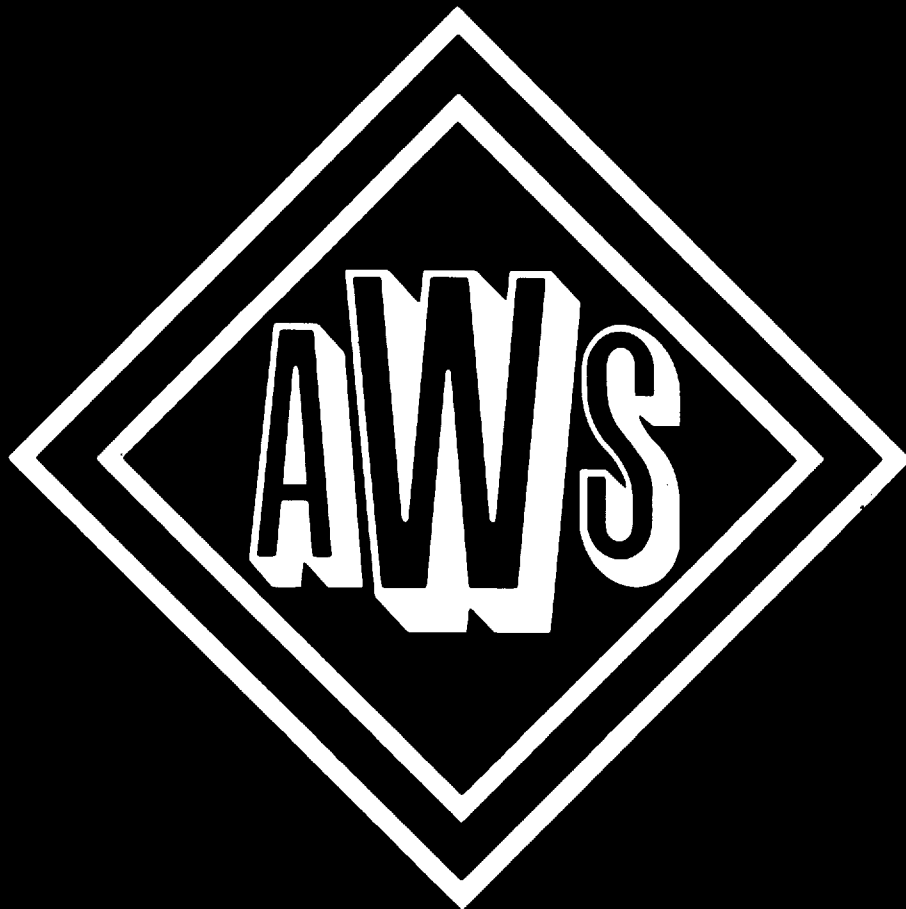


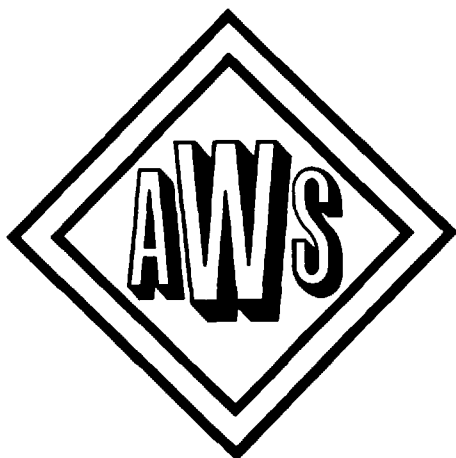
Hands-On Training



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**USE OF MEASURING TOOLS FOR THE
AWS CERTIFIED WELDING INSPECTOR
HANDS-ON EXAMINATION**



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USE OF MEASURING TOOLS FOR THE AWS CERTIFIED WELDING INSPECTOR HANDS-ON EXAMINATION

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USE OF MEASURING TOOLS FOR THE AWS CWI HANDS-ON EXAMINATION

As of July, 1987, the format of the AWS Certified Welding Inspector Examination was altered by the Qualification and Certification Committee. Presently, the three sections of the test include: Part A: Fundamentals (Closed-book; 150 multiple choice questions), Part B: Practical Hands-On (Closed-book; 46 multiple choice questions) and Part C: Code/Standard (Open-book; 46 multiple choice questions). Two (2) hours will be allowed for each separate section of the examination, for a total of 6 hours.

The major change occurring in the examination format is the fact that the Practical portion is now referred to as the "Hands-On" test. In this part of the examination, toolkits will be distributed to each person. In addition to the tools, each kit includes plastic replicas of welds and destructive test specimens, plus an illuminated slide viewer containing several pictures. In order to answer the questions on the examination, each person must demonstrate their ability to utilize the tools to measure various aspects of the plastic replicas provided. In addition, there will be questions referring to the pictures appearing in the illuminated viewer.

