

Tips for Using Weld Gauges

Refresh your knowledge regarding the use of these commonplace inspection tools

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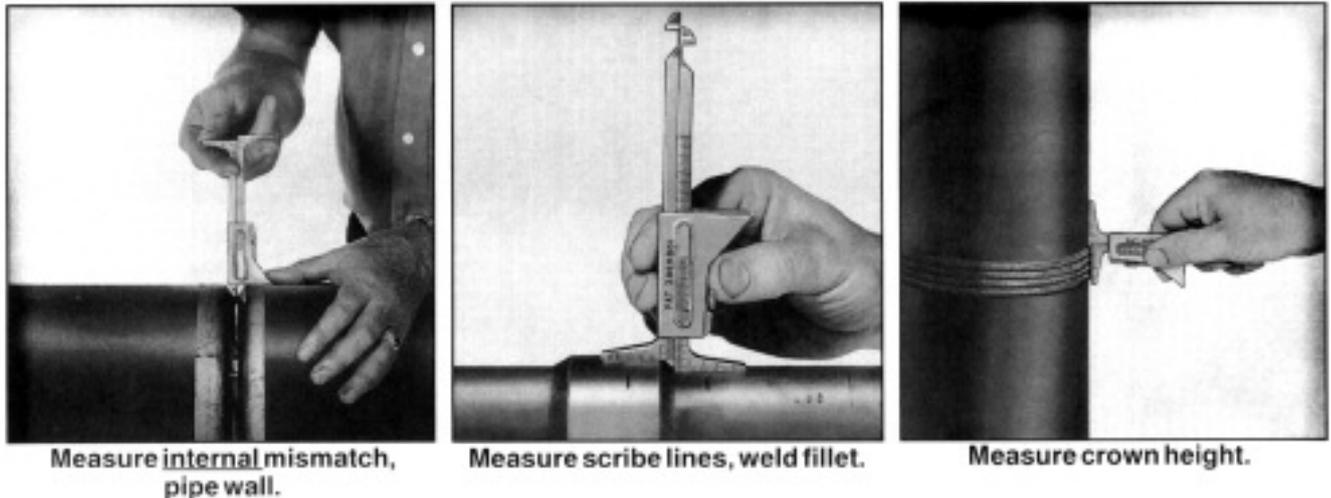


Fig. 1 — Uses for a pipe internal alignment gauge.

Weld gauges are an everyday tool for Certified Weld Inspectors. Gauges are available for checking alignment, checking dimensions before welding, verifying weld dimensions, and for measuring the size of porosity, among other items. Gauges can be single- or multipurpose.

Following are descriptions and tips for using seven types of weld gauges. The gauges featured in this article are manufactured by G.A.L. Gage Co., Stevensville, Mich., and distributed by Newman Tools, Inc.

Pipe Internal Alignment Gauge

This type of gauge measures internal alignment of pipe after fitup — Fig. 1. It can be used to measure internal misalignment of pipe both before and after tacking. Not only does the gauge measure internal mismatch of pipe wall, but it also measures scribe lines, weld fillet size, and crown height. One side measures in inches, the other side in metric units. Use of this type of gauge helps to reduce the number of radiographic rejects. It satisfies fitup requirements in the ASME, ANSI, API, and military standards.

Single-Purpose Weld Gauges

The weld gauges shown in Fig. 2 are designed for checking internal alignment and for determining weld root spacing.

Following are the steps needed to quickly check internal

alignment using the single-purpose gauge shown at left in Fig. 2.

1) Unlock the retaining screws. Press the gauge legs beyond the barrel.

2) Insert the legs (wires) into the root opening between the two pieces of pipe to be fitted. Turn the gauge 90 deg, being careful to apply a constant back pressure to the barrel.

3) Hold the gauge as square as possible with the fitting to obtain an accurate reading. Lock the retaining screw. Reverse the 90-deg turn and remove the gauge. You're now ready to read the increment opposite the red line.

4) When the red line aligns with the $\frac{1}{32}$ increment, you have achieved good internal alignment and fitup. Misalignment can be determined from the zero line by increment markings of $\frac{1}{16}$ in.

Following are the steps needed to determine weld root spacing using the single-purpose gauge shown at right in Fig. 2.

1) Unlock the retaining screw and insert the gauge interior alignment stops between the two pieces of pipe to be fitted.

