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RDT STANDARDS TRANSMITTAL

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	COGNIZANT ENGINEER	TYPE ACTION	
	R. M. Fuller	☐ 1. TENTATIVE	☐ A. TRIAL USE
	PHONE	☐ 2. DRAFT	☐ B. INFORMATION
	615/574-7891	☐ 3. AMENDMENT	☐ C. COMMENTS
EXTENSION	☐ 4. REVISION	☐ D.	
	☒ 5. Errata		
	NUMBER	DESCRIPTION	ACTION
		<p>RDT M 1-2T Stainless Steel Welding Rods and Bare Electrodes (ASME SFA-5.9 with Additional Requirements), October 1978</p> <p>Please replace pages 1 and 2 in the above standard with the attached errata sheet. Paragraph 4.3.3.a was erroneously omitted and the listing for the carb content in the tabulation on page 2 was incorrect in the copy of the standard that was issued November 27, 1978.</p>	

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F. C. Zapp, ORNL Standards Coordinator

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RDT STANDARD

U.S. DEPARTMENT OF ENERGY
OFFICE OF NUCLEAR ENERGY PROGRAMS

RDT	M 1-2T	
DATE	October 1978	
PAGE	1	OF 5

STAINLESS STEEL WELDING RODS AND BARE ELECTRODES (ASME SFA-5.9 WITH ADDITIONAL REQUIREMENTS)

1. SCOPE

This standard covers chromium and chromium-nickel stainless welding rods and bare electrodes for nuclear and associated applications.

2. GENERAL REQUIREMENTS

Material shall conform to the requirements of ASME SFA-5.9; to the requirements of the ASME Boiler and Pressure Vessel Code (ASME Code), Section III, Article NB-2000; and to the additional requirements of this standard.

3. BASIS OF PURCHASE

In addition to requirements such as quantity, form, and size, the purchaser will specify the following as applicable:

1. Test plate welding process requirements for materials to be used without fluxes (see 4.3.2).
2. Applications Supplements and Optional Provisions invoked (see Sections 5 and 6). The purchaser will invoke Application Supplements when the end use is as described in Section 5. If Optional Provision 1 is invoked, the purchaser will purchase electrodes and flux at the same time.

4. ADDITIONAL REQUIREMENTS

The following requirements are mandatory.

4.1 Manufacture. The following manufacturing practices shall be observed.

4.1.1 Rod Coils. The rod coils used in the production of wire coils shall be the product of a single billet and shall not contain a splice. A rod coil is the product of a primary mill consisting of a coil of hot-rolled or extruded rod which is subsequently drawn into wire form.

4.1.2 Wire Coils. A wire coil is a coil of wire which results from the cold drawing of a rod coil. Wire coils shall be the product of no more than two rod coils and have no more than one splice. If two rod coils are involved in the production of a wire coil, both shall be from the same heat of metal. The wire coil shall be relatable to the rod coils involved.

4.2 Acceptability. The chemical composition, all-weld-metal tension test, and delta ferrite tests of 4.3, 4.4, and 4.5 shall be mandatory for acceptance. No other test is required unless an Application Supplement or Optional Provision is invoked by the purchaser.

4.3 Chemical Composition.

4.3.1 Wire Coils. Both ends of each wire coil intended for delivery to the purchaser, or intended for production of spools, straight lengths or smaller coils, shall be chemically analyzed. The analysis results shall conform to the requirements of Table 1 of ASME SFA-5.9 and shall be reported as required by 4.8.

A1

4.3.2 Submerged Arc Electrodes. For materials which are specified to be used in submerged arc welding processes, an analysis shall also be made using specimens from broken all-weld-metal tension test specimens taken from a test plate made by the submerged arc welding process involving a suitable flux. These results shall meet 4.3.3 requirements and shall be reported as required by 4.8.