Also included with this examination is a sample code to which you must refer in order to answer some of the questions. The code provided consists of only a few pages and is generally arranged in the same manner as AWS D1.1. However, the requirements in this sample code are NOT the same as those found in AWS

D1.1. During this part of the examination, you will be asked to measure certain aspects of the plastic replicas. Then you may have to refer to this sample code to determine if the result of that measurement is acceptable in accordance with these code requirements.

The purpose of this discussion is to familiarize those individuals taking the examination with the tools and their proper usage. Before describing their operation, the list below includes all of the tools contained in the kit:

- 6 inch machinist's rule (or scale) in 1/32 and 1/64 inch graduations
- 0 to 1 inch micrometer in 0.001 inch graduations (adjustable - hex wrench provided)
- 150 mm metric dial caliper in 0.1 mm graduations
- 2 inch diameter reading glass (6.50 diopetre)
- Set of Fibre Metal template fillet weld gages (1/8 to 1 inch fillet weld sizes)
- Palmgren weld gage

Figure 1 is a picture showing all of the tools found in a typical toolkit for the examination.

In addition to these tools, the kit also includes an illuminated slide viewer containing pictures showing the equipment for several different nondestructive test methods. Other pictures shown in the viewer illustrate weld radiographs containing various types of weld discontinuities.

Finally, the kit contains plastic replicas of welds and destructive test specimens. These replicas include: a groove weld in a butt joint, single and multiple pass fillet welds on

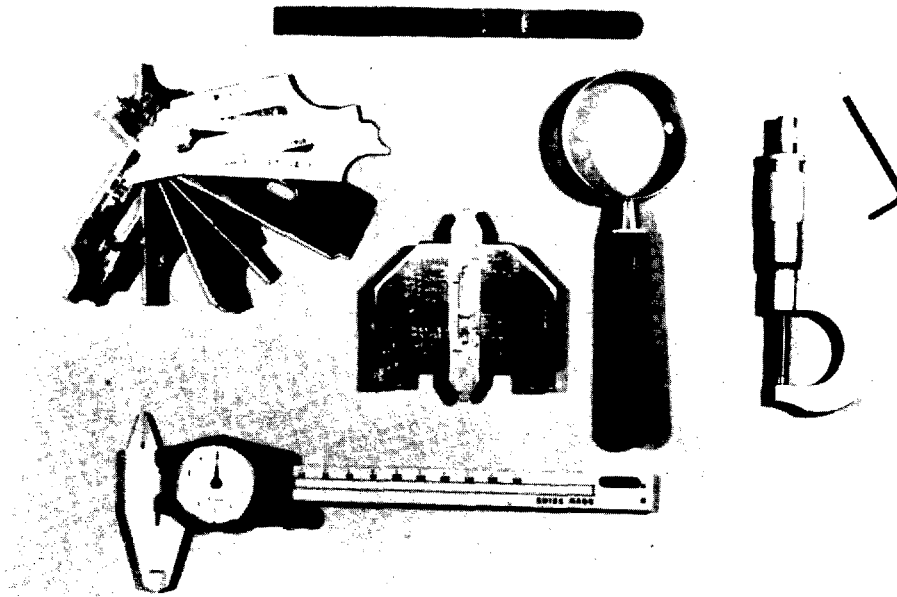


Figure 1, Tools Found in the Examination Toolkit

different sides of a T- or lap joint, a single pass fillet weld on a T-joint with porosity located in segments identified on the sample, a rectangular tensile specimen, and a series of four face or root bends showing their convex surfaces after bending.

Now that all of the components of the kit have been identified, it's appropriate to describe how each particular instrument will be used by the inspector, either during the test or in normal day-to-day inspection activities.

Use of the Tools for Measuring and Weld Evaluation

Measuring With the 6 Inch Machinist's Rule

The simplest, and probably the most common, measuring device included in the toolkit is the 6 inch machinist's rule, sometimes referred to as a scale. Figure 2 shows a closeup of the type included in the kit.