2) Insert the leg with the long taper into the root opening until it makes contact with both sides.

3) Relock the retaining screw, remove the gauge, and read it. The scale is calibrated in fractional dimensions from $\frac{1}{32}$ to $\frac{1}{16}$ in. The readout represents the size of the weld root.

Adjustable Fillet Weld Gauge with Unequal Leg Measurement Feature

This simple-to-use gauge measures any fillet weld from $\frac{1}{8}$ to 1 in. and is accurate to $\frac{1}{32}$ in. — Fig. 3. It can fit into a shirt pocket

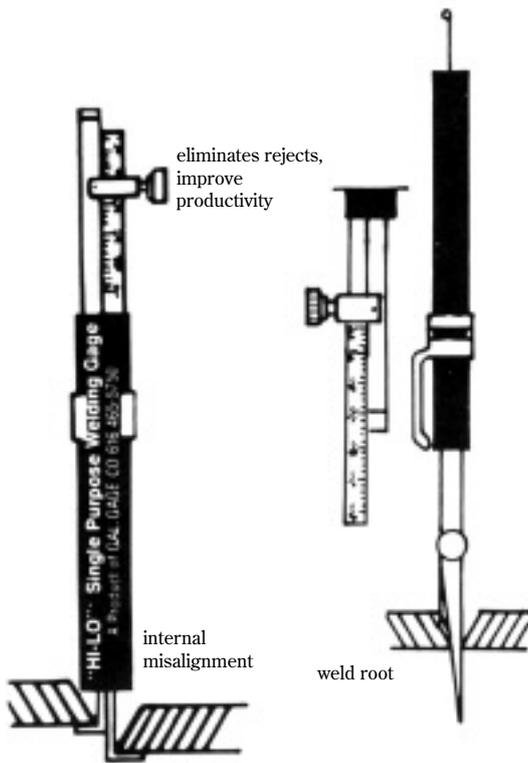


Fig. 2 — Two types of single-purpose weld gauges. The gauge at left measures internal misalignment; the gauge at right measures the size of the weld root.

and eliminates the need to use seven different gauge blades.

The adjustable fillet weld gauge uses an offset arm that slides at a 45-deg angle to make fillet weld length measurements. You simply adjust the arm until it touches the toe of the vertical leg. The gauge is calibrated to $\frac{1}{32}$ in. Four screws hold the offset arm in position for future adjustments.

The gauge also measures weld throat thickness to $\frac{1}{16}$ in. by adjusting a pointer in position for future reference. If the weld is concave, more filler material can be added to build the weld throat up to standard. The adjustable fillet weld gauge measures both leg lengths and weld throat fillet weld thickness.

Bridge Cam Gauge

This type of gauge is a unique, versatile instrument for the inspection of welded surfaces and joints. It can measure the following:

- ◆ Angle of preparation from 0 to 60 deg
- ◆ Excess weld metal (capping size)
- ◆ Depth of undercut
- ◆ Depth of pitting
- ◆ Fillet weld throat size
- ◆ Fillet leg length
- ◆ Misalignment (high and low)

