

Take The Stress Out Of Tapping – Tap Relief Explained

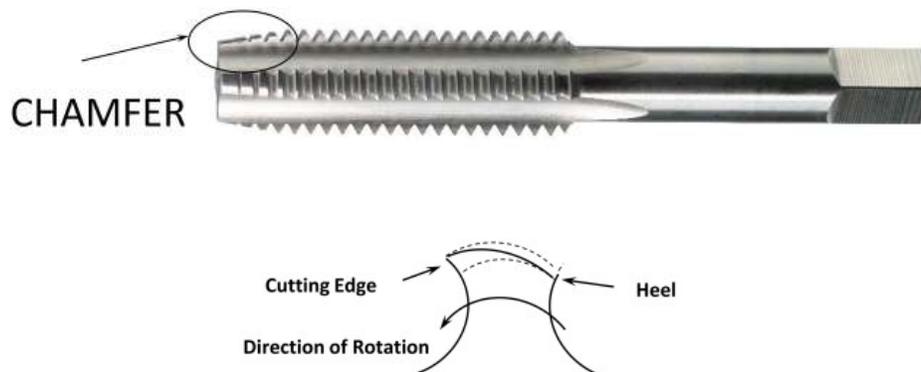
Have you ever had a tapping job that was so troublesome that it caused you to stress out due to broken taps, bad finish, short tap life, over or undersized threads, etc.?

One way of avoiding or alleviating such a condition is accomplished with the use of a tap feature called “relief”. The definition of relief is the removal or lightening of something oppressive, painful, or distressing. For a tap, relief is the reducing of surface contact between the tap/tap feature and the part being tapped. Surface contact generates unwanted heat, causing the issues mentioned above. Depending on the tap feature, relief is applied in a direction that is radially around the tap or axially along the axis of the tap.

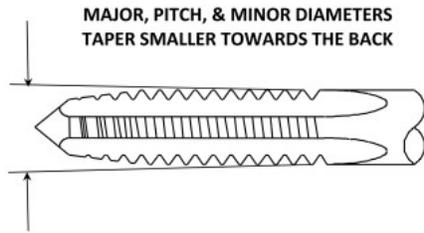
All taps require a minimum number of features to have relief for it to cut, other reliefs are applied when the tapping application requires it. There are always tradeoffs when designing a tap, if a relief is applied or its amount is greater than necessary, causing the tap to run free or loose. This in turn can produce the issues mentioned above.

Relieved features that are always necessary on a tap are:

Chamfer: the tapered threads at the front of the tap. The crests or major diameter of the chamfered threads are radially relieved from the cutting edge to the heel of the land. Without this relief, it would be like cutting a tomato with the non-sharp side of a knife, you can imagine the results of that. When looking at a tap's chamfer, relief results in the crest width being wider at the cutting edge and narrowing towards the heel.



Back Taper: a slight gradual reduction of the tap's thread form including its major, pitch and minor diameters. It starts at the chamfered end of the tap and continues axially for the length of thread towards the shank end. A typical diameter reduction amount for a standard tap is 0.005/0.0010 per inch. This amount may be increased for specially designed taps used for tapping materials that close in excessively on the tap. The chamfer threads, as well as the first full thread of the tap, do the cutting and the balance of the non-chamfered, non-relieved threads, go for the ride helping guide the tap. Back taper prevents surface contact of the non-chamfered threads with the part material.



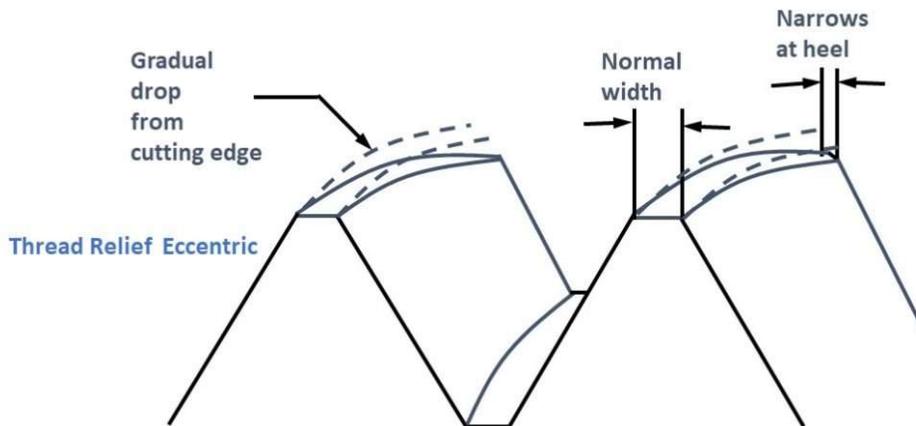
Additional features that can be relieved:

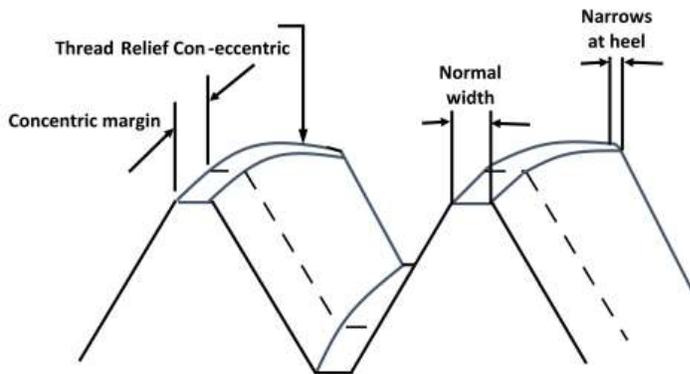
Thread Relief: a radial reduction of the taps major and pitch diameters from the cutting edge to the heel. Relieving of the pitch diameter results in the minor diameter being relieved as well due to the manufacturing process whereas the major diameter is relieved separately. The application of the major or pitch diameter relief is normally applied separately but both can be done in combination. Relief of pitch diameter is the most common followed by the major diameter. Thread relief is applied when Back Taper alone is not enough to prevent surface contact when tapping materials that close in and squeezes the tap like stainless steel. The rate of reduction from the cutting edge to the heel is based on the material being tapped and, in some cases, the tapping application.

There are two common types of Thread Reliefs:

Eccentric: a radial relief in the thread form starting at the cutting edge and continuing to the heel.

Con-Eccentric: radial relief in the thread form starting back of a concentric margin.





The reliefs we have discussed so far are applied during the tap manufacturing and other than the chamfer relief, cannot be added or changed. If you are in a bind and must ship parts but can't wait for us to design, manufacture and ship the appropriate tap, there are additional types of relief that can be applied that may work in a pinch. Sometimes referred to as a poor man's relief, something you may be capable of doing in your shop without too much trouble to get you through a quick job, or until properly designed tools arrive.



The application of relief types and amounts are dependent on many factors such as material properties being tapped, style and size of tap, how the tap is being used (hand, machine, etc.) and application requirements. By providing us with as much information about your tapping application as you can, it will enable our engineers to design a tap with the proper relief.

Information provided by GWS Tool Group