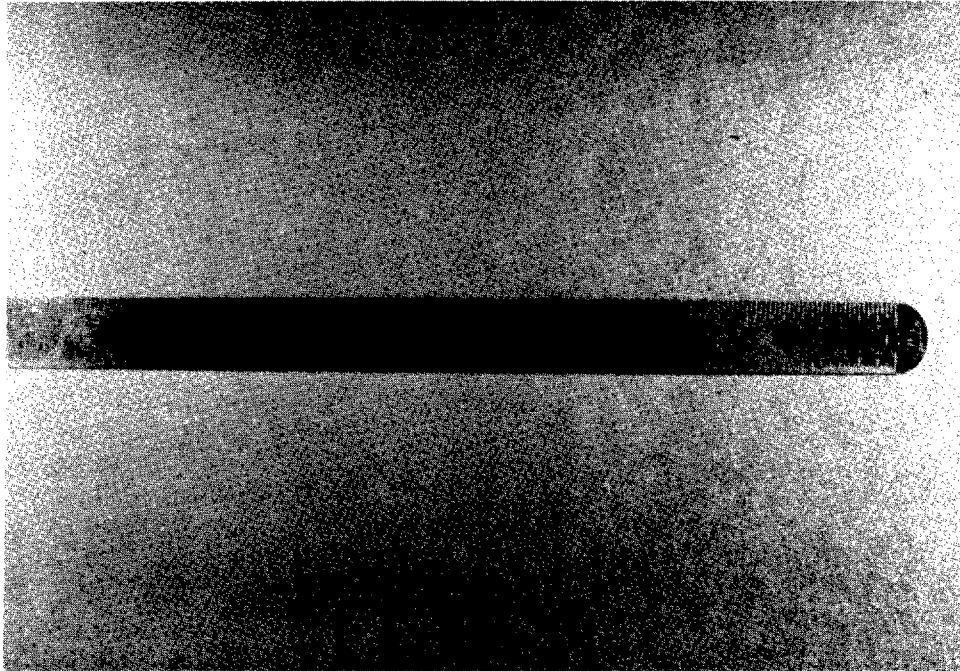


Figure 2, 6 Inch Machinist's Rule

The particular type found in the kit is graduated in increments of $\frac{1}{32}$ inch on the one (top) side and $\frac{1}{64}$ inch on the other (bottom) side. The large numbers indicate whole inches, and the smaller numbers indicate the appropriate number of $\frac{1}{32}$

or 1/64 inch increments, depending which side of the rule is being used. The significance of these graduations is depicted in Figure 3.

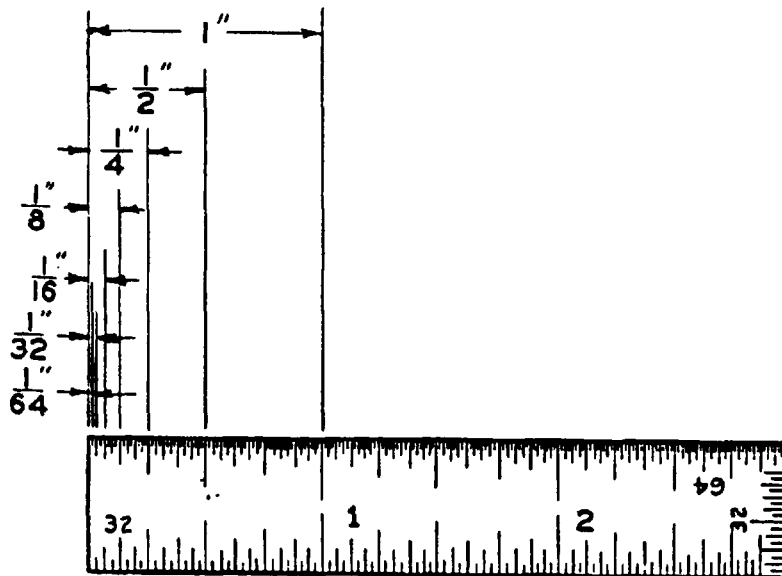


Figure 3, Ruler Increments of One Inch

Measuring With the 0 to 1 Inch Micrometer

The next measuring device to be discussed here will be the 0 to 1 inch micrometer. A micrometer, or "mike" for short, is an instrument that measures in thousandths of an inch (1/1000 inch). The type found in the test kit is adjustable, so there is an accompanying hex wrench. These items are shown in Figure 4.

In Figure 5, the various parts of the micrometer are identified, including the frame, the barrel, the thimble, the spindle, and the anvil. On this particular model, there is also a friction stop. The friction stop, located at the end of the

