

ENGINEERING BULLETIN #110

Corrugated Metal Hose in Externally Pressurized System Under Vacuum

When a corrugated metal hose is considered for use in a system which is externally pressurized or under vacuum conditions, as the case may be with vacuum pumps, the question as to how the hose will behave under “full vacuum” or “perfect vacuum” is often asked.

The definition of vacuum is used to describe any pressure that is lower than standard atmospheric pressure. The most widely accepted unit of vacuum measurement is the Torr (after an Italian scientist Torricelli). One standard atmospheric pressure can be expressed, in the units more commonly used within our community, as the following:

$$1 \text{ atmosphere} = 760 \text{ Torr} = 14.7 \text{ PSI}$$

According to *Columbia Encyclopedia*, “a perfect vacuum has never been obtained,” and therefore expressions “full vacuum” or “perfect vacuum” are used loosely to express conditions with near “0” pressure.

Take a look at the table below to compare different “vacuum conditions.”

	Pressure (Torr)	Pressure (PSI)
Vacuum Cleaner	600	11.60
Liquid Ring Vacuum Pump	24	0.46
Rotary Vane Pump	1 to 0.01	0.02 to 0.0002
Near Earth Outer Space	0.00001	0.000000002

As to the above-mentioned question the answer is corrugated metal hose can be used under vacuum conditions and will not be overstressed under such condition provided the hose section is adequately braced against buckling. The design approach is similar to that for an internally pressurized system keeping in mind that external air pressure causes the hose to contract inwardly rather than expand axially. The proper design though, requires evaluation of the system as a whole not just one segment—such as corrugated hose—at a time.

If you have any questions or comments, please [contact us](#).