Specification for Carbon and Low-Alloy Steel Electrodes for Electrogas Welding
Abstract

Classification requirements are specified for solid and tubular electrodes for electrogas welding. The requirements include chemical composition of the electrode for solid electrodes and of weld metal for tubular electrodes, in addition to the mechanical properties and soundness of weld metal taken from a groove weld made with these electrodes using the prescribed welding procedure. Additional requirements are included or referenced for standard sizes, marking, manufacturing, and packaging.

This specification makes use of both U.S. Customary Units and the International System of Units (SI). Since these are not equivalent, each system must be used independently of the other.
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Official interpretations of any of the technical requirements of this standard may only be obtained by sending a request, in writing, to the appropriate technical committee. Such requests should be addressed to the American Welding Society, Attention: Managing Director, Standards Development, 8669 NW 36 St, # 130, Miami, FL 33166 (see Annex B). With regard to technical inquiries made concerning AWS standards, oral opinions on AWS standards may be rendered. These opinions are offered solely as a convenience to users of this standard, and they do not constitute professional advice. Such opinions represent only the personal opinions of the particular individuals giving them. These individuals do not speak on behalf of AWS, nor do these oral opinions constitute official or unofficial opinions or interpretations of AWS. In addition, oral opinions are informal and should not be used as a substitute for an official interpretation.

This standard is subject to revision at any time by the AWS A5 Committee on Filler Metals and Allied Materials. It must be reviewed every five years, and if not revised, it must be either reaffirmed or withdrawn. Comments (recommendations, additions, or deletions) and any pertinent data that may be of use in improving this standard are requested and should be addressed to AWS Headquarters. Such comments will receive careful consideration by the AWS A5 Committee on Filler Metals and Allied Materials and the author of the comments will be informed of the Committee’s response to the comments. Guests are invited to attend all meetings of the AWS A5 Committee on Filler Metals and Allied Materials to express their comments verbally. Procedures for appeal of an adverse decision concerning all such comments are provided in the Rules of Operation of the Technical Activities Committee. A copy of these Rules can be obtained from the American Welding Society, 8669 NW 36 St, # 130, Miami, FL 33166.
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Foreword

This foreword is not part of this standard but is included for informational purposes only.

This edition makes use of both U.S. Customary Units and the International System of Units (SI) throughout. The measurements are not exact equivalents; therefore, each system must be used independently of the other, without combining in any way. In selecting rational metric units the AWS A1.1, Metric Practice Guide for the Welding Industry, and ISO 544, Welding consumables — Technical delivery conditions for filler materials and fluxes — Type of product, dimensions, tolerances and markings, are used as guides. Tables and figures make use of both U.S. Customary and SI Units, which with the application of the specified tolerances provide for interchangeability of products in both the U.S. Customary and SI Units.

NOTE: The user's attention is called to the possibility that compliance with this standard may require use of an invention covered by patent rights. By publication of this standard, no position is taken with respect to the validity of any such claim(s) or of any patent rights in connection therewith. If a patent holder has filed a statement of willingness to grant a license under these rights on reasonable and nondiscriminatory terms and conditions to applicants desiring to obtain such a license, then details may be obtained from the standards developer.

Substantive changes include changing the metric equivalent to 70 000 psi from 480 MPa to 490 MPa, to better align with international specifications. Two additional options for impact test temperature have been added to the open Charpy V-Notch classification system. The layout and wording of the document were updated to comply with AWS A5 general requirements and standard formats.

Document Development

The document development of this specification is as follows:

<table>
<thead>
<tr>
<th>Standard</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANSI/AWS A5.26-78</td>
<td>Specification for Consumables for Electrogas Welding of Carbon and High Strength Low-Alloy Steels</td>
</tr>
</tbody>
</table>

Comments and suggestions for the improvement of this standard are welcome. They should be sent to the Secretary, AWS A5 Committee on Filler Metals and Allied Materials, American Welding Society, 8669 NW 36 St, # 130, Miami, FL 33166.

All errata to a standard shall be published in the Welding Journal and posted on the AWS website.
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Specification for Carbon and Low-Alloy Steel Electrodes for Electrogas Welding

1. Scope

1.1 This specification prescribes requirements for the classification of carbon and low-alloy steel electrodes for electrogas welding. It covers solid and tubular (flux cored and metal cored) electrodes, for use either with or without external gas shielding.

1.2 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 when referring to material properties. The specification designated A5.26 uses U.S. Customary Units. The specification designated A5.26M uses the International System of Units (SI). The latter are shown within brackets [ ] or in appropriate columns in tables and figures. Standard dimensions based on either system may be used for sizing of electrodes, packaging, or both under A5.26 or A5.26M specifications.

Safety and health issues and concerns are beyond the scope of this standard; some safety and health information is provided, but such issues are not fully addressed herein. Some safety and health information can be found in the non-mandatory annex, Clauses A5 and A9.

Safety and Health information is available from the following sources:

American Welding Society:
- (1) ANSI Z49.1, Safety in Welding, Cutting, and Allied Processes
- (2) AWS Safety and Health Fact Sheets
- (3) Other safety and health information on AWS website

Material or Equipment Manufacturers:
- (1) Safety Data Sheets supplied by material manufacturers
- (2) Operating Manuals supplied by equipment manufacturers

Applicable Regulatory Agencies

Work performed in accordance with this standard may involve the use of materials that have been deemed hazardous, and may involve operations or equipment that may cause injury or death. This standard does not purport to address all safety and health risks that may be encountered. The user of this standard should establish an appropriate safety program to address such risks as well as to meet applicable regulatory requirements. ANSI Z49.1 should be considered when developing the safety program.

2. Normative References

The documents listed below are referenced within this publication and are mandatory to the extent specified herein. For undated references, the latest edition of the referenced standard shall apply. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply.

American Welding Society (AWS) standards:
- AWS A1.1, Metric Guide for the Welding Industry
AWS A3.0M/A3.0, *Standard Welding Terms and Definitions, Including Terms for Adhesive Bonding, Brazing, Soldering, Thermal Cutting, and Thermal Spraying*

AWS A5.01M/A5.01, *Welding Consumables—Procurement of Filler Metals and Fluxes*

AWS A5.02/A5.02M, *Specification for Filler Metal Standard Sizes, Packaging, and Physical Attributes*

AWS A5.32M/A5.32 (ISO 14175 MOD), *Welding Consumables—Gases and Gas Mixtures for Fusion Welding and Allied Processes*

AWS B4.0, *Standard Methods for Mechanical Testing of Welds*

AWS F3.2M/F3.2, *Ventilation Guide for Weld Fume*

American National Standards Institute (ANSI) standard:

ANSI Z49.1, *Safety in Welding, Cutting, and Allied Processes*

ASTM International (ASTM) documents:

ASTM A36/A36M, *Standard Specification for Carbon Structural Steel*

ASTM A242/A242M, *Standard Specification for High-Strength Low-Alloy Structural Steel*