It displays measurements in both inches and millimeters

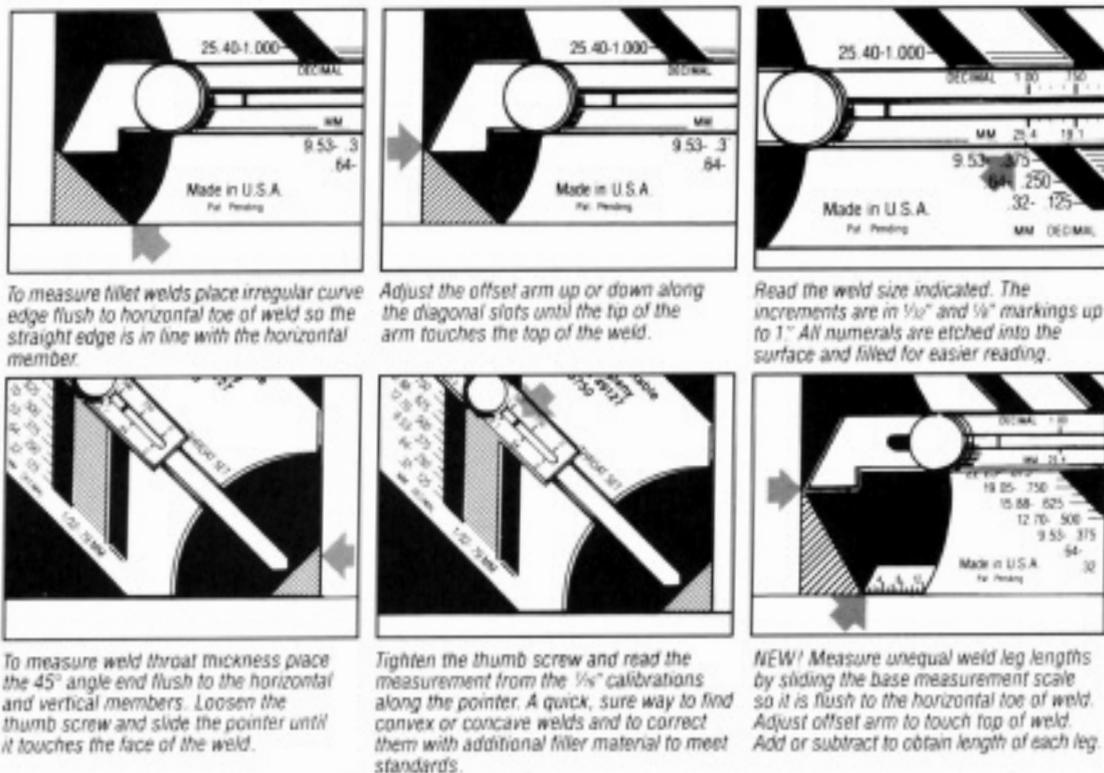


Fig. 3 — How to use an adjustable fillet weld gauge.

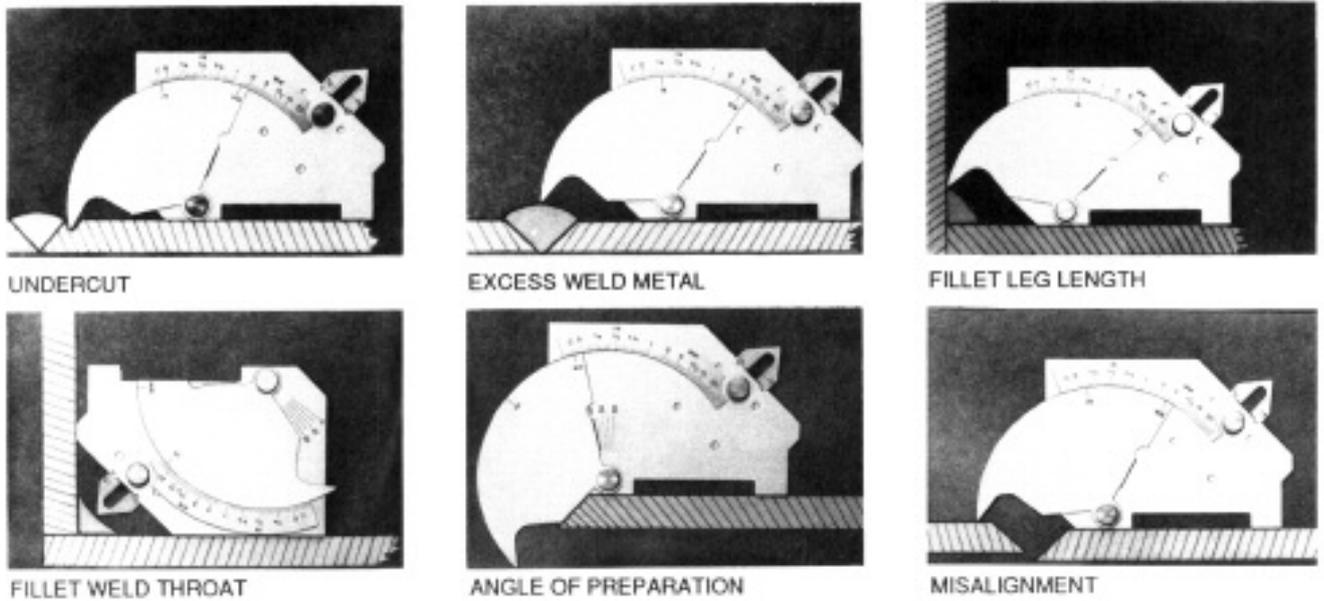


Fig. 4 — A bridge cam gauge can provide a variety of measurements.

