Designation: A 994 – 98

Standard Guide for Editorial Procedures and Form of Product Specifications for Steel, Stainless Steel, and Related Alloys[1]

This standard is issued under the fixed designation A 994; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This guide covers the editorial form and style for product specifications under the jurisdiction of ASTM Committee A-1.

NOTE 1—For standards other than product specifications, such as test methods, practices, and guides, see the appropriate sections of *Form and Style for ASTM Standards* (Blue Book).[2]

1.2 Subcommittees preparing new product specifications or revising existing ones should follow the practices and procedures outlined herein, and be guided by the latest specification covering similar commodities.

1.3 This guide has been prepared as a supplement to the current edition of the Blue Book, and is appropriate for use by the subcommittees to Committee A-1. This guide is to be applied in conjunction with the Blue Book.

1.4 If a conflict exists between this guide and the mandatory sections of the current edition of the Blue Book, the Blue Book requirements have precedence. If a conflict exists between this guide and the nonmandatory sections of the current edition of the Blue Book, the guide has precedence.

2. Referenced Documents

2.1 *ASTM Standards:*

A 370 Test Method and Definitions for Mechanical Testing of Steel Products[3,4]

A 488/A 488M Practice for Steel Castings, Welding, Qualification of Procedures and Personnel[5]

A 700 Practices for Packaging, Marking, and Loading Methods for Steel Products for Domestic Shipment[6]

A 751 Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products[3,4]

A 941 Terminology Relating to Steel, Stainless Steel, Related Alloys, and Ferroalloys[4]

E 6 Terminology Relating to Methods of Mechanical Testing[7]

E 1282 Guide for Specifying the Chemical Compositions and Selecting Sampling Practices and Quantitative Analysis Methods for Metals and Alloys[8]

2.2 *ASME Standard:*

Boiler and Pressure Vessel Code, Section IX, Welding and Brazing Qualifications[9]

2.3 *Military Standard:*

MIL-STD-163, Steel Mill Products, Preparation for Shipment and Storage[10]

2.4 *Federal Standard:*

Fed. Std. No. 123, Marking for Shipments (Civil Agencies)[10]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard*:

3.1.1 For definitions of terms used in this guide, refer to the Blue Book, Terminology A 941, and Terminology E 6.

4. Significance and Use

4.1 The Blue Book provides mandatory requirements and recommended practices for the preparation and content of ASTM specifications. In order to promote consistency in the style and content of product specifications under its jurisdiction, Committee A-1 recognizes the need to provide a supplementary document pertaining to the types of products and materials covered by those specifications.

4.2 This guide contains a list of sections to be considered for inclusion in a specification for steel, stainless steel, and related alloy products, and guidance or recommended wording, or both, for such sections.

[1] This guide is under the jurisdiction of ASTM Committee A-1 on Steel, Stainless Steel, and Related Alloys and is the direct responsibility of Subcommittee A01.91 on Editorial.

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[2] Available from ASTM Headquarters, 100 Barr Harbor Drive, West Conshohocken, PA 19428.

[3] *Annual Book of ASTM Standards*, Vol 01.03.

[4] *Annual Book of ASTM Standards*, Vol 01.01.

[5] *Annual Book of ASTM Standards*, Vol 01.02.

[6] *Annual Book of ASTM Standards*, Vol 01.05.

[7] *Annual Book of ASTM Standards*, Vol 03.01.

[8] *Annual Book of ASTM Standards*, Vol 03.06.

[9] Available from American Society of Mechanical Engineers (ASME), 345 E. 47th St., New York, NY 10017.

[10] Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Phila., PA 19111-5094, Attn: NPODS.

4.3 It is expected that persons drafting new product specifications under the jurisdiction of Committee A-1, or modifying existing ones, will follow the mandatory requirements of the Blue Book and this guide.

5. Subject Headings of Text

5.1 The various sections of a Committee A-1 product specification should be arranged in the following order. Not all of these sections will appear in every specification; however, those used should be listed in the order given. In some cases, a specification may require the addition of a section or sections not listed, in which case they should be inserted in the specification so as to preserve the logical sequence of sections, insofar as possible.

5.2 When only one requirement is used in a section having multiple possible subheadings, that requirement becomes the section heading (for example, Tension Test instead of Mechanical Properties).