ASTM A537/A537M, *Standard Specification for Pressure Vessel Plates, Heat-Treated, Carbon-Manganese-Silicon Steel*

ASTM A572/A572M, *Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel*

ASTM A588/A588M, *Standard Specification for High-Strength Low-Alloy Structural Steel, up to 50 ksi [345 MPa] Minimum Yield Point, with Atmospheric Corrosion Resistance*


ASTM E29, *Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications*


ASTM E1032, *Standard Test Method for Radiographic Examination of Weldments*

ASTM E2033, *Standard Practice for Radiographic Examination Using Computed Radiography*

ASTM E2698, *Standard Practice for Radiographic Examination Using Digital Detector Arrays*

International Organization for Standardization (ISO) standards:

ISO 544, *Welding consumables — Technical delivery conditions for filler materials and fluxes — Type of product, dimensions, tolerances and markings*

ISO 80000-1:2009, *Quantities and units — Part 1: General*

### 3. Classification

3.1 The solid electrodes covered by the A5.26 specification utilize a classification system based upon U.S. Customary Units and are classified according to the chemical composition of the electrode, as specified in Table 1 and the mechanical properties of the weld metal as specified in Tables 2 and 3.
### Table 1

**Chemical Composition Requirements for Solid Electrodes**

<table>
<thead>
<tr>
<th>AWS Classification&lt;sup&gt;c&lt;/sup&gt;</th>
<th>UNS Number&lt;sup&gt;d&lt;/sup&gt;</th>
<th>Weight Percent&lt;sup&gt;a,b&lt;/sup&gt;</th>
<th>Other Elements, Total&lt;sup&gt;f&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>C</td>
<td>Mn</td>
</tr>
<tr>
<td>EGXXS-1</td>
<td>K01313</td>
<td>0.07–0.19</td>
<td>0.90–1.40</td>
</tr>
<tr>
<td>EGXXS-2</td>
<td>K10726</td>
<td>0.07</td>
<td>0.90–1.40</td>
</tr>
<tr>
<td>EGXXS-3</td>
<td>K11022</td>
<td>0.06–0.15</td>
<td>0.90–1.40</td>
</tr>
<tr>
<td>EGXXS-5</td>
<td>K11357</td>
<td>0.07–0.19</td>
<td>0.90–1.40</td>
</tr>
<tr>
<td>EGXXS-6</td>
<td>K11140</td>
<td>0.06–0.15</td>
<td>1.40–1.85</td>
</tr>
<tr>
<td>EGXXS-D2</td>
<td>K10945</td>
<td>0.07–0.12</td>
<td>1.60–2.10</td>
</tr>
<tr>
<td>EGXXS-G</td>
<td>—</td>
<td>Not Specified&lt;sup&gt;g&lt;/sup&gt;</td>
<td>—</td>
</tr>
</tbody>
</table>

<sup>a</sup> Analysis of the electrode shall be made for the elements for which specific values are shown in this table. All other elements not specified shall be reported, if intentionally added. The total of these unspecified elements and all other elements not intentionally added (excluding iron) shall not exceed the limit specified for “Other Elements, Total.”

<sup>b</sup> Single values are maximums.

<sup>c</sup> The letters “XX” as used in the AWS classification column of this table refer respectively to the tensile strength designator (see Table 2) and the impact designator (see Table 3).

<sup>d</sup> SAE HS-1086/ASTM DS-56, *Metals & Alloys in the Unified Numbering System*.

<sup>e</sup> The copper limit includes copper that may be applied as a coating on the electrode.

<sup>f</sup> An analysis of the electrode for boron is required and shall be reported if this element is intentionally added or if it is known to be present at levels in excess of 0.0010%.

<sup>g</sup> Composition shall be reported with the requirements as agreed to by the purchaser and the supplier.

### Table 2

**Tension Test Requirements (As Welded)**

<table>
<thead>
<tr>
<th>Tensile Strength Designator</th>
<th>For A5.26 U.S. Customary Units</th>
<th>For A5.26M International System of Units (SI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tensile Strength (ksi)</td>
<td>Minimum Yield Strength&lt;sup&gt;a&lt;/sup&gt; (ksi)</td>
</tr>
<tr>
<td>A5.26 U.S. Customary Units</td>
<td>A5.26M International System of Units (SI)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>43</td>
<td>60–80</td>
</tr>
<tr>
<td>7</td>
<td>49</td>
<td>70–95</td>
</tr>
<tr>
<td>8</td>
<td>55</td>
<td>80–100</td>
</tr>
</tbody>
</table>

<sup>a</sup> Yield strength at 0.2% offset.

<sup>b</sup> In a 2 in [50 mm] gage length, nominal diameter of 0.500 in [12.5 mm] and a nominal gage length-to-diameter ratio of 4:1 per AWS B4.0.
### Table 3
Charpy Impact Test Requirements

<table>
<thead>
<tr>
<th>Impact Designator&lt;sup&gt;a,b&lt;/sup&gt;</th>
<th>Maximum Test Temperature&lt;sup&gt;c&lt;/sup&gt; (°F)</th>
<th>Minimum Average Energy Level</th>
<th>Impact Designator&lt;sup&gt;a,b&lt;/sup&gt;</th>
<th>Maximum Test Temperature&lt;sup&gt;c&lt;/sup&gt; (°C)</th>
<th>Minimum Average Energy Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td></td>
<td>2</td>
<td>–20</td>
<td>27 Joules</td>
</tr>
<tr>
<td>2</td>
<td>–20</td>
<td>20 ft·lbf</td>
<td>3</td>
<td>–30</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>–40</td>
<td></td>
<td>4</td>
<td>–40</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>–60</td>
<td></td>
<td>5</td>
<td>–50</td>
<td></td>
</tr>
<tr>
<td>Z</td>
<td>No Impact Requirements</td>
<td>Z</td>
<td>No Impact Requirements</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup> Based on the results of the impact tests of the weld metal, the manufacturer shall insert in the classification the appropriate designator from Table 3 above, as indicated in Figure 1.

<sup>b</sup> When classifying an electrode to A5.26 using U.S. Customary Units the Impact Designator indicates the maximum impact test temperature in °F. When classifying to A5.26M using the International System of Units (SI) the Impact Designator indicates the maximum impact test temperature in °C. With the exception of the Impact Designator “4” a given Impact Designator will indicate different temperatures depending upon whether classification is according to A5.26 in U.S. Customary Units or according to A5.26M in the International System of Units (SI). For example, a “2” Impact Designator when classifying to A5.26 indicates a test temperature of –20°F. When classifying to A5.26M the “2” Impact Designator indicates a test temperature of –4°F.

<sup>c</sup> Weld metal from an electrode that meets the impact requirements at a given temperature also meets the requirements at all higher temperatures in this table. For example, weld metal meeting the A5.26 requirements for designator “6” also meets the requirements for designators 4, 2, 0, and Z. (Weld metal meeting the A5.26M requirements for designator “5” also meets the requirements for designators 4, 3, 2, and Z.) In these cases, the actual temperature used for testing shall be listed on the certification documentation when issued.

