

GEOHERMAL AND THE ENVIRONMENT

About Refrigerants and Copper Tubing Used in TOTAL GREEN Geothermal Systems

The **TOTAL GREEN** 'DX' Geothermal Systems refrigerant, R-22, is not harmful to the environment. As the key component in the **TOTAL GREEN** refrigeration cycle, it circulates within heavy walled copper tubing along with a small amount of clear vegetable oil based compressor lubricant.

R-22 is the most commonly used refrigerant today and is non-poisonous, stable, and harmless. This is why it has been safely used in home air conditioners and commercial refrigerators for nearly 40 years. Pursuant to the Montreal Protocol, it will be available to service installed equipment until at least 2035 or beyond (source: EPA.gov.)

R-22 is safe underground because it's sealed within extremely strong, pressure tested copper tubing bedded in fine mason sand for excellent thermal conductivity and stability. **Leaks are highly unlikely. However, even if a leak occurred, there would be no harm done, as neither of the fluids in the TOTAL GREEN System are hazardous, verified by their respective Material Safety Data Sheets (MSDS) which are matters of public record.**

Competitors of 'DX' technology, being unable to match the superior DX system operational efficiencies, have circulated rumors that potential refrigerant and compressor lubrication oil leaks would be harmful to the environment. This is false and intentionally designed to confuse DX customers.

NO TOTAL GREEN equipment using R-22 refrigerant have been prohibited, in any manner, from any sub-surface direct expansion heating/cooling application by the U.S. Environmental Protection Agency.

While any refrigerant can unsafely displace oxygen in a confined area, and should therefore, always be safely reclaimed by a licensed professional, **TOTAL GREEN'S** refrigerant is not poisonous and would have the same effect as displacing oxygen in a confined space with nitrogen or any other non-poisonous gas.

The thick walled copper tubing which contains the R-22 refrigerant circulating in **TOTAL GREEN'S** geothermal ground taps is also safe. Copper is a naturally occurring element. Copper forms a reddish/greenish-brown film of cuprous oxide (see Statue of Liberty) when exposed to the elements. This film tends to actually provide an additional safe, protective layer for the underlying copper. However, **TOTAL GREEN** adds another layer of protection for our copper tubing by installing a consumer replaceable magnesium anode with each geo field.

Copper artifacts have reportedly been found intact in the Middle East beneath deposits of clay **more than 4000 years old**. In addition, underground copper pipes used to convey water in ancient Egypt are still in existence. For more than 150 years, copper tubing has been routinely and safely used to pipe drinking water in municipal water systems. Ask any plumber.

TOTAL GREEN 'DX' Geothermal systems, when compared to water based geothermal systems which circulate a mixture of water and anti-freeze, is proven to eliminate associated potential risk of sub-surface bacterial, or other potentially harmful contamination which has been reported to have occurred in various geothermal **water-source** system applications. Some **water-source** systems have utilized poisonous antifreeze mixed with water to avoid the use of propylene glycol (a food grade anti-freeze) that becomes thicker when cold and dramatically increases the water pump's power usage, decreasing operational efficiencies. **TOTAL GREEN Systems do not use water or anti-freeze in any form.**