A1

A1

4.3.3 Analytical Details. All material shall be analyzed for carbon, chromium, molybdenum, nickel, manganese, silicon, phosphorus, sulfur, vanadium, columbium + tantalum, titanium, and copper, in addition to any other elements specified in Table 1 of ASME SFA-5.9 for the appropriate classifications which are not listed here. Analysis results shall conform to the chemical composition shown in Table 1 of ASME SFA-5.9 except as follows.

A1

A2

a. Where a welding flux is used with Table 1 materials (including ER16-8-2), the silicon range of the weld deposit shall be 0.25 to 1.0 percent, and phosphorus shall be 0.05 percent maximum.

Errata

b. Where a welding flux is used with ER308 and ER308L materials, the chromium content of the weld deposit may be 18.0 to 22.0%; and for ER316 and ER316L, 17.0 to 20.0%.

N

The following chemical requirements for classification ER16-8-2 shall be included in Table 1.

<u>Element</u>	<u>Weight, Percent</u>
Carbon	0.10 maximum
Chromium	14.5 to 16.5
Nickel	7.5 to 9.5
Molybdenum	1.0 to 2.0
Columbium + tantalum	--
Manganese	2.5 maximum
Silicon	0.50 maximum
Phosphorus	0.03 maximum
Sulfur	0.03 maximum
Tungsten	0.03 maximum

Errata

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In addition to requirements such as quantity, form, and size, the purchaser will specify the following as applicable:

1. Test plate welding process requirements for materials to be used without fluxes (see 4.3.2).
2. Applications Supplements and Optional Provisions invoked (see Sections 5 and 6). The purchaser will invoke Application Supplements when the end use is as described in Section 5. If Optional Provision 1 is invoked, the purchaser will purchase electrodes and flux at the same time.

4. ADDITIONAL REQUIREMENTS

The following requirements are mandatory.

4.1 Manufacture. The following manufacturing practices shall be observed.

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] Errata

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Manganese	2.5 maximum
Silicon	0.50 maximum
Phosphorus	0.03 maximum
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] Errata

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3-2253	☐ 5.		
NUMBER	DESCRIPTION		ACTION
	RDT M 1-2T Stainless Steel Welding Rods and Bare Electrodes (ASME SFA-5.9 with Additional Requirements), October 1978		A
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F. C. Zapp, ORNL, Standards Coordinator

RDT M 1-2T

Supersedes
RDT M 1-2T, March 1975

RDT Standard

STAINLESS STEEL WELDING RODS
AND BARE ELECTRODES
(ASME SFA-5.9 WITH ADDITIONAL
REQUIREMENTS)

OCTOBER 1978

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U.S. DEPARTMENT OF ENERGY
OFFICE OF NUCLEAR ENERGY PROGRAMS

ASSESSMENT OF APPLICATION OF STANDARDS

This standard has been prepared under the cognizance of Nuclear Energy Programs, Department of Energy. It is intended that the standard be replaced by a voluntary National consensus standard at the earliest possible opportunity. In the interim, users of this standard are requested to submit any comments and pertinent data that may be of use in improving the standard by completing the form attached to the back of the standard and returning it to the Nuclear Standards Office, Oak Ridge National Laboratory, Post Office Box Y, Oak Ridge, Tennessee 37830.

FOREWORD

This standard supersedes the March 1975 issue of RDT M 1-2T and incorporates those changes to that issue of the standard that were approved for publication as Amendments 1 and 2 and those changes that were approved for publication in this revision. These changes are identified by the following marginal notation:

A1	Amendment 1, July 1975
A2	Amendment 2, January 1977
C	Change approved October 1978
N	Additional approved October 1978

The International System of Units (SI) has been adopted; SI units are shown in parentheses following the English units.

