

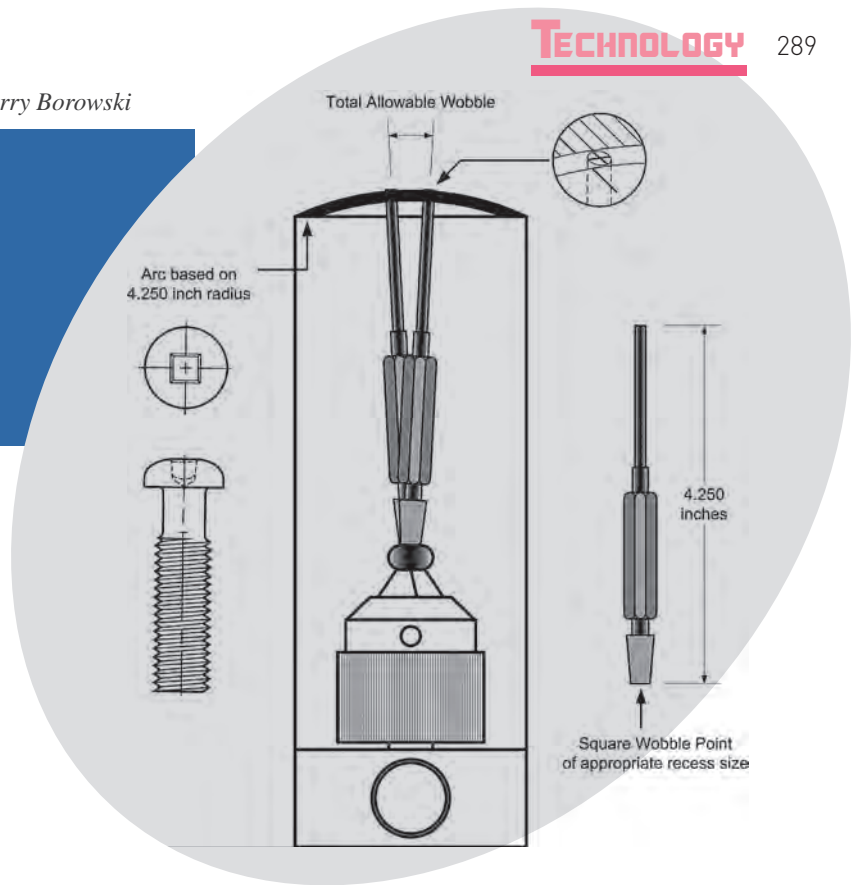
by Larry Borowski

Square Socket Recess Wobble Inspection

A Brief History of the Square Recess

The square socket recess was developed in the early part of the 1900's by the P.L. Robertson Screw Company of Canada and for many years was the dominant recess design in Canada. Years later, the square recess was adopted heavily in the United States in the furniture and recreational vehicle industries.

The square recess and its variations (combination with cruciform recesses and/or slots) have since been adopted in a variety of additional industries largely because the square socket recess provides a very stable fit between the driver bit and the screw recess. This stability between the driver bit and screw recess is a great benefit in driving screws which drill or pierce their own holes in mating parts. This is mostly due to the slight taper of the recess walls. Types of fasteners that benefit from this design include self drilling screws, self piercing screws, wood screws, and similar products. The successful performance of this fastener drive system is largely dependant on the tight fit between the driver bit and the screw recess.



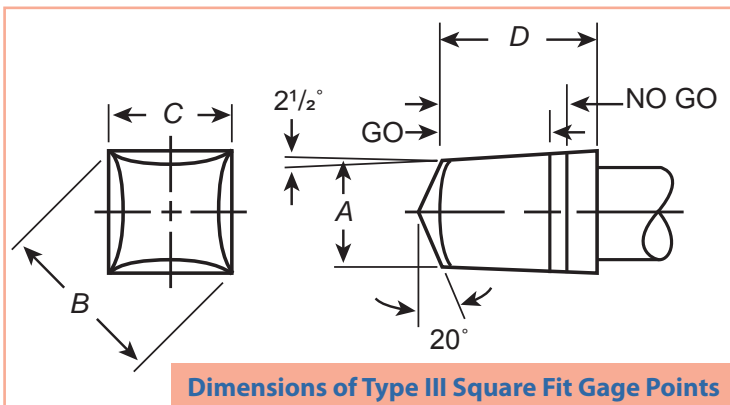
The benefits of this design are lost if excessive wobble is present at the system interface of the driver to the recess. The quality of this aspect of the recess can be effectively inspected by use of the wobble gaging system. The wobble gaging point is also slightly tapered to mimic the form of the recess to better evaluate its performance.

