Dangers of Heat Exposure to CO_2 Cylinders

CO_2 cylinders are declared full when the weight of the CO_2 charge is equivalent to 68% of the weight of the total water capacity of the cylinder. This is due to the expansion characteristics of the CO_2 charge and the dramatic affects the increase in temperature has on it. As the temperature increases, the CO_2 charge greatly expands. In a cylinder, since the charge is limited to the capacity of the cylinder, the expansion is measured as an increase in pressure.

Following is a description of the relationship between the pressure of the CO_2 charge in a 20 lb. CO_2 cylinder and the affects of exposure to increased temperature.

- A 20 lb. CO_2 cylinder is filled with liquid CO_2 by weight. At the time of fill, the temperature of the charge is extremely cold and the pressure is around 100 psi.
- When a fully charged 20 lb. CO_2 cylinder, 68% full by water capacity, warms up to room temperature (70^0F), the pressure inside the cylinder increases to 837 psi.
- When the same cylinder reaches 87.9^0F the entire charge becomes a gas, no matter what the pressure. A fully charged CO_2 cylinder at 87.9^0F will have an internal pressure of approximately 1100 psi.
- At 120^0F the same cylinder will have an internal pressure of nearly 2000 psi. This cylinder at 120^0F now has an internal pressure greater than the marked service pressure of the cylinder and is properly filled, not overfilled.
- At 155^0F the same cylinder will reach a pressure of 3000 psi, a pressure great enough to activate the safety, venting the charge through the safety.

As you can see, when the temperature of the fully charged cylinder increases, the pressure increases. The temperature of 155^0F, at which the safety would actuate and vent the contents of the cylinder, is not that high of a temperature. This temperature could easily be reached in many different environments (i.e. in a shed or a vehicle on a hot day or in the kitchen of a restaurant, etc.). Unexpected venting of a cylinder through its safety can be startling to personnel potentially leading to accidents, property damaged, and/or personal injury. Coming into contact with the venting of the CO_2 charge of a cylinder can cause personal injury such as frostbite.

When using, handling, transporting, and storing a CO_2 cylinder - always be aware of the temperature to which the cylinder will be exposed. This is not just the temperature the cylinder is exposed to at that point in time, but also the maximum temperature that the cylinder will be exposed to at any time in it's service. Catalina Cylinders, along with the CGA, recommends that CO_2 cylinders not be used at temperatures exceeding 120^0F.

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