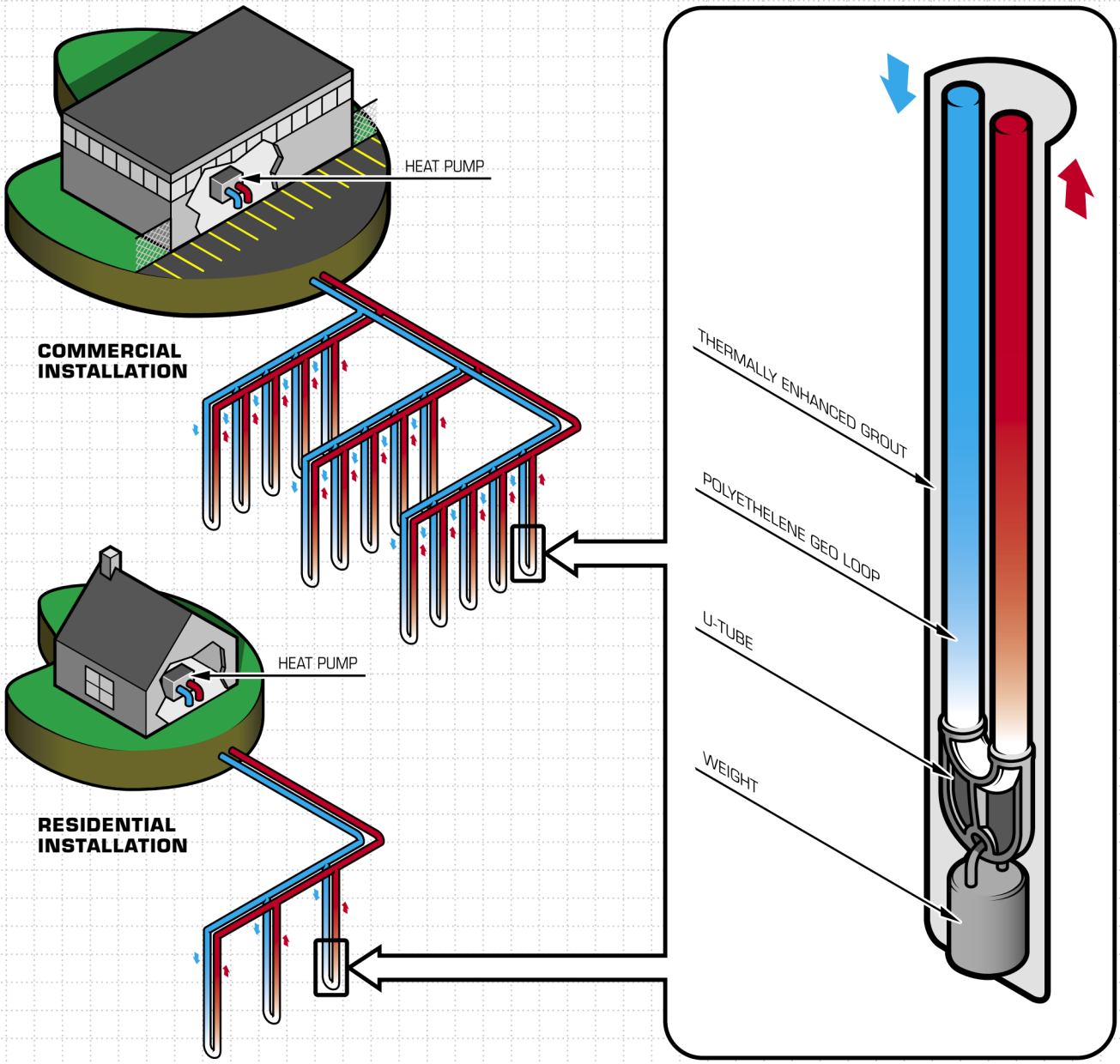
TYPICAL INSTALLATION OF A GROUND SOURCE HEAT PUMP SYSTEM



For more information, visit our website at **www.sonicdrilling.com**
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