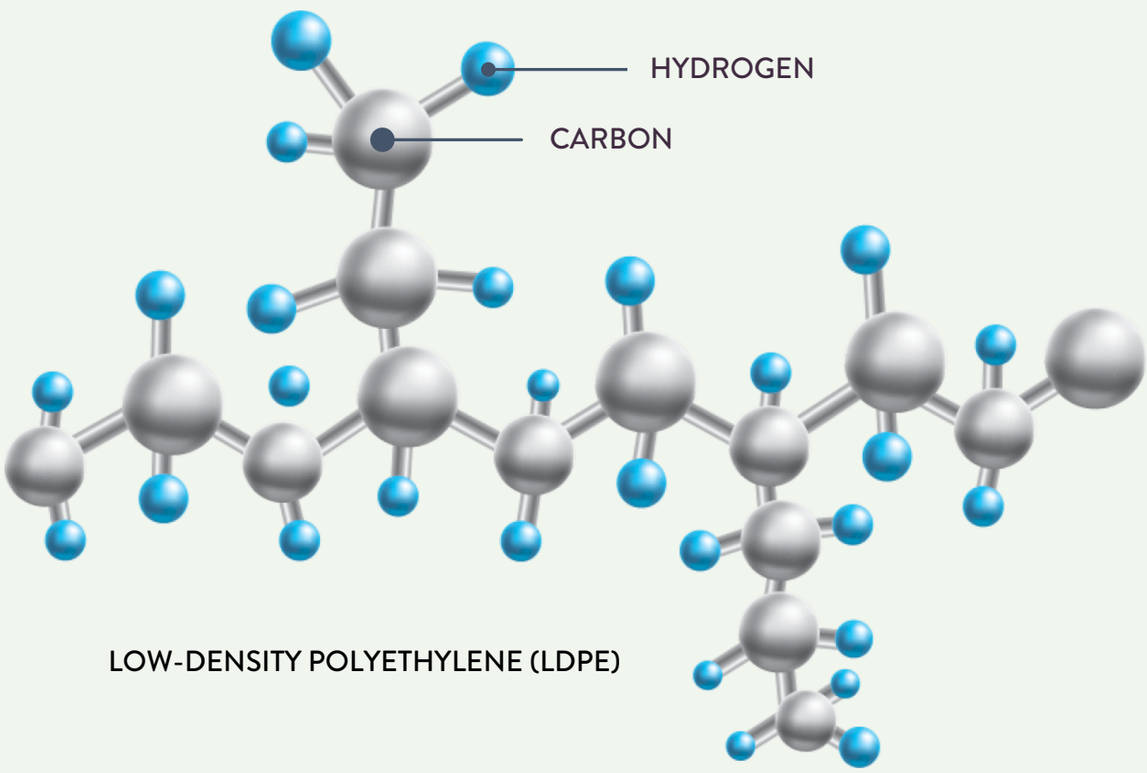
MOLECULAR STRUCTURE

The thermoplastic, or PE, the primary material used to manufacture the turf, absorbs and retains heat differently than natural grass. The thermal buildup is not safety but rather a comfort issue. When solar energy is transmitted to the turf surface, it transfers excess heat to the air within a safe area (below the chest level.) The conventional solutions are centered around infills. But as a practice has shown, many of them won't work as anticipated.



LOW-DENSITY POLYETHYLENE (LDPE)

TESTING T°COOL ® SYSTEM

The answer to cooling synthetic turf lies in the physics of heat energy. Heat can be transferred from one object to another in four ways: conduction, convection, advection, and radiation.

HEAT CONDUCTION

Heat conduction is the flow of internal energy from a region of higher temperature to an area with of a lower temperature. Above -273.15° Celsius, every object's particles (atoms, ions, electrons, molecules, etc.)

EVAPORATIVE COOLING

Evaporative cooling is something that we have all know and experienced. Wearing a damp tee shirt on a warm but windy day gives us a chill. The phenomenon that causes this is the latent heat of vaporization.

LATENT HEAT

Latent heat is the heat energy per mass unit required for a phase change to occur. To cause a state change in the water, or to break intermolecular forces which hold the molecules of water together.

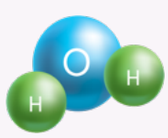
THE STATES OF **WATER**

WATER EXISTS IN THREE STATES: AS SOLID (ICE), LIQUID, OR GAS (VAPOR.) SNOW, RAIN, AND CLOUDS ARE ALL MADE OF SOME STATE OF WATER.

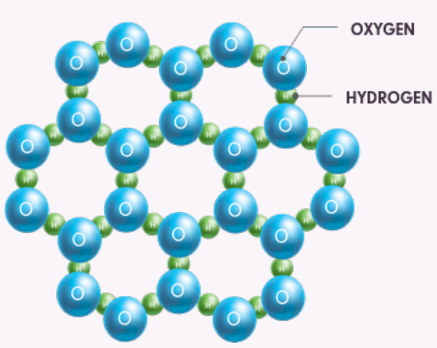
In a solid state (ice), water molecules are all hydrogen-bonded. Hydrogen bonds hold the water molecules in place. A regular crystalline structure consists of a single oxygen atom covalently bonded to two hydrogen atoms: H-O-H. When water freezes, its molecules move apart, begin moving around slower, allowing them to form hydrogen bonds, and eventually become an open crystalline structure. Since this structure is open, the volume decreases by about 9%, making ice lighter than the same volume of water. Water is one of the few substances whose solid state can float on its liquid state.

MOLECULAR STRUCTURE OF **ICE**

In a liquid state, water molecules move around quicker than in its solid state, enabling them to form fewer hydrogen bonds and stay close together. Each particle forms hydrogen bonds between the positive side of hydrogen atoms of one water molecule and negative side of neighboring water molecule.

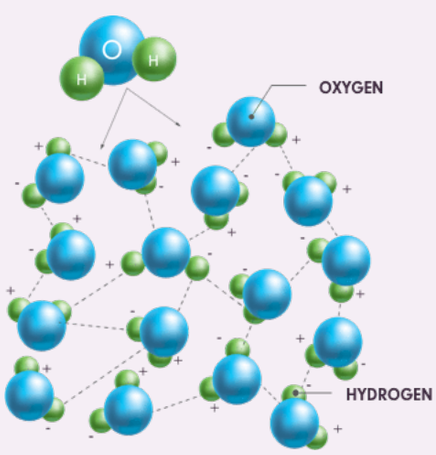


In ice, hydrogen bonds hold the water molecules in place. A regular crystalline structure consists of a single oxygen atom covalently bonded to two hydrogen atoms: H-O-H.



MOLECULAR STRUCTURE OF **WATER**

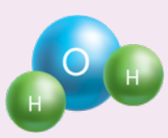
Hydrogen form a bond. The lack of hydrogen bonds explains why steam burns more than water at the same temperature. Vapor contains all energy used to break hydrogen bonds in water. When it hits your skin, it suddenly loses energy causing damage to your cells.



Hydrogen bonds between the positive side of hydrogen atoms of one water molecule and negative side of neighboring water molecule.

RANDOM MOLECULAR STRUCTURE OF **VAPORIZED WATER**

Current research suggests that the energy required to free an atom from the liquid is equivalent to the energy needed to overcome the surface resistance of the fluid. Since water has relatively high surface tension from its hydrogen bonds, thus water needs to absorb a significant amount of energy to go through a state change. The amount of heat transfer depends on the evaporation rate, which in turn depends on the air humidity and its temperature. When the air is very humid, the evaporation is slower. Thus, it's more effective in dry climates.



In gases, the molecules are not connected to each other and can move around freely.