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**Designates an electrode for electrogas welding.**

**Tensile Strength Designator.** For A5.26, one digit indicates the minimum tensile strength (when multiplied by 10,000 psi) of weld metal deposited with the electrode under the welding conditions specified in the specification. For A5.26M, two digits are used to indicate the minimum tensile strength (when multiplied by 10 Megapascals [MPa]) (see Table 2).

**Impact Designator.** For A5.26, this designator indicates the temperature in °F at or above which the impact strength of the weld metal meets or exceeds 20 ft·lbf. For A5.26M, this designator indicates the temperature in °C at or above which the impact strength of the weld deposit meets or exceeds 27 J (see Table 3). A “Z” in this position indicates that there are no impact requirements for the classification.

**Indicates whether the electrode is tubular (T) or solid (S).**

**Indicates the chemical composition of the weld metal produced by a tubular electrode or the chemical composition of a solid electrode, and references whether shielding gas is used when welding with a tubular electrode (see Tables 1 and 4).**

---

**Figure 1—Classification System**
3.2 The tubular electrodes covered by the A5.26 specification utilize a classification system based upon U.S. Customary Units and are classified according to the need for external shielding gas (Table 4) and the chemical composition and mechanical properties of the weld metal, as specified in Tables 2, 3, and 4.

3.3 The solid electrodes covered by the A5.26M specification utilize a classification system based upon the International System of Units (SI) and are classified according to the chemical composition of the electrode, as specified in Table 1 and the mechanical properties of the weld metal as specified in Tables 2 and 3.

3.4 The tubular electrodes covered by the A5.26M specification utilize a classification system based upon the International System of Units (SI) and are classified according to the need for external shielding gas (Table 4) and the chemical composition and mechanical properties of the weld metal, as specified in Tables 2, 3, and 4.

3.5 Electrodes classified under one classification shall not be classified under any other classification in this specification, except as specifically permitted by Note (c) to Table 3.

3.6 The electrodes classified under this specification are intended for electrogas welding, but that is not to prohibit their use with any other process for which they are found suitable.

4. Acceptance
Acceptance\(^1\) of the electrodes shall be in accordance with the provisions of AWS A5.01M/A5.01.

5. Certification
By affixing the AWS Specification and Classification designations to the packaging, or the classification to the product, the manufacturer certifies that the product meets the requirements of this specification. See A4 (in Annex A) for further information concerning certification and the testing called for to meet this requirement.

6. Rounding Procedure
For the purpose of determining compliance with the requirements of this standard, the actual test values obtained shall be subjected to the rounding rules of ASTM E29 or Rule A in Clause B.3 of ISO 80000-1 (the results are the same). If the measured values are obtained by equipment calibrated in units other than those of the specified limit, the measured values shall be converted to the units of the specified limit before rounding. If the average value is to be compared to the specified limit, rounding shall be done only after calculating the average. An observed or calculated value shall be rounded to the nearest 1000 psi (1 ksi) for tensile and yield strength for A5.26 (to the nearest 10 MPa for tensile and yield strength for A5.26M) and to the nearest unit in the last right-hand place of figures used in expressing the limiting values for other quantities. The rounded results shall fulfill the requirements for the classification under test.

7. Summary of Tests
The tests required for each classification are specified in Table 6. The purpose of these tests is to determine the chemical composition, the mechanical properties, and soundness of the weld. The preparation of test samples, the testing procedures to be employed, and the results required are given in Clauses 9 through 13.

8. Retest
If the results of any test fail to meet the requirement, that test shall be repeated twice. The results of both retests shall meet the requirement. Specimens for retest may be taken from the original test assembly or from one or two new test assemblies. For chemical analysis, retest need be only for those specific elements that failed to meet the test requirement.

\(^1\) See A3 (in Annex A) for further information concerning acceptance, testing of the material shipped, and AWS A5.01M/A5.01.
### Table 4
Chemical Composition Requirements for Weld Metal from Tubular Electrodes

| AWS Classification<sup>a</sup> | UNS Number<sup>d</sup> | Shielding Gas<sup>e</sup> | C   | Mn  | P   | S   | Si  | Ni  | Cr  | Mo  | Cu  | V  | Other Elements, Total<sup>f</sup> |
|--------------------------------|------------------------|---------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----------------|------------------|
| EG6XT-1                        | EG43XT-1               | W06301                    | (g) | 1.7 | 0.03| 0.03| 0.50| 0.30| 0.20| 0.35| 0.35| 0.08| 0.50                       |
| EG7XT-1                        | EG49XT-1               | W07301                    | (g) | 1.7 | 0.03| 0.03| 0.50| 0.30| 0.20| 0.35| 0.35| 0.08| 0.50                       |
| EG8XT-1                        | EG55XT-1               | —                          | None|(g) | 1.8 | 0.03| 0.03| 0.90| 0.30| 0.20| 0.25–0.65| 0.35| 0.08| 0.50                       |
| EG6XT-2                        | EG43XT-2               | W06302                    | C1  | 2.0 | 0.03| 0.03| 0.90| 0.30| 0.20| 0.35| 0.35| 0.08| 0.50                       |
| EG7XT-2                        | EG49XT-2               | W07302                    | C1  | 2.0 | 0.03| 0.03| 0.90| 0.30| 0.20| 0.35| 0.35| 0.08| 0.50                       |
| EGXXT-Ni1                      | EGXXXT-Ni1             | W21033                    | C1  | 0.10| 1.0–1.8| 0.03| 0.03| 0.50| 0.70–1.10| — | 0.30| 0.35| — | 0.50                       |
| EGXXT-NM1                      | EGXXXT-NM1             | W22334                    | M21 or C1 | 0.12| 1.0–2.0| 0.02| 0.03| 0.15–0.50| 1.5–2.0| 0.20| 0.40–0.65| 0.35| 0.05| 0.50                       |
| EGXXT-NM2                      | EGXXXT-NM2             | W22333                    | C1  | 0.12| 1.1–2.1| 0.03| 0.03| 0.20–0.60| 1.1–2.0| 0.20| 0.10–0.35| 0.35| 0.05| 0.50                       |
| EGXXT-W                        | EGXXXT-W               | W20131                    | C1  | 0.12| 0.50–1.3| 0.03| 0.03| 0.30–0.80| 0.40–0.80| 0.45–0.70| — | 0.30–0.75| — | 0.50                       |
| EGXXT-G                        | EGXXXT-G               | —                          | Not Specified |  |     |     |     |     |     |     |     |     |  |  |                          |

<sup>a</sup>The letters “XX” or “XXX” as used in the AWS classification column in this table refer respectively to the designator(s) for tensile strength of the weld metal (see Table 2) and the designator for impact strength (see Table 3). The single letter “X” as used in the AWS classification column refers to the designator for impact strength (see Table 3).