- Title
- Designation
- Scope
- Referenced Documents
  - ASTM Standards
  - Other Documents
- Classification
- Terminology
- Ordering Information
- General Requirements
- Materials and Manufacture
  - Melting Practice
  - Mechanical Working Practice
  - Heat Treatment
  - Welding
  - Coatings
- Chemical Composition
  - Heat Analysis
  - Product Analysis
  - Methods of Analysis
- Metallurgical Requirements
  - Grain Size
  - Decarburization
  - Etch Test
  - Micro-cleanliness
  - Hardenability
  - Corrosion Resistance
- Physical Properties
  - Electrical Resistivity
  - Thermal Conductivity
- Mechanical Properties
  - Tension Test
  - Hardness Test
  - Impact Test
  - Bend Test
  - Flattening Test
  - Flange Test
  - Flare Test
  - Proof Load Test
  - Wrap Test
  - Crush Test
  - Coiling Test
- Pressure Test Requirements
  - Hydrostatic Test
  - Air-Under-Water Test
- Nondestructive Test Requirements
  - Magnetic Particle Test
  - Liquid Penetrant Test
  - Radiographic Test
  - Ultrasonic Test
  - Eddy Current Test
  - Flux Leakage Test
- Other Test Requirements
- Dimensions, Mass, and Permissible Variations
  - Flatness
  - Straightness
  - Out-of-roundness
  - Camber
  - Bowing
  - Mating
  - Length
  - Diameter
  - Thickness
- Workmanship, Finish, and Appearance
  - Surface Finish
  - Edges
  - End Finish
- Rework, Retreatment, and Weld Repair
- Sampling
- Number of Tests, Retests, and Resampling
- Specimen Preparation
- Test Methods and Analytical Methods
- Inspection
- Rejection and Rehearing
- Certification
- Product Identification
- Packaging, Marking, and Loading for Shipment
- Keywords
- Supplementary Requirements
- Annexes and Appendixes

6. Section Contents

6.1 *Title*:

6.1.1 The title should be as concise as possible, but complete enough to identify clearly the product covered by the specification. Titles are also used in lists, table of contents, and indexes, and it is most important that they be brief but self-explanatory.

6.1.2 Two methods for establishing wording are considered acceptable and are at the option of the subcommittee.

6.1.3 One is to word as in ordinary conversation with the adjectives first as is normal in the English language. For example, “Standard Specification for Hot-Worked, Hot-Cold-Worked, and Cold-Worked Alloy Steel Plate, Sheet, and Strip for High Strength at Elevated Temperatures.” A general scheme for generating titles with this format is:

6.1.3.1 Type of document: “Standard Specification for,”

6.1.3.2 Special treatment of the material, if any: “quenched and tempered,” “hot-rolled,” “seamless,” “welded,” etc.,

6.1.3.3 Material type based on chemical composition: “carbon,” “high-strength low-alloy,” “austenitic stainless,” etc.,

6.1.3.4 “Steel,”

6.1.3.5 Product form: “bars,” “pressure vessel plate,” “casting,” “sheet and strip,” etc.,

6.1.3.6 Special quality of the product, if any: “with improved toughness,” “with mechanical property requirements,” “of commercial quality,” etc., and

6.1.3.7 Specific application or use of the product, if any: “for machine parts,” “for valves,” “for low temperature,” “for general use,” “for corrosive service,” etc.

6.1.4 The key word in order of importance concept for specification titles is preferred by many subcommittees because it facilitates accurate indexing and provides rapid identification of specification subject matter. For example, “Standard Specification for Steel Plate, Sheet, and Strip, Alloy, Hot-Worked, Hot-Cold-Worked, and Cold-Worked, for High Strength at Elevated Temperatures.” A general scheme for developing a title with this format is:

6.1.4.1 Type of document: “Standard Specification for,”

6.1.4.2 "Steel,"

6.1.4.3 Product form: "bars," "pressure vessel plate," "casting," "sheet and strip," etc.,

6.1.4.4 Material type based on chemical composition: "carbon," "high-strength low-alloy," "austenitic stainless," etc.,

6.1.4.5 Special treatment of the material, if any: "quenched and tempered," "hot-rolled," "seamless," "welded," etc.,

6.1.4.6 Special quality of the product, if any: "with improved toughness," "with mechanical property requirements," "commercial quality," etc., and

6.1.4.7 Specific application or use of the product, if any: "for machine parts," "for valves," "for low temperature," "for general use," "for corrosive service," etc.

6.1.5 The use of temperature categories in the titles of specifications should be avoided. When a subcommittee determines that temperature categories must be used in the title of a specific standard, numerical temperature ranges should not be used; the establishment of limits on the use of materials is not the responsibility of Committee A-1. When a subcommittee determines that a temperature category must be used in a title, one of the following should be selected: cryogenic, low, ambient, moderate, elevated, or high.

6.2 *Scope*:

6.2.1 When the specification covers multiple grades, classes, types, or combinations thereof, this should be stated in a separate section in the scope. The subdivision grade should be based upon chemical composition, a mechanical property, or application of the product. Further subdivision should be by class, based on some pertinent property or properties, and identified by arabic numbers. The subdivision type should be based on some major property, such as manufacture, product form, or generic classification. The precedence of grade, class, and type is the A-1 preferred style, and it should be used in the absence of any established preference.

6.2.2 In a general requirements specification, the scope should contain the following, or a similar, statement:

> In the case of conflict between a requirement of a product specification and a requirement of this specification, the product specification shall prevail. In the case of conflict between a requirement of the product specification or a requirement of this specification and a more stringent requirement of the purchase order, the purchase order shall prevail. The purchase order requirements shall not take precedence if they, in any way, violate the requirements of the product specification or this specification; for example, by the waiving of a test requirement or by making a test requirement less stringent.