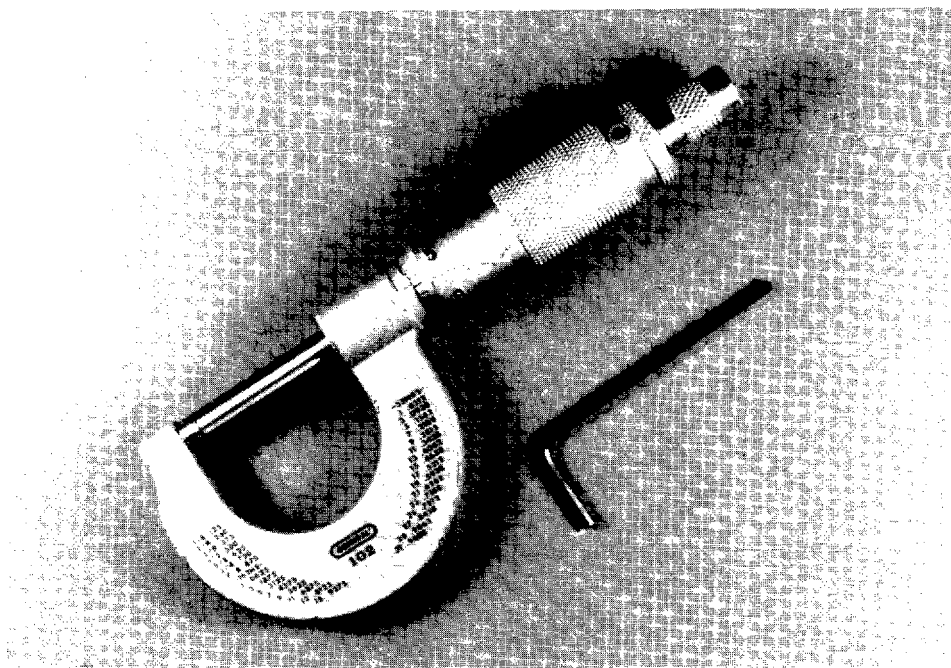


Figure 4, Adjustable Micrometer with Hex Wrench

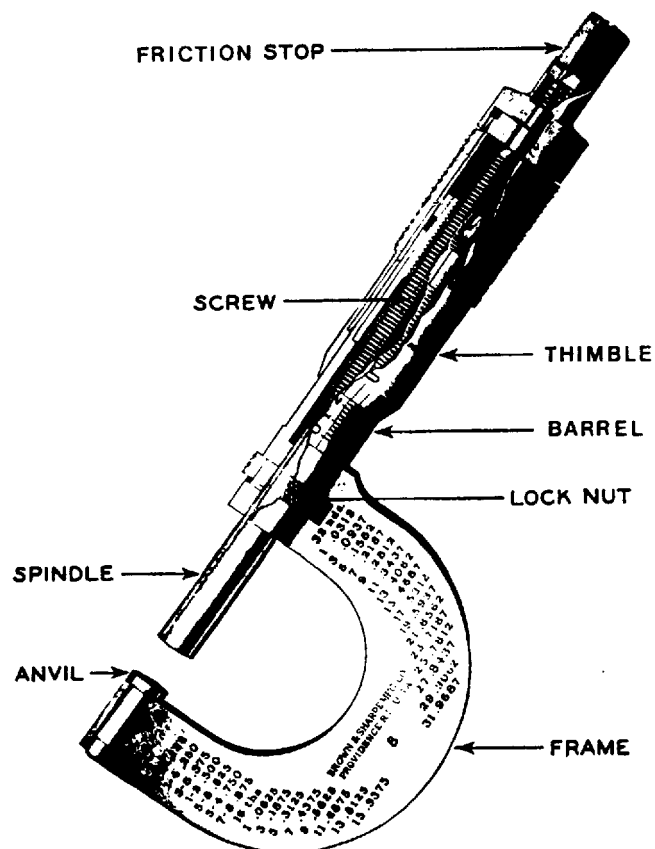


Figure 5, Parts of a Micrometer

thimble, can be used to tighten the micrometer on the object to be measured. Since the friction stop always slips at a particular pressure, the micrometer can be tightened the same amount for each measurement, allowing for more repeatable results.

Since the micrometer found in the test kit is an adjustable type, the first operation involves checking to make certain that the micrometer is "zeroed." To do this, hold the micrometer as shown in Figure 6, and turn the friction stop until the spindle and anvil are in contact. With the micrometer closed, the "0" on the thimble should be aligned with the "0" mark on the barrel, as shown in Figure 7. If this is not the case, then the instrument must be adjusted as explained below.

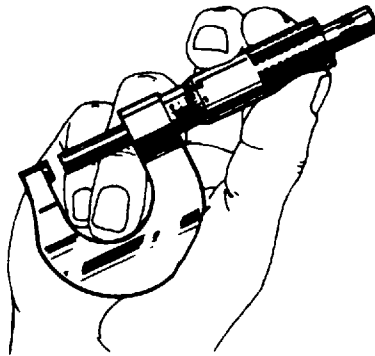


Figure 6, Proper Way to Hold a Micrometer

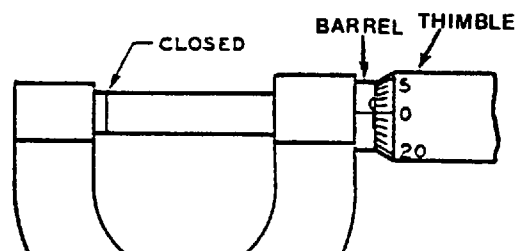


Figure 7, Testing the Exactness of a 1 Inch Micrometer