<sup>b</sup>Analysis of the weld metal shall be made for the elements for which specific values are shown in this table. All other elements not specified shall be reported, if intentionally added. The total of these unspecified elements and all other elements not intentionally added (excluding iron) shall not exceed the limit specified for “Other Elements, Total.”

<sup>c</sup>Single values are maximums.

<sup>d</sup>SAE HS-1086/ASTM DS-56, Metals & Alloys in the Unified Numbering System.

<sup>e</sup>See Table 5.

<sup>f</sup>An analysis of the weld deposit for boron is required and shall be reported if this element is intentionally added or if it is known to be present at levels in excess of 0.0010%.

<sup>g</sup>Composition range of carbon not specified for these classifications, but the amount shall be determined and reported.

<sup>h</sup>Composition shall be reported with the requirements as agreed to by the purchaser and supplier.
If the results of one or both retests fail to meet the requirement, the material under test shall be considered as not meeting the requirements of this specification for that classification.

In the event that during preparation or after completion of any test, it is clearly determined that prescribed or proper procedures were not followed in preparing the weld test assembly or test specimens or in conducting the test, the test shall be considered invalid without regard to whether the test was actually completed, or whether test results met, or failed to meet, the requirement. That test shall be repeated, following prescribed procedures. In this case the requirement for doubling of the number of test specimens does not apply.

### 9. Weld Test Assemblies

9.1 One or more of the following weld test assemblies are required for classification testing. They are:

   (1) The groove weld in Figure 2 for mechanical properties and soundness of the weld metal for all classifications.

   (2) The weld ingot in Figure 3 for chemical analysis of the weld metal.

### Table 5
**Composition Requirements for Shielding Gases**

<table>
<thead>
<tr>
<th>AWS A5.26/A5.26M Shielding Gas Designator&lt;sup&gt;a&lt;/sup&gt;</th>
<th>AWS A5.32M/A5.32 Composition Ranges for Indicated Main/Sub Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>Oxidizing Components % CO₂</td>
</tr>
<tr>
<td>M21</td>
<td>15 &lt; CO₂ ≤ 25</td>
</tr>
</tbody>
</table>

<sup>a</sup> The shielding gas designators are identical to the Main group/Sub-group symbols used in AWS A5.32M/A5.32. The AWS A5.32M/A5.32 shielding gas designation begins with “AWS A5.32M/A5.32.” That part of the designation has been omitted from the Shielding Gas Designator for brevity.

### Table 6
**Tests Required for Classification**

<table>
<thead>
<tr>
<th>General Electrode Category</th>
<th>Electrode Classification</th>
<th>Chemical Analysis</th>
<th>Radiographic Test</th>
<th>Tension Test</th>
<th>Impact Test&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid</td>
<td>EGXXS-X</td>
<td>Required</td>
<td>Not Required</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td></td>
<td>EGXXS-G&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tubular</td>
<td>EGXXT-X</td>
<td>Not Required</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td></td>
<td>EGXXT-G&lt;sup&gt;c&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup> When the “Z” impact designator is used, the impact test is not required (see Table 3).

<sup>b</sup> When a “G” appears in the position shown, it indicates that the electrode composition is “as agreed to by the purchaser and the supplier.”

<sup>c</sup> When a “G” appears in the position shown, it indicates that the weld metal composition and/or shielding gas, if used, are “as agreed to by the purchaser and the supplier.”
Figure 2—Groove Weld Test Assembly for Mechanical Properties and Soundness
The sample for chemical analysis of weld metal from tubular electrodes may be taken from the reduced section of the fractured tension test specimen or from a corresponding location in the weld metal in the groove weld in Figure 2 thereby avoiding the need to make the weld ingot. In case of dispute, the weld ingot shall be the referee method for chemical analysis.

9.2 Preparation of each weld test assembly shall be as prescribed in 9.3 and 9.4. The base metal for each assembly shall be as required in Table 7 and shall meet the requirements of the ASTM specification shown there, or a chemically equivalent specification. Testing of the assemblies shall be as prescribed in 10.2, 10.3, and Clauses 11 through 13.

9.3 Weld Ingot. A weld ingot shall be prepared as specified in Figure 3 except when the alternative in 9.1 (taking the sample from the broken tension test specimen or from a corresponding location in the groove weld in Figure 2) is selected.

9.4 Groove Weld. A test assembly shall be prepared and welded as specified in Figure 2, using base metal of the appropriate type specified in Table 7.

9.4.1 Welding shall be in the flat position with approximately vertical welding progression and shall be completed in one pass. The assembly shall be restrained or preset to prevent warpage in excess of 5°. An assembly that is warped more than 5° out of plane shall be discarded. Test assemblies shall not be straightened. Fixturing of the test assembly shall be based on the manufacturer’s recommendations. Water-cooled copper shoes shall be used except when using consumable
guide tubes. For welding with consumable guide tubes, follow the manufacturer’s recommendations regarding the use of water-cooled shoes and report the composition, size, and type of consumable guide tube on the certificate. When using water cooling, the outgoing water temperature shall not exceed 180°F [80°C] near the exit point.

9.4.2 If the manufacturer does not make the electrode size specified, the nearest size may be used. For sizes other than those shown, the manufacturer’s recommended procedure shall be used.

9.4.3 Welding shall begin with the assembly at room temperature, 65°F [18°C] minimum. No external heat shall be applied during welding. Postweld heat treatment shall not be applied to the test assembly. Starting and runoff tabs are not required if the test assembly without weld tabs is sufficient to provide the required test specimens.

10. Chemical Analysis

10.1 For solid electrodes, a sample of the electrode shall be prepared for chemical analysis. Solid electrodes, when analyzed for elements that are present in a coating (copper flashing, for example), shall be analyzed without removing the coating. When the electrode is analyzed for elements other than those in the coating, the coating must be removed if its presence affects the results of the analysis for other elements.

10.2 Tubular electrodes shall be analyzed in the form of weld metal, not electrode. The sample for analysis shall be taken from weld metal obtained with the electrode (and the shielding gas with which it is classified, for those classifications for which an external shielding gas is required). The sample shall come from an ingot (Figure 3), the reduced section of the fractured tension test specimen, or the groove weld in Figure 2.

When the ingot is used, the top surface of the ingot (described in 9.3 and shown in Figure 3) shall be removed and discarded and a sample for analysis shall be obtained from the underlying metal at a location at least 2 in [50 mm] from both the start and crater ends of the ingot by any appropriate mechanical means. The sample shall be free of slag.

When the reduced section of the fractured tension test specimen or a sample from the groove weld in Figure 2 is used, the sample shall be prepared by any suitable mechanical means. The sample from the groove weld shall be taken at least 2 in [50 mm] from both the start and crater ends of the weld.

