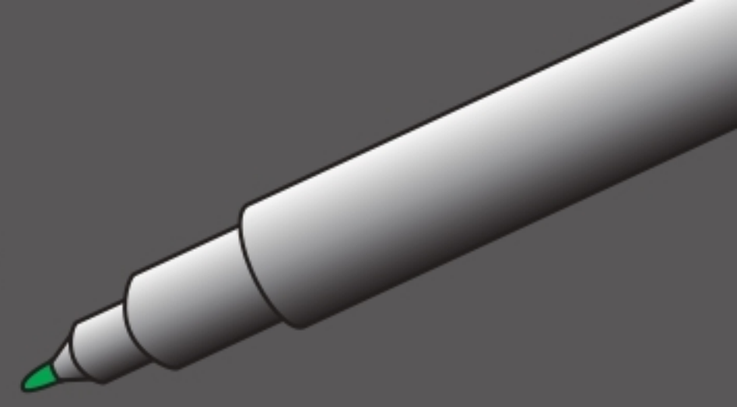
Fastener Drive Systems Need to Be Checked

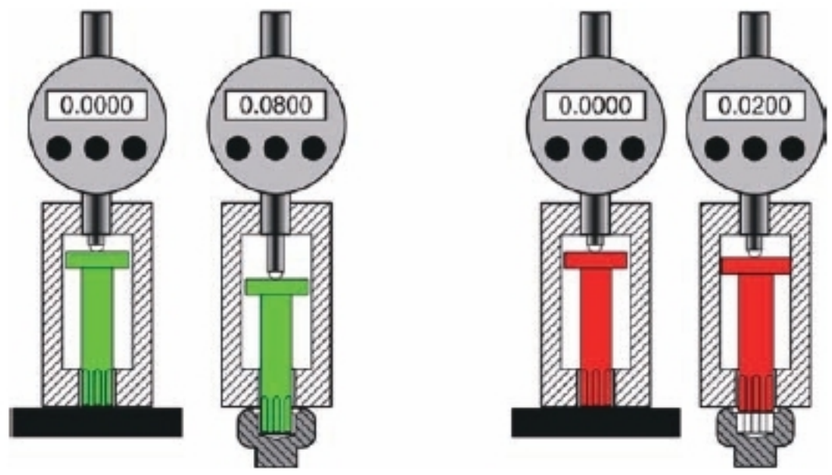


by Larry Borowski

The quality of a fastener drive system can have a major impact on assembly efficiency and end product integrity. The quality of the threads may be perfect, but if the drive system is improperly formed, the fasteners may not install at all or may have so poor performance that they cannot be fully tightened. When you can't drive a fastener correctly, it can affect everything from assembly rates to service, and potentially liability issues in the field. A "Drive System" is more than just the recess or the head; it includes the threads and the mechanism used to do the driving. We will just be dealing with the recesses in this article. The following are typical questions that we see regarding the quality of a fastener drive system:

Question: Are there ways of inspecting the drives on the fasteners themselves, and if so, what should be checked?

Answer: Yes, there are proper gages and methods for inspecting all shapes and sizes of fastener drive system. Some of the most common are:



1. **Slots –** Slotted drives have requirement for width and depth. There are specific gages for inspecting both features quickly and effectively.
2. **Type 1 (Phillips), Type 1A (Pozi), Type II (Frearson) -** This group is often referred to as the Cruciform (cross) recess. These designs are to be inspected for total recess depth, penetration depth, and wobble. Most critical are the recess penetration depth and wobble to insure that these will drive properly.
   a. Correct recess shape has the proper depth. Too deep can result in heads popping off during install, and too shallow can result in recess stripping.
   b. Wobble gaging will measure how tight the shape is. The depth may be good, but too much wobble can result in stripped recesses during installation.
3. **Hex Socket Recesses –** Hex recesses are to be inspected using Go and NoGo Hex plug gages to insure proper size. They should also be inspected for recess penetration depth, to ensure proper key engagement.

Question: Is checking wobble in cross recesses and square recesses really necessary?

Answer: Yes, as stated above, recess penetration depth may be within specification, however the parts may not drive properly because they are too loose or have excessive wobble. Cross recesses and square recesses are the only drives that require a wobble check. This can also be termed the "degree of looseness". There are precision plug gages made specifically for checking this feature on cross recesses as well as square recesses. A typical gage configuration is outlined in the ASME B18 standards on tapping screws, and consists of a wobble fixture and appropriate sized wobble plug. The fastener is held in the fixture, and oriented a particular way. Typically on cross recesses, the "wings" are oriented left-right, and front-back, and on square recesses, the flats are oriented

in the same manner. This is called the zero position. The plug is then inserted into the recess, and with a slight downward pressure is "wobbled" left to right. The total degree of movement is indicated by the position of the pointer on the opposite end of the plug relative to the degree plate on top of the fixture. The fastener is then rotated 90 degrees and the test is repeated. A recess can be acceptable in one direction, and non-conforming in the other. A sloppy recess can result in a driver bit not staying in the recess, and will ultimately affect its driving performance. This is especially problematic with longer screws of all types.

Question: CanÕI just use a driver bit to check penetration depth, fit, or wobble?

