The coefficient of thermal conductivity of HDPE pipe is about **2.5 BTU/hr/ft/º F. per inch of thickness**. The linear thermal coefficient of expansion is **0.00014 in/in/C**.

Thermal Conductivity:
Polyethylene is a relatively poor conductor of heat compared to metals. The coefficient of thermal conductivity for polyethylene pipe is approximately 2.5 BTU/hr/ft/º F. per inch of thickness. As a result, temperatures which are unevenly applied do not dissipate readily and thermal effects can be localized.

This property can be used to advantage in water systems in cold climates. The slow heat transfer inhibits freezing and, if the usual precautions are taken with respect to depth of burial, accidental freezing is practically eliminated. If the pipe does freeze, it does not burst and will resume its function upon thawing. Cyclical freezing, as in lines used for summer service only, is well tolerated but it is recommended that such lines be depressurized at shutdown. Irrigation lines have been operated in this way for many seasons without damage.

Localization of heated areas can cause noticeable deformation of the pipe. Solar heat, absorbed on one side of the pipe, is not readily conducted to the other side. Lines installed on the surface of the ground, unprotected from solar exposure, will require extensive anchoring to confine and control movement. The principle of design for such systems is to ensure that the movement is controlled over short lengths and is confined within a convenient plane where room to accommodate the movement can be provided.

Thermal Expansion:
The coefficient of thermal expansion for polyethylene pipe under completely unrestrained conditions is 8 x 10-5 in./in./ºF. (14 x 10cm./cm./ºC).

However, in most conditions of installation, some restraint is automatically provided. With pipes of 4 inch nominal diameter or greater, simple burial under 2 feet or more of soil usually provides ample restraint. Under these conditions, expansion or contraction due to temperature changes does not occur and no design considerations are required to provide restraint. Pipe installed in a trench should be at the temperature of the trench bottom before backfilling is started. The temperature differences after backfilling will not have any contraction or expansion effects because of the friction between the soil and pipe.

Smaller diameter pipes, i.e. 1/2"to 3",should be snaked during installation in the trench, regardless of the burial depth, to increase the restraint available from friction with the soil.

If unrestrained, a pipeline installed above ground will tend to move laterally as a result of temperature changes, especially if the line is empty. If space is limited, or if the line is installed on a pipe bridge, restraining supports must be provided. When lateral movement is restricted, expansion will take place in either length or diameter, whichever is less restrained. Of particular importance in design is the condition in which pipe passes from an area of adequate restraint into an area of poor restraint. Failures can result if the pipe and connections do not have adequate support at points of transition from large fixed structures to less restricting conditions.