10.3 The sample shall be analyzed by accepted analytical methods. The referee method shall be ASTM E350.

10.4 The results of the analysis shall meet the requirements of Table 1 for solid electrodes and Table 4 for tubular electrodes, for the classification of electrode under test.
11. Radiographic Test

11.1 The groove weld described in 9.4 and shown in Figure 2 shall be radiographed to evaluate the soundness of the weld metal. In preparation for radiography, both surfaces of the weld may be machined or ground smooth and flush with the original surfaces of the base metal or with a uniform reinforcement not exceeding 3/32 in [2.5 mm].

It is permitted on both sides of the test assembly to remove base metal to a depth of 1/16 in [1.5 mm] nominal below the original base metal surface in order to facilitate backing and/or buildup removal. The thickness of the weld metal shall not be reduced by more than 1/16 in [1.5 mm] so that the thickness of the prepared radiographic test specimen equals at least the thickness of the base metal minus 1/16 in [1.5 mm]. Both surfaces of the test assembly, in the area of the weld, shall be smooth enough to avoid difficulty in interpreting the radiograph.

11.2 The quality level of inspection shall be 2-2T. The weld shall be radiographed in accordance with one of the following:

(1) Film Radiology: ASTM E1032.

(2) Computed Radiology (CR): ASTM E2033 and the requirements of ASTM E1032 except where CR differs from film. The term film, as used within ASTM E1032, applicable to performing radiography in accordance with ASTM E2033, refers to phosphor imaging plate.

(3) Digital Radiology (DR): ASTM E2698 and the requirements of ASTM E1032 except where DR differs from film. The term film, as used within ASTM E1032, applicable to performing radiography in accordance with ASTM E2698, refers to digital detector array (DDA).

11.3 The soundness of the weld metal meets the requirements of this specification if the radiograph shows:

(1) No cracks, no incomplete fusion, and no incomplete penetration

(2) No slag inclusions longer than 1/4 in [6 mm] or 1/3 of the thickness of the weld, whichever is greater, or no groups of slag inclusions in line that have an aggregate length greater than the thickness of the weld in a length 12 times the thickness of the weld except when the distance between the successive inclusions exceeds six times the length of the longest inclusion in the group

(3) No rounded indications in excess of those permitted by the radiographic standards in Figure 4.

In evaluating the radiograph, 2-1/2 in [65 mm] of the weld on each end of the test assembly shall be disregarded.

11.3.1 A rounded indication is an indication (on the radiograph) whose length is no more than three times its width. Rounded indications may be circular or irregular in shape and may have tails. The size of a rounded indication is the largest dimension of the indication, including any tail that may be present.

11.3.2 The indication may be of porosity or slag. Indications whose largest dimension does not exceed 1/64 in [0.4 mm] shall be disregarded. Test assemblies with indications greater than the largest indications permitted in the radiographic standards do not meet the requirements of this specification.

12. Tension Test

12.1 One all-weld-metal tension test specimen, as specified in the Tension Test clause of AWS B4.0, shall be machined from the welded test assembly described in 9.4 and shown in Figure 2. The tension test specimen shall have a nominal diameter of 0.500 in [12.5mm] and a nominal gage length to diameter ratio of 4:1.

12.2 The specimen shall be tested in the manner described in the Tension Test clause of AWS B4.0.

12.3 The results of the tension test shall meet the requirements specified in Table 2.

13. Impact Test

13.1 Five full-size Charpy V-notch impact specimens, as specified in the Fracture Toughness Test section of AWS B4.0, shall be machined from the welded test assembly shown in Figure 2, for those classifications for which impact testing is required in Table 6.
(A) ASSORTED ROUNDED INDICATIONS

SIZE 1/64 in to 1/16 in [0.4 mm TO 1.6 mm] DIAMETER OR IN LENGTH.
MAXIMUM NUMBER OF INDICATIONS IN ANY 6 in [150 mm] OF WELD = 18, WITH THE FOLLOWING RESTRICTIONS:
MAXIMUM NUMBER OF LARGE 3/64 in TO 1/16 in [1.2 mm TO 1.6 mm] DIAMETER AND/OR LENGTH INDICATIONS = 3.
MAXIMUM NUMBER OF MEDIUM 1/32 in TO 3/64 in [0.8 mm TO 1.2 mm] DIAMETER AND/OR LENGTH INDICATIONS = 5.
MAXIMUM NUMBER OF SMALL 1/64 in TO 1/32 in [0.4 mm TO 0.8 mm] DIAMETER AND/OR LENGTH INDICATIONS = 10.

(B) LARGE ROUNDED INDICATIONS

SIZE 3/64 in to 1/16 in [1.2 mm TO 1.6 mm] DIAMETER AND/OR LENGTH.
MAXIMUM NUMBER OF INDICATIONS IN ANY 6 in [150 mm] OF WELD = 8.

(C) MEDIUM ROUNDED INDICATIONS

SIZE 1/32 in to 3/64 in [0.8 mm TO 1.2 mm] DIAMETER AND/OR LENGTH.
MAXIMUM NUMBER OF INDICATIONS IN ANY 6 in [150 mm] OF WELD = 15.

(D) SMALL ROUNDED INDICATIONS

SIZE 1/64 in to 1/32 in [0.4 mm TO 0.8 mm] DIAMETER AND/OR LENGTH.
MAXIMUM NUMBER OF INDICATIONS IN ANY 6 in [150 mm] OF WELD = 30.

Notes:
1. In using these standards the chart which is most representative of the size of the porosity and/or inclusions present in the test specimen radiograph shall be used for determining conformance to these radiographic standards.
2. Since these are test welds specifically made in the laboratory for classification purposes, the radiographic requirements for these test welds are more rigid than those which may be required for general fabrication.
3. Indications smaller than 1/64 in [0.4 mm] shall be disregarded.

Figure 4—Radiographic Acceptance Standards
The Charpy V-Notch specimens shall have the notched surface and the struck surface parallel with each other within 0.002 in [0.05 mm]. The other two surfaces of the specimen shall be square with the notched or struck surfaces within 10 minutes of a degree. The notch shall be smoothly machined and shall be square with the longitudinal edge of the specimen within 2°.

The geometry of the notch shall be measured on at least one specimen in a set of five specimens. Measurement shall be done at a minimum 10X magnification on either a shadowgraph or metallograph. The correct location of the notch shall be verified by etching before or after machining.

13.2 The five specimens shall be tested in accordance with the Fracture Toughness Test section of AWS B4.0. The test temperature shall be that specified in Table 3 for the classification under test.

13.3 In evaluating the test results, the lowest and the highest values obtained shall be disregarded. Two of the remaining three values shall equal, or exceed, the specified 20 ft·lbf [27 J] energy level. One of the three may be lower, but not lower than 15 ft·lbf [20 J], and the average of the three shall be not less than the required 20 ft·lbf [27 J] energy level.

14. Method of Manufacture

The electrodes classified according to this specification may be manufactured by any method that will produce material that meets the requirements of this specification.

15. Standard Sizes

Standard sizes for filler metal in the different package forms (coils with support, coils without support, spools and drums) are as specified in AWS A5.02/A5.02M.

