

Metalworking Employability Tests

THE METALWORKING INDUSTRY employs a variety of individuals who perform different jobs. For instance, the metal industry employs welders, casters, machinists, and CNC operators. All of these occupations require specialized skills. To insure that tasks are completed at a high level of precision, the industry employs a variety of tests to verify a worker's skill level. The ability to pass these tests allows a worker to gain greater wages and to advance.



Objective:



Identify the various tests used to certify people in the metalworking industry.

Key Terms:



AWS

CNC

die casting

FMA

groove weld

NADCA

NIMS

PSMO

SMAW

stick welding

welding

Certifying Organizations

Within the metalworking industry, a variety of organizations provide descriptions and testing opportunities to verify knowledge. These organizations work with many manufacturers, unions, and government organizations to develop descriptions and content for tests. The tests are used to certify skills and content knowledge for many aspects of the metalworking industry.

AMERICAN WELDING SOCIETY

AWS is an abbreviation for American Welding Society, which is the largest and most respected agency for certifying welders. To certify welders, the AWS sets forth a variety of tests conducted through welding task performance. Welders are certified by the equipment they use and the materials being welded. In general, welders are certified in two major areas: structural welding and pipe welding. In both cases, **welding** is an occupation that involves the use of extreme heat to melt and fuse two separate pieces of metal together. Once mixed, the metals are allowed to harden and form one solid continuous piece of metal.

One of the most common types of certified welding is **stick welding**, which is a type of welding in which a metal rod is placed between two edges of metal to be joined together. Electricity is passed through the rod to produce an arc on the metal to be welded. This type of welding is sometimes called **SMAW**, which is an abbreviation for shielded metal arc welding. The arc produces very high temperatures and thus melts the metal so it can run and pool together. Once the metal is pooled together, it is allowed to harden and create a continuous piece of metal. This setup for welding is sometimes referred to as a **groove weld** or a weld in which a small space (groove) exists between two pieces of metal to be joined. Depending upon the position of the groove to be welded, welders can be certified at different skill levels, such as 1G, 2G, 3G, and 4G for structural welding. For pipe welders, these levels can be 1G, 2G, 5G, 6G, and 6GR. The G stands for groove, the R stands for restricted, and the numbers refer to different positions welders must assume to



FIGURE 1. This is a structural 1G welding position. (Image provided by David Zielinski, <http://www.gowelding.org>)



FURTHER EXPLORATION...

ONLINE CONNECTION: Welding as an Occupation

To explore the occupation of welding, visit <http://gowelding.org>. Read the information found there regarding certification tests, welding schools, and careers in welding. Compare <http://gowelding.org> to <http://aws.org>. In both cases, you will be able to explore the opportunity for careers and the development of necessary skills in the welding area.

perform the weld. The level of certification for welders determines what types of jobs they can have.

NORTH AMERICAN DIE CASTERS ASSOCIATION

NADCA is an abbreviation for North American Die Casters Association and is the professional organization that provides certification tests for workers that perform duties associated with die casting. **Die casting** is the process of pouring molten metal into forms that allow the metal to cool and harden into the desired shape and form. NADCA has developed and administers certification tests on three levels. Level I is certification for the die casting technician. Level II has three categories: master of die casting maintenance, master of die cast tooling, and master of die casting process. Level III is the master of die casting technology.

FABRICATORS AND MANUFACTURERS ASSOCIATION

FMA is an abbreviation for Fabricators and Manufacturers Association, which is an international organization that provides descriptions for the skills needed as a sheet metal worker. To certify sheet metal workers, the FMA uses an exam called the PSMO. **PSMO** is an abbreviation for Precision Sheet Metal Operator. The exam certifies that a worker knows aspects of the sheet metal industry covered in 13 areas. Test topics include shearing, sawing, press brake, turret punch press, laser cutting and mechanical finishing, metals, metallurgy, metalworking processes; paperwork and documentation; math calculations for



FIGURE 2. This is a pipe 1G welding position. (Image provided by David Zielinski, <http://www.gowelding.org>)



FIGURE 3. This is metal casting in progress.

sheet metal fabrication; blueprint reading and part layout; computer/part programming; machine setup, functioning, and operation; hand tools; inspection/quality control; inspection tools; tooling/dies/jigs/fixtures; material and product handling; safety checks, equipment, and procedures; and preventive maintenance on equipment and tools.

NATIONAL INSTITUTE FOR METALWORKING SKILLS

NIMS is an abbreviation for National Institute for Metalworking Skills, which is the largest organization that provides certification in the metalworking and fabrication areas. The NIMS organization provides certification tests for 52 skills. The tested skill areas for certification include the machining of a part, the setup or operation of a machine, and the writing of code (CNC) for manufacturing a specific part. **CNC** is computer numerically controlled, which is a type of machining that uses a computer-guided cutting edge to shape and form a specific part. It is one of the areas tested by NIMS. All NIMS tests are a combination of paper (and pencil) and job performance. If you want to earn certifications through NIMS, you will have to demonstrate your knowledge of the skills required for each certificate through the product creation and the completion of a multiple choice exam. The earnings of NIMS credentials allows you the ability to enter the metalworking industry's Competency Based Apprenticeship Program. An earned credential verifies that you have the necessary skills and knowledge to enter the industry. The areas in which NIMS certifies are found in the 24 operational areas covering the metalworking industry and include metal-forming (e.g., stamping, press brake, roll forming, and laser cutting) and machining (e.g., machining, tool and die making, mold making, screw machining, machine building and

