

**AWS C2.16/C2.16M:2002**  
**An American National Standard**



# **Guide for Thermal-Spray Operator Qualification**



**American Welding Society**



**Key Words**—Thermal-spray operator qualification, knowledge test, skill test, flame spraying, spray and fusing, arc spraying, plasma spraying, HVOF spraying

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# **Guide for Thermal-Spray Operator Qualification**

**Supersedes ANSI/AWS C2.16-92**

Prepared by  
AWS C2 Committee on Thermal Spraying

Under the Direction of  
AWS Technical Activities Committee

Approved by  
AWS Board of Directors

## **Abstract**

This guide contains recommendations for thermal-spray operator qualification based on knowledge and skill testing. Twelve individual thermal-spray operator qualification tests (TSOQT) are included for engineering and corrosion control applications: one each for job knowledge, high velocity oxygen fuel (HVOF) spraying and flame spray-fusing, two for arc spraying, and three each for flame spraying and air-plasma spraying.



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# Guide for Thermal-Spray Operator Qualification

## 1. Scope

This guide recommends the knowledge and skill requirements for thermal-spray operator qualification.

These recommendations include:

- (1) Rules for thermal-spray operator knowledge
- (2) Performance qualifications
- (3) Specific Thermal-Spray Operator Qualification Tests (TSOQT) for flame, arc, plasma, and high velocity oxygen fuel (HVOF) spray methods.

The term qualified thermal-spray operator is used synonymously with thermal-spray technician.

**1.1 Exclusion.** AWS C2.16/C2.16M does not supersede an employer or contractor from continuing to qualify thermal-spray operators in accordance with the following AWS and other standards and references such as:

- (1) MIL-STD-1687, *Thermal Spray Processes for Naval Ship Machinery Applications*.
- (2) MIL-STD-2138, *Metal Sprayed Coatings for Corrosion Protection Aboard Naval Ships* (Metric).
- (3) Various original equipment manufacturer's (OEM) or after-market repair, thermal-spray process, and spray parameter specifications.
- (4) Material Safety Data Sheets (MSDSs) for abrasive blasting and thermal-spray feedstock materials.
- (5) ISO 14917, *Thermal Spraying—Terminology, Classification*.
- (6) ISO 14918, *Thermal Spraying—Approval Testing of Thermal Sprayers*.

Employers of thermal-spray operators may impose supplementary requirements to this guide.

**1.2 Safety Considerations.** Thermal-spray operators must have the basic knowledge and skills to include: safe assembly, setting up, operating, and closing down procedures of equipment; personal protection; fire hazards; dust explosions; electrical hazard; flash backs; leak detection; ultraviolet radiation; and noise. Annex A summarizes safety information for thermal spraying.

## 1.3 Units of Measure and Rounding-Off Procedures.

This specification makes use of both U.S. Customary Units and the International System of Units [SI]. The measurements are not exact equivalents; therefore each system must be used independently of the other without combining in any way. The specification with the designation C2.16 uses U.S. Customary Units. The specification C2.16M uses SI Units. The latter are shown in appropriate columns in tables or within brackets [ ] when used in the text.

For the purposes of determining conformance with this specification, an observed or calculated value shall be rounded to the nearest unit in the last right-hand place of figures used in expressing the limiting values in accordance with the rounding-off method given in ASTM E 29, *Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications*.

## 1.4 Referenced Documents

The following standards contain provisions which, through reference in this text, constitute provisions of this AWS standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this AWS standard are encouraged to investigate the possibility of applying the most recent editions of the documents shown below. For undated references, the latest edition of the standard referred to applies.

- (1) Thermal Spraying, Chapter 28, *AWS Welding Handbook*, Vol. 2, 1991.<sup>1</sup>
- (2) *AWS Thermal Spraying, Practice, Theory, and Applications*, 1985.
- (3) AWS C2.18, *Guide for the Protection of Steel with Thermal Sprayed Coatings of Aluminum and Zinc and Their Alloys and Composites*.
- (4) AWS C2.20-0X, *Specification for Zinc Thermal-Spray Coatings for Reinforced Concrete*, in preparation.

1. Available from Global Engineering, 15 Inverness Way East, Englewood, CO 80112-5776.