16. Finish and Uniformity

Finish and uniformity shall be as specified in AWS A5.02/A5.02M.

17. Standard Package Forms

Standard package forms are coils with support, coils without support, spools, and drums. Standard package dimensions and weights and other requirements for each form shall be as specified in AWS A5.02/A5.02M.

18. Winding Requirements

18.1 Winding requirements shall be as specified in AWS A5.02/A5.02M. The outermost layer of electrode on spools shall be at least 1/8 in [3 mm] from the rim (the OD) of the flanges of the spool.

18.2 The cast and helix of filler metal shall be as specified in AWS A5.02/A5.02M.

19. Filler Metal Identification

Filler Metal Identification, product information and the precautionary information shall be as specified in AWS A5.02/A5.02M.
20. Packaging
Electrodes shall be suitably packaged to ensure against damage during shipment and storage under normal conditions.

21. Marking of Packages
21.1 The product information (as a minimum) that shall be legibly marked so as to be visible from the outside of each unit package shall be as specified in AWS A5.02/A5.02M.

21.2 The appropriate precautionary information, as given in ANSI Z49.1 (as a minimum) or its equivalent shall be prominently displayed in legible print on all packages of electrodes including individual unit packages enclosed within a larger package.
Annex A (Informative)

Guide to AWS Specification for Carbon and Low-Alloy Steel Electrodes for Electrogas Welding

This annex is not part of this standard, but is included for informational purposes only.

A1. Introduction

The purpose of this guide is to correlate the electrode classifications with their intended applications so the specification can be used effectively. Reference to appropriate base metal specifications is made whenever that can be done and when it would be helpful. Such references are intended as examples rather than complete listings of the base metals for which each filler metal is suitable.

A2. Classification System

A2.1 The system for identifying the electrode classifications in this specification follows the standard pattern used in other AWS filler metal specifications (see Figure 1). The letters “EG” at the beginning of each classification designation show that the electrode is intended for use with the electrogas welding process. Some of the solid electrode classifications are similar to those in other AWS Specifications as shown in Table A.1.

<table>
<thead>
<tr>
<th>AWS A5.26/A5.26M Classification</th>
<th>Similar Classifications(^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AWS A5.17</td>
</tr>
<tr>
<td>EGXXS-1</td>
<td></td>
</tr>
<tr>
<td>EGXXS-2</td>
<td></td>
</tr>
<tr>
<td>EGXXS-3</td>
<td>EM13K</td>
</tr>
<tr>
<td>EGXXS-5</td>
<td></td>
</tr>
<tr>
<td>EGXXS-6</td>
<td>EH11K</td>
</tr>
<tr>
<td>EGXXS-D2</td>
<td></td>
</tr>
</tbody>
</table>

\(^a\) Classifications are similar but not necessarily identical in composition:
AWS A5.17/A5.17M, Specification for Carbon Steel Electrodes and Fluxes for Submerged Arc Welding
AWS A5.18/A5.18M, Specification for Carbon Steel Electrodes and Rods for Gas Shielded Arc Welding
AWS A5.23/A5.23M, Specification for Low-Alloy Steel Electrodes and Fluxes for Submerged Arc Welding
AWS A5.25/A5.25M, Specification for Carbon and Low-Alloy Steel Electrodes and Fluxes for Electroslag Welding
AWS A5.28/A5.28M, Specification for Low-Alloy Steel Electrodes and Rods for Gas Shielded Arc Welding
In the case of the designations for A5.26, this is followed by the Tensile Strength Designator a single digit (6, 7, or 8) representing the minimum tensile strength of the weld metal in units of 10,000 psi. For the designations of A5.26M, the “EG” is followed by two digits (43, 49, or 55) representing the minimum tensile strength in units of 10 MPa (see Table 2).

The digit that follows is the Impact Designator, a number or the letter “Z.” The number designates the temperature at which (and/or above which) the weld metal meets or exceeds the required 20 ft-lbf [27 J] Charpy V-notch impact strength. The letter “Z” indicates that no impact strength requirement is specified.

The next letter, either S or T, indicates that the electrode is solid (S) or tubular (flux cored or metal cored) (T). The designator (digits or letters) following the hyphen in the classification indicates the chemical composition (of weld metal for the tubular electrodes and of the electrode itself for solid electrodes) and the type or absence of shielding gas required in the case of tubular electrodes only.

A2.2 “G” Classification

A2.2.1 This specification includes filler metals classified as EGXXT-G or EGXXS-G. The last “G” indicates that the filler metal is of a general classification. It is “general” because not all of the particular requirements specified for each of the other classifications are specified for this classification. The intent in establishing this classification is to provide a means by which filler metals that differ in one respect or another (chemical composition, for example) from all other classifications (meaning that the composition of the filler metal, in the case of the example, does not meet the composition specified for any of the classifications in the specification) can still be classified according to the specification. The purpose is to allow a useful filler metal—one that otherwise would have to await a revision of the specification—to be classified immediately, under the existing specification. This means, then, that two filler metals, each bearing the same “G” classification, may be quite different in some certain respect (chemical composition, again, for example).

A2.2.2 The point of difference (although not necessarily the amount of that difference) between filler metal of a “G” classification and filler metal of a similar classification without the “G” (or even with it, for that matter) will be readily apparent from the use of the words not required and not specified in the specification. The use of these words is as follows:

Not Specified is used in those areas of the specification that refer to the results of some particular test. It indicates that the requirements for that test are not specified for that particular classification.

Not Required is used in those areas of the specification that refer to the tests that must be conducted in order to classify a welding material. It indicates that that test is not required because the requirements (results) for the test have not been specified for that particular classification. Restating the case, when a requirement is not specified, it is not necessary to conduct the corresponding test in order to classify a filler metal to that classification. When a purchaser wants the information provided by that test in order to consider a particular product of that classification for a certain application, the purchaser will have to arrange for that information with the supplier of the product. The purchaser will have to establish with that supplier just what the testing procedure and the acceptance requirements are to be, for that test. The purchaser may want to incorporate that information [via AWS A5.01M/A5.01] into the purchase order.

A2.2.3 Request for Filler Metal Classification

(1) When a filler metal cannot be classified other than as a “G” classification, a manufacturer may request that a new classification be established. The manufacturer shall do this using the following procedure:

(a) Declaration that the new classification will be offered for sale commercially.

(b) All classification requirements as given for existing classifications, such as, chemical composition ranges, mechanical property requirements, and usability test requirements.

(c) Any conditions for conducting the tests used to demonstrate that the filler metal meets the classification requirements. It would be sufficient, for example, to state that welding conditions are the same as for other classifications.

(d) Information on Descriptions and Intended Use, which parallels that for existing classifications (for that clause of the Annex).
(e) Actual test data for all tests required for classification according to the requirements of the specification for a minimum of two production heats/lots must be provided. In addition, if the specification is silent regarding mechanical properties, test data submitted shall include appropriate weld metal mechanical properties from a minimum of two production heats/lots.