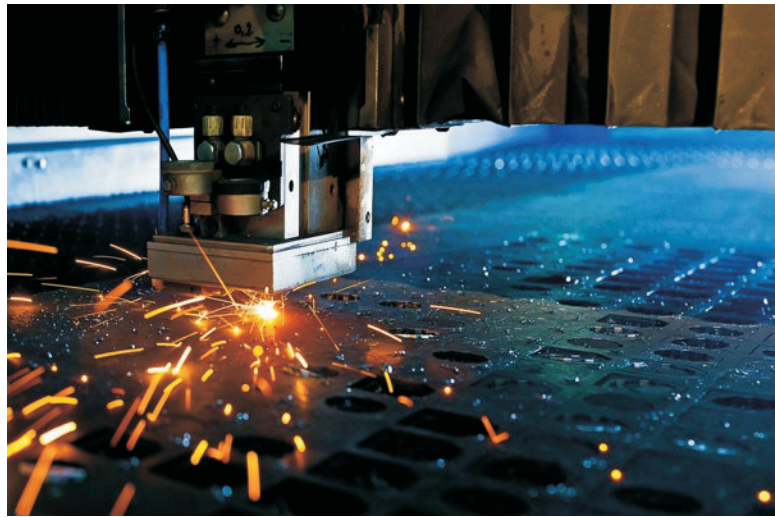


FIGURE 4. This is a laser cutting of a sheet metal template.



FIGURE 5. This is the machining of a metal part.



ON THE JOB...

CAREER CONNECTION: Fabricated Metal Product Manufacturing

According to the Bureau of Labor Statistics (BLS), there are approximately 404,000 workers in the Fabricated Metal Product Manufacturing Industry. These workers earn an average salary of \$39,000 per year or \$22.05 per hour. Salaries and hourly wage in these areas are widely dependent upon the level of skill and certification achieved by the worker. This occupation is expected to show up to a 3 percent growth rate in the next five years.

machine maintenance, and service and repair). Certifications are earned in three levels: entry (level I) to master (level III).

TABLE 1. NIMS Certification Areas

Machining level 1 (for entry-level certification)	Measurement, materials, & safety Job planning, benchwork, & layout Manual milling skills I Turning operations: turning between centers Turning operations: turning chucking skills Grinding skills I Drill press skills I CNC turning: programming setup & operations CNC milling: programming setup & operations CNC turning: operations CNC milling: operations
Machining level II (for journey-level certification)	Manual milling skills II Turning II (manual) Drill press skills II Grinding skills II CNC milling skills II CNC turning skills II EDM—Wire EDM—Plunge
Machining level III (for master-level certification)	CNC turning skills III CNC milling skills III
Metallforming level I	Metallforming level I

Stamping level II	Operate with single hit tooling II Operate with compound dies II Operate with progressive dies II Operate with deep draw dies II Operate with transfer dies II
Stamping level III	Parts inspection & quality control Setup with single hit tooling III Setup with compound dies III Setup with progressive dies III Setup with deep draw dies III Setup with transfer dies III
Press brake level II	Operate non-CNC drive press brake skills II CNC punch (turret) press level II
Press brake level III	Setup and operate non-CNC mechanical III Setup and operate CNC drive III
Slide forming level II	Slide forming operations II
Slide forming level III	Slide forming setup & operation II
Screw machining level II	Operate with single spindles II Operate with multiple spindles II
Screw machining level III	Setup & operate with single spindles II Setup & operate with multiple spindles III
Machine building level II	Machine building level II mechanical assembly
Machine building level III	Machine building level III mechanical assembly
Machine maintenance, service & repair level II	Preventive maintenance
Machine maintenance, service & repair level III	Machine service & repair Machine repair/rebuilding
Diemaking level II	Diemaking level II
Diemaking level III	Diemaking level III

Summary:



The metalworking industry holds a variety of opportunities for employment. Employment in the industry is based on earning certifications for the various skills associated with each metalworking job. The higher a worker advances through certification, the more pay and responsibility he or she receives.

Numerous organizations provide testing for workers to show competency, such as the American Welding Society (AWS), National Institute for Metalworking Skills (NIMS), North American Die Casters Association (NADCA), and Fabricators and

Manufacturers Association (FMA). These organizations provide many tests that allow workers to earn certificates for the skills they possess.

Certification tests can be taken through trade schools, union membership, and on-the-job training. Tests are generally a combination of paper and pencil multiple choice questions and job performance tasks.

Checking Your Knowledge:



1. What are the four certification areas for structural welding?
2. What type of metalworking does NADCA certify?
3. The PSMO exam certifies what type of worker?
4. How many different areas does NIMS have certification in?
5. CNC is used for what?

Expanding Your Knowledge:



Contact a local union that deals in the metalworking industry. Unions in this area are ironworkers, boiler makers, pipe fitters, steel workers, and sheet metal workers. Ask if you can interview an apprenticeship instructor regarding certifications needed to work in the union as well as what the certifications offer in terms of advancement.

Web Links:



National Institute for Metalworking Skills

<https://www.nims-skills.org/web/nims/home>

Fabricators Manufacturers Association

<http://fmanet.org/>

North American Die Casters Association

<http://www.diecasting.org/default.php>