Square Recesses are Covered by ASME Standards as Type III Recesses

Due to the broadening use of the square socket recess in the United States, the American Society of Mechanical Engineers (ASME) gave it the designation of Type III recess. ASME first incorporated the recess design in its B18.6.5M, Metric Tapping Screw Standard, and B18.6.7M, Metric Machine Screw Standard. Unfortunately, these standards did not provide limits for acceptable wobble in these recesses. In the recently consolidated and re-published ASME B18.6.3, (Inch Machine Screw Standard) does specify limits for square recess wobble. These limits are shown below:

ASME B18.6.3 Provides Wobble Gaging Guidance

The excerpt below from the Mandatory Appendix IV in ASME B18.6.3 provides the following information of recess wobble gaging.



Dimensions of Type III Square Fit Gage Points

Gaging Limits for Type I, IA, III Recesses

Size of Recess Gage	Maximum Allowable Total Wobble, degree		
	Type I	Type IA	Type III
No. 0	N/A	N/A	N/A
No. 1	15	12	3
No. 2	12	10	3
No. 3	10	8	3
No. 4	10	8	3
No. 5	10	8	N/A

Wobble gaging provides a means for determining the compatibility of recesses in the heads of screws with companion screw drivers, and will indicate the point where deviations in the recess contours affect satisfactory driver engagement. Recesses that exhibit excessive wobble characteristics will result in poor screw driveability because of driver camout prior to attaining normal torque level, damage to recesses, accelerated driver wear, or a combination thereof.

The allowable total wobble gaging limits for the various types of recesses were predicated originally on the gaging of plain finish (unplated or uncoated) screws. However, subsequent experience has shown these limits to be suitable for the gaging of screws having coating thickness up to and including 0.0003 in. on significant surfaces. Screws having heavier coatings, which fail to meet the wobble gaging requirements, must be stripped of finish and gaged for acceptance or rejection in the plain condition.

Wobble gaging fixtures as illustrated above and appropriate recess master plug gages with handles and position indicators for the respective recess types, are available through the punch and gage suppliers.

How the Gaging Works:

The screw to be gaged shall be placed into the screw holding chuck and oriented such that one side of the square is parallel to the upright back plate. The screw shall be positioned and the chuck shall be tightened sufficiently to prevent any tilting of the screw in the chuck when taking wobble readings.

The position gage pointer and handle shall be positioned in the slot of the degree scale and the "business end" (square end) of the plug gage inserted into the screw recess. It is essential that registry between the cross lines of the pointer and side of the square plug end be maintained. To correct any misalignment, the chuck position lock screw is loosened, the chuck is rotated until registry is obtained, and the chuck raised or lowered until the gage pointer is flush with the top of the degree scale. The chuck position lock screw is then tightened and the readings taken. The gage handle, with downward pressure applied, is moved from side to side until resistance is encountered and the total reading between points of travel of the gage pointer is recorded. Because the wobble plug only checks the fit right to left (half of the recess), the screw must be checked again in an orientation 90 degrees from the first position. Simply loosen the chuck locking screw and rotate the screw/gaging assembly 90 degrees and lock it back down. Perform the wobble test again. The allowable angular wobble limits shall not exceed the tabulated values above in either orientation. Cross lines on the gage pointer should be rechecked with flats of the square to make certain cross lines and flats are registered on identical radials.

Excessive Wobble Between the Driver Bit and Screw Recess are Detrimental to Performance

The square socket recess is a well performing fastener drive system provided that the screw's recesses are manufactured properly. The only way to assure end users of square socket recess (Type III) fastener's quality is to inspect both the recess penetration depth and the recess wobble. The only way to inspect square socket recess wobble limits is to use the appropriate inspection technique with the appropriate wobble inspection plugs and fixtures. ■