(f) A request for a new classification without the above will be considered incomplete. The Secretary will return the request to the requester for further information.

(3) The request should be sent to the Secretary of the Committee on Filler Metals and Allied Materials at AWS Headquarters.

A3. Acceptance

Acceptance of all welding materials classified under this specification is in accordance with AWS A5.01M/A5.01 or the tests and requirements of this specification. Any testing a purchaser requires of the supplier, for material shipped in accordance with this specification, shall be clearly stated in the purchase order. In the absence of any such statement in the purchase order, the supplier may ship the material with whatever testing is normally conducted on material of that classification, as specified in Schedule F, Table 1, of AWS A5.01M/A5.01. Testing in accordance with any other Schedule in that Table must be specifically required by the purchase order. In such cases, acceptance of the material shipped shall be in accordance with those requirements.

A4. Certification

The act of placing the AWS Specification and Classification designations on the packaging enclosing the product or the classification on the product itself, constitutes the supplier’s (manufacturer’s) certification that the product meets all of the requirements of the specification.

The only testing requirement implicit in this certification is that the manufacturer actually has conducted the tests required by the specification on material that is representative of that being shipped and that the material met the requirements of the specification.

Representative material, in this case, is any production run of that classification using the same formulation. “Certification” is not to be construed to mean that tests of any kind were necessarily conducted on samples of the specific material shipped. Tests on such material may or may not have been conducted. The basis for the certification required by the specification is the classification test of representative material cited above and the Manufacturer’s Quality Assurance Program in AWS A5.01M/A5.01.

A5. Ventilation During Welding

A5.1 Five major factors govern the quantity of fumes in the atmosphere to which welders and welding operators are exposed during welding. They are:

(1) Dimensions of the space in which welding is done (with special regard to the height of the ceiling)

(2) Number of welders and welding operators working in that space

(3) Rate of evolution of fumes, gases, or dust, according to the materials and processes used

(4) The proximity of the welders or welding operators to the fumes as the fumes issue from the welding zone, and to the gases and dusts in the space in which they are working

(5) The ventilation provided to the space in which the welding is done
A5.2 American National Standard ANSI Z49.1, *Safety in Welding, Cutting, and Allied Processes* (published by the American Welding Society), discusses the ventilation that is required during welding and should be referred to for details. Attention is drawn particularly to the clause on protection of personnel and the general area and ventilation in that document. See also AWS F3.2M/F3.2, *Ventilation Guide for Weld Fume* for more detailed description of ventilation options.

A6. Welding Considerations

A6.1 Electrogas welding is an arc welding process that uses solid electrodes with gas shielding, tubular cored electrodes with gas shielding, or tubular cored electrodes without gas shielding (self-shielded). Operating on direct current, the electrode deposits filler metal in the cavity formed by the water-cooled or solid backing shoe(s) that bridges the groove between the joint members. The joint normally is made in a single pass, though with special fixturing multipass joints have been welded.

A6.2 Flux cored electrodes used with the electrogas welding process are designed specifically for compatibility with the process. The flux produces a thin layer of slag between the weld metal and copper backing shoes without accumulating excessive slag above the weld pool. The nonmetallic content of the flux core is lower than that of conventional gas shielded and self-shielded flux cored electrodes.

A6.3 Because of the large volume of molten weld metal produced in electrogas welding and the necessity to contain it, the process is used for welding in the flat position with approximately vertical progression. Joints are readily welded in plate assemblies that are as much as 15° from the vertical, or where the joint in vertical plate assemblies may be as much as 15° from vertical, or both.

A6.4 The entire assembly, including electrode, copper shoes, wire-feeding mechanism, controls, and oscillator, generally moves vertically during operation. When consumable guide tubes are used, vertical movement of the equipment may not be required. The length of vertical travel is unlimited and is dependent upon the design of the equipment used.

A6.5 The standard joint geometry is a simple square groove in a butt joint. Joint geometries other than square grooves in butt joints can be used.

A6.6 Certain classifications can be used with consumable guide tubes. These guide tubes are generally AISI Grades 1008 to 1020 carbon steel tubing. In some applications, the guide tubes are covered with a flux which provides a protective slag and insulates the tube should it contact the side wall or copper backing shoes. Other applications use ceramic fusible insulators in the shape of washers affixed to the tubes. The manufacturer should be consulted for specific recommendations regarding consumable guide tubes.

The effect of the consumable guide tubes is generally to dilute the alloy content of the weld metal. Consumable guide tubes are not classified per this specification; therefore, weld metal strength and toughness should be tested by the user.

A6.7 The specification requires the use of certain base metals for classification purposes. This does not signify any restriction on the application of the process for joining other base metals, but rather to provide a means for obtaining reproducible results. Electrogas welding is a “high-dilution” process, meaning that the base metal forms a significant portion of the weld metal. The type of base metal, especially given the wide variety of available low-alloy structural steels, will influence the mechanical and other properties of the joint and weld procedure qualification tests, as distinguished from filler metal classification tests, should be used for assessing the properties of welds for a given application.

A6.8 Electrogas welding is generally a high-deposition process, especially when applied to thick plates. Since it usually is operated as a single-pass process, the weld metal and heat-affected zones (HAZs) are subject to no subsequent weld thermal cycles, such as is common with conventional multipass arc welding of thick materials. The relatively wide HAZ on thick plates is often characterized by large grains. On these types of applications, the as-welded mechanical properties of the weld and HAZ may, therefore, be somewhat lower than the base metal, and should be adequately tested and evaluated for the intended application.
A7. Description and Intended Use of Electrodes

This specification contains classifications that describe three categories of electrodes: solid electrodes for use with gas shielding, tubular (flux cored or metal cored) electrodes for use with gas shielding, and self-shielded tubular (flux cored) electrodes which require no external gas shielding.

A7.1 Solid Electrodes. The classifications for solid electrodes contained in this specification are very similar in electrode chemical composition to, or, in many cases, identical to electrode chemical composition to classifications contained in AWS A5.18, Specification for Carbon Steel Electrodes and Rods for Gas Shielded Arc Welding, and AWS A5.28, Specification for Low-Alloy Steel Electrodes and Rods for Gas Shielded Arc Welding. The user should be aware that the mechanical properties obtained when using these electrodes with the electrogas welding process will differ from those obtained when using them with the gas metal or gas tungsten arc welding processes.

Weld metal mechanical properties obtained with the use of solid electrodes with the electrogas welding process are very dependent on the type of gas employed. The change from one gas type or blend to another (either more reactive or less reactive) will affect the chemical composition of the weld metal and the resulting mechanical properties. In some cases, this change in mechanical properties may be significant enough to necessitate a change in the electrode classification. For this reason, care should be taken to test the electrode with the gas or gas blend which will be used in production.

A7.2 Tubular Electrodes. The classifications for tubular (flux cored and metal cored) electrodes contained in this specification are based on weld metal chemical composition and the type of, or absence of, an external shielding gas, as shown in Table 4. Once again, it is important for the user to remember that the change from one gas type or blend to another (either more reactive or less reactive) will affect the chemical composition of the weld metal and the resulting mechanical properties.

