

DEFLATE GATE SOLVED

By James Collins February 1, 2015

Discovery of a football's internal pressure down about 2 pounds per square inch (psi) versus the specification of 12.5psi at a playoff game for the Super Bowl has raised claims of cheating against the Patriots football team, Tom Brady and the owner Robert Kraft. This report proves that such claims are fallacious and the change in pressure internal to the football is a perfectly natural phenomenon. My son James Collins a professor at MIT has explained this to me in the following manner, which I have documented.

The basic physics equation for pressure and temperature inside of a volume is as follows:

$$PV/T = k \text{ (a constant)}$$

V is the internal volume of the football, which does not change, and is also a constant

Therefore the equation is $P/T = k$. This means that as the temperature rises, the pressure rises, and conversely as the temperature falls, the pressure falls.

The specification pressure of 12.5 (psi) is gauge pressure. The air around everything is 14.7 psi, and the total pressure (P) is the sum of the two or 27.2 psi.

The temperature is in degrees Kelvin. Absolute zero on the Kelvin scale is -273°C . Our calculations are based on the major reference point for most thermometers or freezing (0 degrees Kelvin), therefore T equals 273°C .

Our equation is now:

$$27.2 \text{ psi}/273^{\circ}\text{C}$$

The ratio rounds off to 1/10; this means that every 10° centigrade change in temperature results in a 1-psi change in the internal pressure of the football. Therefore, a 2-psi change results in a 20°C shift.

The equation to convert centigrade to Fahrenheit is as follows:

$$^{\circ}\text{F} = (^{\circ}\text{C} \times 9/5) + 32^{\circ}$$

$$20^{\circ}\text{C} \text{ equals } 36^{\circ} + 32^{\circ} = 68^{\circ}\text{F}$$

The change of 20° C equals a change of 36° F because in both cases the addition of the 32° is effectively an add-on constant. This results in the 2-psi change in pressure causing a 36° F change. Therefore, for every 18° F change, the internal pressure in the football changes IPsec in the same direction.

The temperature in most rooms approximates 75°F so we can estimate that the ball was initially filled at approximately 75°F but when it was measured on the field on that cold January day it was about 47°F (0° C = 32° F). Therefore, the change in internal pressure is purely a physical phenomenon affected by the external temperature that the football encountered. There was no cheating involved. The change in pressure, is purely related to the temperature difference between when the ball was filled (probably in doors) versus when it was measured on the field at an approximate 28°F fall in temperature from 75°F internal to 47°F external (about 1 ½ psi). Gillette field is an open arena without a roof so the football encounters greater temperature extremes than an enclosed arena. The deflation of the football was a purely natural event and involved no manipulation by anyone on either team.