RDT STANDARD

U.S. DEPARTMENT OF ENERGY
OFFICE OF NUCLEAR ENERGY PROGRAMS

RDT M 1-2T
DATE October 1978
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STAINLESS STEEL WELDING RODS AND BARE ELECTRODES (ASME SFA-5.9 WITH
ADDITIONAL REQUIREMENTS)

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4.3.4 Reports of Analytical Results. Analytical results for elements listed in 4.3.3 which are not requirements of Table 1 for the appropriate classification for which reporting is required by 4.8 shall be reported for information. | A

4.4 All-Weld-Metal Tension Tests. An all-weld metal tension test shall be performed to demonstrate the tensile properties of the deposited weld metal using the welding process specified by the purchaser (see 3.1). One tensile specimen shall be required for each heat of electrodes. The applicable provisions of Part 2 of ASME SFA-5.4 shall apply where details for performing the tests are lacking in ASME SFA-5.9. or this standard. The following shall also apply.

a. Where tests are required for electrode sizes not listed in Fig. 3 of ASME SFA-5.4, the size of electrode used shall be chosen by the electrode manufacturer from among the sizes ordered.

b. Where welds are made by the submerged arc process, the flux manufacturer's designation and classification (and lot number if Optional Provision 1 is invoked) shall be made part of the test records.

After heat treatment is complete, tensile specimens shall be taken from the test plate and machined and tested in accordance with ASME SFA-5.4. Results shall satisfy the following mechanical properties requirements:

<u>Composition</u>	<u>All-Weld-Metal Tensile Strength, psi (MPa), min.</u>	<u>% Elongation in 2 In. (50 mm), min.</u>	
ER308	80,000 (550)	35	
ER308L	75,000 (515)	35	
ER309	80,000	30	
ER310	80,000	30	
ER312	95,000 (655)	22	
ER316	75,000	30	C
ER316L	70,000 (480)	30	C
ER317	80,000	30	
ER318	80,000	25	
ER321	80,000	30	
ER347	80,000	30	
ER348	80,000	30	
ER349	100,000 (690)	25	
ER410a	70,000	20	

^aUnless otherwise specified, specimen shall be heated to between 1150°F and 1600°F, (621°C and 871°C), held for 2 h, furnace cooled at a rate not exceeding 100°F (38°C)/h to 1100°F (593°C) and air cooled.

rod coil manufacturer shall show a phosphorus content of 0.012 % maximum, a sulfur content of 0.015% maximum, and a copper content of 0.01% maximum. Analytical results of 4.3 shall show phosphorus and sulfur content to not exceed 0.015 and 0.018%, respectively, and copper content to not exceed 0.10%.

6. OPTIONAL PROVISIONS

The following provisions shall apply only when specified and to the extent specified by the purchaser.

1. In-Combination Electrode and Flux Tests. Electrodes and flux shall be tested in the combination in which they will be used (see 3.2). Specimens for tension tests shall be taken from a test plate which was welded with electrode and flux combination intended for delivery. Test results to be reported (see 4.4.b) shall relate results with the electrode heat number and the flux classification and lot number.

A flux lot is defined as one dry batch or a blend of two or more dry batches mixed in a mixing vessel to produce a mixture uniformity equal to that of any batch from which the blend is made. A dry batch is defined as a quantity of dry ingredients mixed at one time in one vessel to produce a uniform mixture.

7. REFERENCED DOCUMENTS

ASME SFA-5.9 and AWS A5.9-77	Specification for Corrosion-Resisting Chromium- Nickel Steel Welding Rods and Bare Electrodes
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ASME SFA-5.4	Specification for Corrosion-Resisting Chromium and Chromium-Nickel Steel Covered Welding Electrodes
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ASME Boiler and Pressure Vessel Code, Section III, Nuclear Power Plant
Components

|c

USER EXPERIENCE

Users of this standard may use this form to provide comments for improving the standard. Please provide the information requested below and return to the Nuclear Standards Office, Oak Ridge National Laboratory, Post Office Box Y, Oak Ridge, Tennessee 37830. Attach pertinent data in support of furnished information. Submittal of comments does not constitute or imply authorization to waive or amend requirements of this standard.

NUMBER, TITLE, AND DATE OF STANDARD:

USE:

COMMENTS (identify paragraph, problem encountered, suggested change and reason):

SUBMITTED (organization, address, individual - including name and phone number):

DATE:

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