It should be noted that the EGXXT-1 and EGXXT-2 classifications in this specification are totally different from the EXXT-1 and EXXT-2 classifications contained in AWS A5.20, Specification for Carbon Steel Electrodes for Flux Cored Arc Welding, and AWS A5.29, Specification for Low Alloy Steel Electrodes for Flux Cored Arc Welding.

A7.2.1 EGXXT-1 Classification. Electrodes of the EGXXT-1 (and EGXXXT-1) classifications are self-shielded electrodes which require no external shielding gas. Electrodes of these classifications are designed for the core materials to provide a slag cover, along with the appropriate alloys, deoxidizers, and shielding materials. These often consist of fluorides, metallic alloys, and alkali and alkali earth oxides and carbonates. EGXXT-1 electrodes are designed for welding many structural steels such as ASTM A36, A572, and A515, as well as many grades used in ship construction. Typical applications include bases for heavy equipment, storage tanks, ship hulls, structural members, and pressure vessels.

A7.2.2 EGXXT-2 Classification. Electrodes of the EGXXT-2 (and EGXXXT-2) classifications are gas shielded electrodes designed for use with carbon dioxide shielding gas. Typical applications would be similar to those of EGXXT-1 electrodes, except the use of an external shielding gas would normally confine their use to a wind-protected environment.

A7.2.3 EGXXT-Ni1 Classification. Electrodes of the EGXXT-Ni1 (and EGXXXT-Ni1) classifications are gas shielded electrodes designed for use with carbon dioxide shielding gas. These electrodes are similar to EGXXT-2 electrodes except they produce weld metal with approximately 1% nickel.

A7.2.4 EGXXT-NM1 and -NM2 Classifications. Electrodes of the EGXXT-NM1 (EGXXXT-NM1) and EGXXT-NM2 (EGXXXT-NM2) classifications are gas shielded electrodes designed for use with carbon dioxide shielding gas (or an argon/carbon dioxide blend in the case of EGXXT-NM2). These electrodes produce weld metal alloyed with various levels of nickel and molybdenum.

A7.2.5 EGXXT-W Classification. Electrodes of the EGXXT-W (and EGXXXT-W) classifications are gas shielded electrodes designed for use with carbon dioxide shielding gas. These electrodes produce weld metal which is intended for use on bare exposed applications of weathering steels, such as ASTM A242 and A588.

A7.2.6 EGXXT-G Classification. Electrodes of the EGXXT-G (and EGXXXT-G) classifications are those electrodes not included in the preceding classifications, and for which only mechanical property requirements are specified. The electrode supplier should be consulted for the composition, properties, characteristics, and intended use of electrodes of this classification. (See A2.2 for further information.)
A8. Discontinued Classifications

The classifications shown in Table A.2 have been discontinued over the life of this specification.

A9. General Safety Considerations

A9.1 Safety and health issues and concerns are beyond the scope of this standard and, therefore, are not fully addressed herein. Some safety and health information can be found in Annex Clause A5. Safety and health information is available from other sources, including, but not limited to Safety and Health Fact Sheets, ANSI Z49.1, and applicable regulatory agencies.

A9.2 Safety and Health Fact Sheets. The Safety and Health Fact Sheets are published by the American Welding Society (AWS). They may be downloaded and printed directly from the AWS website at http://www.aws.org. The Safety and Health Fact Sheets are revised, and additional sheets added periodically.

### Table A.2

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Annex B (Informative)

Requesting an Official Interpretation on an AWS Standard

This annex is not part of this standard but is included for informational purposes only.

B1. Introduction

The following procedures are here to assist standard users in submitting successful requests for official interpretations to AWS standards. Requests from the general public submitted to AWS staff or committee members that do not follow these rules may be returned to the sender unanswered. AWS reserves the right to decline answering specific requests; if AWS declines a request, AWS will provide the reason to the individual why the request was declined.

B2. Limitations

The activities of AWS technical committees regarding interpretations are limited strictly to the interpretation of provisions of standards prepared by the committees. Neither AWS staff nor the committees are in a position to offer interpretive or consulting services on (1) specific engineering problems, (2) requirements of standards applied to fabrications outside the scope of the document, or (3) points not specifically covered by the standard. In such cases, the inquirer should seek assistance from a competent engineer experienced in the particular field of interest.

B3. General Procedure for all Requests

B3.1 Submission. All requests shall be sent to the Managing Director, AWS Standards Development. For efficient handling, it is preferred that all requests should be submitted electronically through standards@aws.org. Alternatively, requests may be mailed to:

Managing Director
Standards Development
American Welding Society
8669 NW 36 St, # 130
Miami, FL 33166

B3.2 Contact Information. All inquiries shall contain the name, address, email, phone number, and employer of the inquirer.

B3.3 Scope. Each inquiry shall address one single provision of the standard unless the issue in question involves two or more interrelated provisions. The provision(s) shall be identified in the scope of the request along with the edition of the standard (e.g., D1.1:2006) that contains the provision(s) the inquirer is addressing.

B3.4 Question(s). All requests shall be stated in the form of a question that can be answered ‘yes’ or ‘no’. The request shall be concise, yet complete enough to enable the committee to understand the point of the issue in question. When the point is not clearly defined, the request will be returned for clarification. Sketches should be used whenever appropriate, and all paragraphs, figures, and tables (or annexes) that bear on the issue in question shall be cited.
B3.5 Proposed Answer(s). The inquirer shall provide proposed answer(s) to their own question(s).

B3.6 Background. Additional information on the topic may be provided but is not necessary. The question(s) and proposed answer(s) above shall stand on their own without the need for additional background information.

B4. AWS Policy on Interpretations

The American Welding Society (AWS) Board of Directors has adopted a policy whereby all official interpretations of AWS standards are handled in a formal manner. Under this policy, all official interpretations are approved by the technical committee that is responsible for the standard. Communication concerning an official interpretation is directed through the AWS staff member who works with that technical committee. The policy requires that all requests for an official interpretation be submitted in writing. Such requests will be handled as expeditiously as possible, but due to the procedures that must be followed, some requests for an official interpretation may take considerable time to complete.

B5. AWS Response to Requests

Upon approval by the committee, the interpretation is an official interpretation of the Society, and AWS shall transmit the response to the inquirer, publish it in the Welding Journal, and post it on the AWS website.

B6. Telephone Inquiries

Telephone inquiries to AWS Headquarters concerning AWS standards should be limited to questions of a general nature or to matters directly related to the use of the standard. The AWS Board Policy Manual requires that all AWS staff members respond to a telephone request for an official interpretation of any AWS standard with the information that such an interpretation can be obtained only through a written request. Headquarters staff cannot provide consulting services. However, the staff can refer a caller to any of those consultants whose names are on file at AWS Headquarters.
### AWS Filler Metal Specifications by Material and Welding Process

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