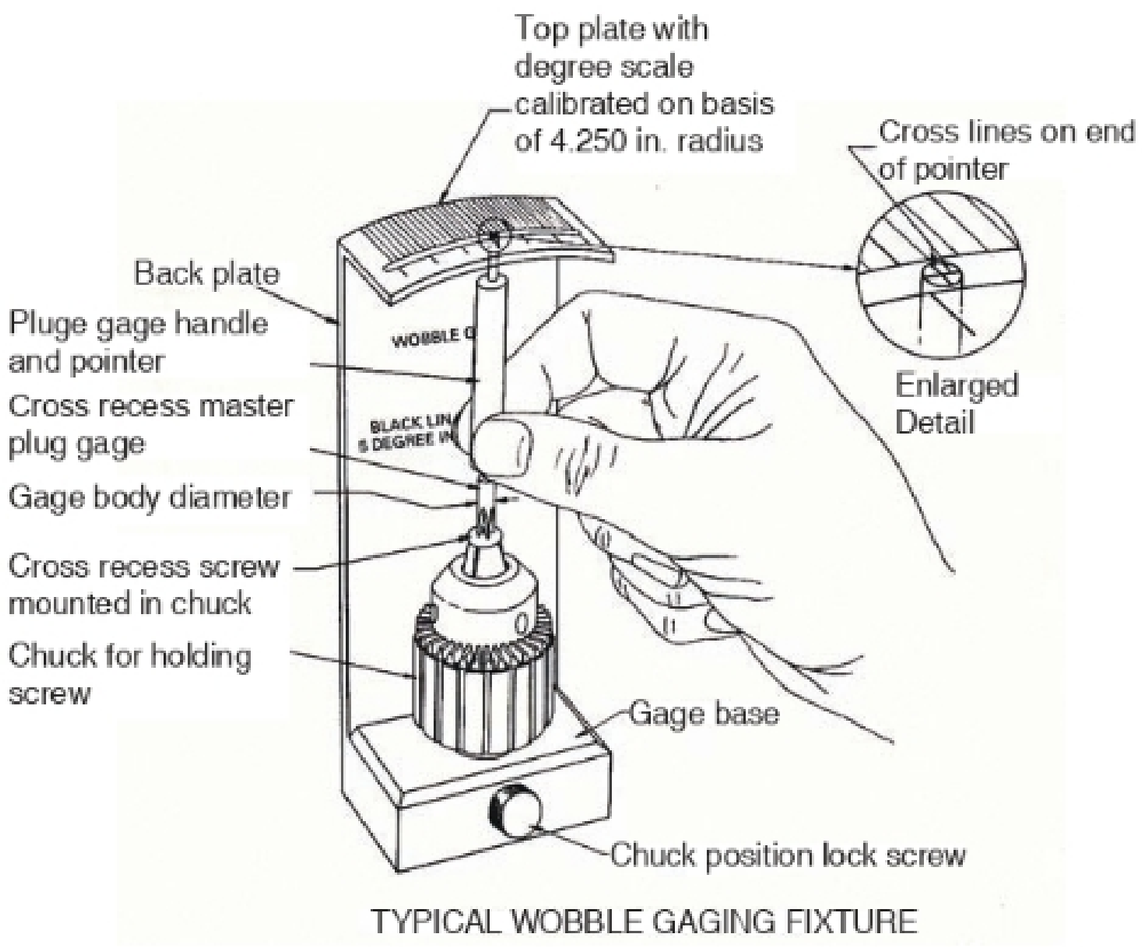
Answer: No. Although it seems like a logical functional test, recess gages are made to much closer tolerances than driving bits are. Just because a particular drive bit appears to fit well into a recess does not mean that a gage will accept the parts, nor that another driver bit will produce the same fit.

Question: Well, what about the driver bits? How can I be sure those are good?

Answer: Driver bits have dimensional specifications just like fasteners do. There are a number of specific gages outlined to inspect these tools. Not only are driver bits inspected for dimensional accuracy, they are also inspected for torsional strength to make sure they can withstand the appropriate torque to seat a screw.

Question ÐWhat about Ù orxÓrecesses, how are those to be inspected?

Answer – The "Torx" drive system was originally developed and patented by Camcar-Textron. The patent is long expired, but the trademark name still exists, and "Torx" gages are only available through licensees. These drives are also referred to as Hexalobe, 6-lobe, etc. Whatever they are called, they all require the same gaging techniques, and most standards agree very closely as to their size, but you should still make sure to specify which standard you are working to when procuring gages. These drives should be checked for basic size using a Go and a NoGo plug gage. In addition to size, just like most other recesses, they need to be checked for recess penetration depth. Something unique to the Hexalobe recess, and a handful of others, is the "fallaway" depth gage. This is essentially a NoGo gage fitted to an indicator to measure how deep it will enter the recess. There is a certain amount of taper, chamfer, or lead in allowed at the entrance of the recess, and the fallaway gage is used to ensure that it does not exceed that amount.



TYPICAL WOBBLE GAGING FIXTURE

In conclusion, please remember that the fastener drive system is critical to its overall performance. Know what you have and what specifications relate to your product. There are many other recesses out there than what is mentioned in this article, so do your research before making assumptions. You can have perfect threads, but if the drive does not work properly, you have a fastener that will not do what it is intended to….hold things together. ■