



**American Welding Society**  
*Gateway to the World of Welding*



**SSPC**  
the society for protective coatings

Item No. 21100

## Joint Standard

# NACE No. 12/AWS C2.23M/SSPC-CS 23.00 Specification for the Application of Thermal Spray Coatings (Metallizing) of Aluminum, Zinc, and Their Alloys and Composites for the Corrosion Protection of Steel

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## Foreword

This "Specification for the Application of Thermal Spray Coatings (Metallizing) of Aluminum, Zinc, Their Alloys, and Composites for the Corrosion Protection of Steel" is issued to meet a critical industry and government need.

Thermal spray coatings (TSCs) are used extensively for the corrosion protection of steel and iron in a wide range of environments. The corrosion tests carried out by the American Welding Society<sup>(1)</sup> and the marine-atmosphere performance reports of ASTM<sup>(2)</sup> and the LaQue Center for Corrosion Technology<sup>(3)</sup> confirm the effectiveness of flame-sprayed aluminum and zinc coatings over long periods of time in a wide range of hostile environments. The British Standards Institution "Code of Practice for the Corrosion Protection of Steel"<sup>(4)</sup> specifies that only TSCs give protection for more than 20 years to first maintenance for the 19 industrial and marine environments considered and that only sealed, sprayed aluminum or zinc gives such protection in seawater immersion or splash zones.

This standard may be used by owners, and design, fabrication, and maintenance engineers to detail and contract for the application of TSCs for the preservation and maintenance of steel structures. This standard may also be used by TSC inspectors and TSC applicators to develop and maintain application procedures, equipment inventory, and an operator-training program.

This standard presents the basic need-to-know information for the application of quality TSCs. Appendixes present amplifying information. The Table of Contents gives an overview of this standard and may be used to find specific information.

This standard was prepared by the AWS C2B Subcommittee on Thermal Spray Coatings for Corrosion Protection, SSPC C.1.2.B Committee on Thermal Spraying, and NACE Task Group (TG) 146 on Thermal Spray Coatings. TG 146 is administered by Specific Technology Group (STG) 02 on Protective Coatings and Linings—Atmospheric, and is sponsored by STG 39 on Process Industry—Materials Applications.

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<sup>(1)</sup> AWS C2.14-74, "Corrosion Tests of Flame-Sprayed Coated Steel, 19-Year Report" (Miami, FL: AWS). AWS standards can be obtained from Global Engineering, 15 Inverness Way East, Englewood, CO 80112-5776, Telephone (800)-854-7179, Fax (303) 307-2740, Internet [www.global.ihs.com](http://www.global.ihs.com)

<sup>(2)</sup> R.M. Kain, E.A. Baker, "Marine Atmospheric Corrosion Museum Report on the Performance of Thermal Spray Coatings on Steel," ASTM STP 947 (West Conshohocken, PA: ASTM, 1987). Available from ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428.

<sup>(3)</sup> S.J. Pikul, "Appearance of Thermal Sprayed Coatings After 44 Years Marine Atmospheric Exposure at Kure Beach, North Carolina," LaQue Center for Corrosion Technology, Inc, February 1996. Available from the LaQue Center for Corrosion Technology, Inc., 702 Causeway Drive, Wrightsville Beach, NC 28480.

<sup>(4)</sup> BS 5493, "Code of Practice for Protective Coatings of Iron and Steel Structures Against Corrosion" (London, UK: British Standards Institution). Available from the American National Standards Institute (ANSI), 11 West 42<sup>nd</sup> Street, New York, NY 10036-8002, USA; and the British Standards Institution (BSI), British Standards House, 389 Chiswick High Rd., London W4 4AL, UK.

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## Section 1: General

### 1.1 General

This standard is a procedure for the application of metallic thermal spray coating (TSC) of aluminum, zinc, and their alloys and composites for the corrosion protection of steel. Required equipment, application procedures, and in-pro-

cess quality control (QC) checkpoints are specified. This standard may be used as a procurement document. Appendix A presents a fill-in-the-blanks model procurement specification. The flow diagram in Figure 1 provides an overview of the thermal spray coating process presented in this standard.

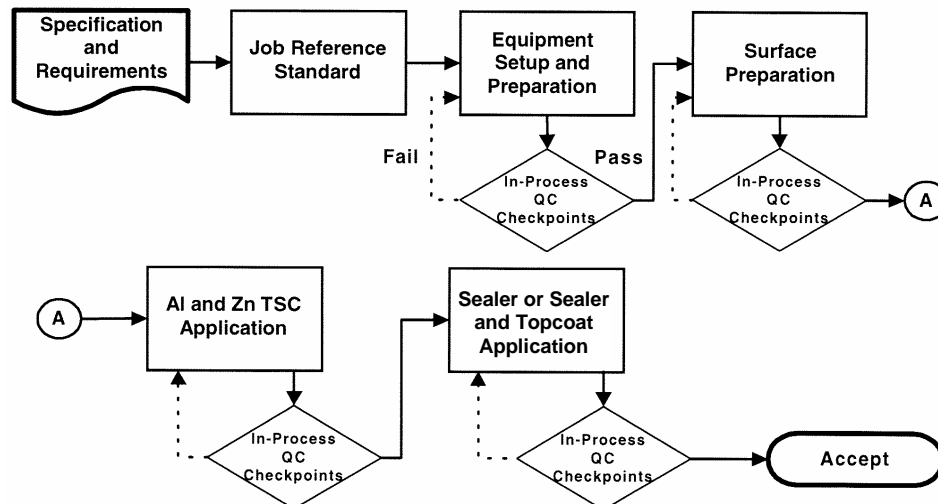


Figure 1: Thermal Spray Coating Process

Not included in this standard are requirements for design and fabrication, thermal spray equipment qualification, coating selection, and operator and inspector certification. For successful thermal spray application, the steel structure and components should be designed and fabricated according to NACE Standard RP0178.<sup>(5)</sup> Additional consideration should be given to weldments whose oxyfuel cut edges may affect hardness which may preclude adequate profile depth.

### 1.2 Safety

The basic precautions for thermal spraying are essentially the same as for welding and cutting. Information on safety can be found in the Safety Chapter in *AWS Thermal Spraying: Practice, Theory, and Application*; ANSI Z49.1, *Safety in Welding, Cutting; and Allied Processes*; and NFPA 58,<sup>(6)</sup> *Standard for the Storage and Handling of Liquefied Petroleum Gases*. Safety precautions can also be found in the manufacturer's equipment technical instructions and manuals and the feedstock Material Safety Data Sheet. This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

Potential thermal spraying hazards include exposure to vapors, dust, fumes, gases, noise (from the spray gun), and arc ultraviolet (UV) radiation. Additionally, improperly used thermal spray equipment can create potential fire and explosion hazards from the fuel and carrier gases and a potential electrical shock hazard from the electrical and electronic equipment and charged wire spools. To minimize hazards, proper safety precautions shall be followed. Operators shall comply with the procedures in the safety references, the manufacturer's technical manuals, and the material safety data sheets.

Thermal spraying can be a completely safe process when performed by an operator who follows the recommended precautionary measures, has a proper understanding of thermal spraying practices, and has knowledge, skill, and exercises care in using thermal spray equipment.

### 1.3 Units of Measure

This specification makes use of both the International System (SI) and U.S. Customary units. The measurements are not exact equivalents; therefore each system must be used independently of the other without combining in any way.

<sup>(5)</sup> NACE standards can be obtained from NACE International, 1440 South Creek Drive, Houston, TX 77084-4906.

<sup>(6)</sup> Available from the National Fire Protection Association (NFPA), 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.