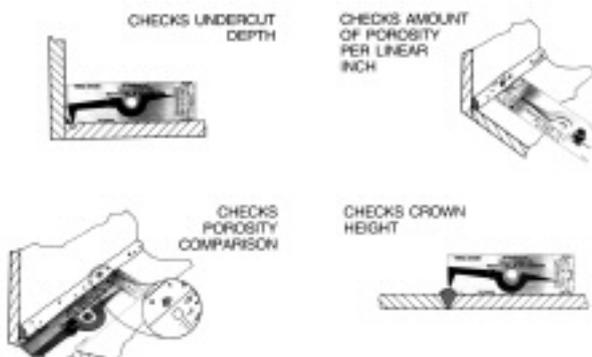


Fig. 5 — A single gauge checks the four measurements required for compliance with the NRC visual weld acceptance criteria.

(linear measurements up to 60 mm or 2 in.). The gauge is easy to use. It is comprised of one rotating dial and one sliding pointer. You simply move the dial or pointer until it makes the appropriate contact and then read the result.

Visual Weld Acceptance Criteria Gauge

This type of gauge is used to determine if fillet welds meet U.S. Nuclear Regulatory Commission (NRC) visual weld acceptance criteria for structural weldments — Fig. 5. It easily and quickly checks the four essential measurements required for compliance with the NRC visual weld acceptance criteria: undercut depth, porosity comparison, amount of porosity per linear inch, and crown height.

The undercut depth or crown height scale can be read to $\frac{1}{2}$ in. Porosity comparisons are in terms of $\frac{1}{8}$ and $\frac{1}{16}$ in. The linear gauge is in $\frac{1}{16}$ -in. increments. The gauge is easy to set and a locking screw holds it in position for later reference. All four required measurements are made with one gauge.

Automatic Weld Size Gauge

An automatic weld size gauge provides accurate calibrations

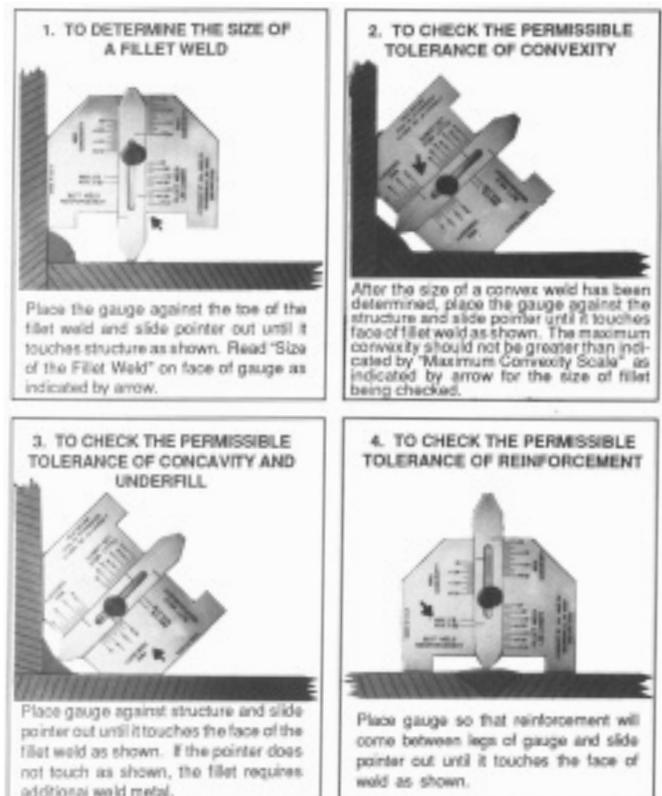


Fig. 6 — Directions for using an automatic weld size gauge to determine fillet weld size; permissible tolerance of convexity, concavity, and underfill; and permissible tolerance of reinforcement.

of butt-joint and fillet welds. The diagrams in Fig. 6 illustrate how welders and inspectors can accurately check sizes of convex or concave fillets as well as butt-joint weld reinforcements.

The convexity and concavity sizes have automatically been determined in accordance with AWS D1.1, *Structural Welding Code — Steel*, paragraph 3.6.❖