6.2.3 *Temperature Categories*:

6.2.3.1 Temperature categories should not be used in the scopes of specifications, because that use may mislead users of standards by creating an implication that the scope reflects engineering judgment on the temperature suitability of products for specific applications. The establishment of temperature limitations on the use of materials is the responsibility of code committees.

6.2.3.2 When a subcommittee determines that temperature categories must be used in a specific standard, numerical temperature ranges should not be used. The categories should be limited to the following: cryogenic, low, ambient, moderate, elevated, or high.

6.2.3.3 When a temperature category is used in the scope of a standard, the scope must cite the property or properties of the specified material that explain the selection of the temperature category with a statement such as:

> Elevated temperatures are temperatures in the range where creep and stress rupture properties are important for the steels in this specification.
>
> Low (or cryogenic) temperatures are temperatures where fracture toughness is important.

6.2.4 Definitions of the various product forms should be addressed in the section on Terminology, rather than in the Scope section.

6.3 *Terminology*— The standards to which the Terminology section should refer for definitions of terms are as follows:

6.3.1

> A 941 Terminology Relating to Steel, Stainless Steel, Related Alloys, and Ferroalloys
>
> E 6 Terminology Relating to Methods of Mechanical Testing

6.4 *Ordering Information*:

6.4.1 In general, the following statement should appear in the Ordering Information section:

> It shall be the responsibility of the purchaser to specify all requirements that are necessary for product under this specification. Such requirements to be considered include, but are not limited to, the following:

6.4.2 This statement should be followed by a list of the appropriate items to be shown in the purchase order to adequately describe the product to be supplied under the specification. Each item should contain a parenthetical reference to the number of the appropriate part of the specification to which the item applies, to the extent possible and practicable. Typically, the list would include:

6.4.2.1 Quantity (mass, length, or number of pieces),

6.4.2.2 Name of material,

6.4.2.3 ASTM specification designation and year of issue to which the product is to be furnished and be certified as meeting,

6.4.2.4 Condition (hot rolled, cold rolled, cold drawn, annealed, heat treated),

6.4.2.5 Grade, class, and type designations,

6.4.2.6 Dimensions,

6.4.2.7 Shape and finish characteristics,

6.4.2.8 Requirements for certifications and for reporting chemical analyses and test results, and

6.4.2.9 Supplementary or other special requirements.

6.5 *General Requirements*:

6.5.1 When a general requirements specification exists for the product specification under consideration, the product specification should contain a General Requirements section, if the general requirements specification is to apply in whole or in part.

6.5.2 Appropriate wording for a General Requirements section is as follows:

> Product furnished to this specification shall conform to the requirements of Specification A xxx/A xxxM, including any supplementary requirements that are indicated in the purchase order. Failure to comply with the general requirements of Specification A xxx/A xxxM constitutes nonconformance with this specification. In case of conflict between the requirements of this specification and Specification A xxx/A xxxM, this specification shall prevail.

6.6 *Materials and Manufacture*:

6.6.1 This section addresses such issues as melting, refining, and casting practices; mechanical working requirements; fabrication practices; heat treatment; and surface finishing.

6.6.2 Unless technical considerations dictate otherwise, restrictions should not be placed on manufacturing practices.

6.6.3 When lengthy sections are required describing annealing, heat treating, or other processing, they should be specified in a separate major heading; for example: "8. Heat Treatment."

6.6.4 This section should state briefly the general requirements of the starting materials to be used. Reference appropriate ASTM specifications, if available, and, if appropriate, the process to be followed in manufacture.

6.6.5 When welding is involved in the fabrication of the material or product specified, or to bring a product to the specification requirements, it is necessary to define the processes and procedures that are permitted, either in this section or by reference to other codes and standards. The appropriate process and procedure qualifications may be determined by the intended end use of the part. For example, for castings that are not intended for use under the ASME Boiler and Pressure Vessel Code, procedures and welders shall be qualified under Practice A 488/A 488M. For castings that are intended for use under the ASME Boiler and Pressure Vessel Code, procedures and welders shall be qualified under Section IX of that code.

6.7 *Chemical Composition*:

6.7.1 When limits on chemical composition are required, the section should be stated substantially as, "The steel shall conform to the requirements prescribed in Table X."

6.7.2 This section should include detailed requirements of the chemical composition to which the steel must conform. These requirements should be listed in tabular form and include:

6.7.2.1 Name of each element spelled out,

6.7.2.2 Maximum, minimum, or range for each element,

6.7.2.3 The units applicable (percent or ppm),

6.7.2.4 The UNS number (if available) or common name for each grade of steel, or both, and

6.7.2.5 References to explanatory notes, when applicable.

6.7.3 The preferred order for listing elements for carbon and alloy steels is as follows:

Carbon
Manganese
Phosphorus
Sulfur
Silicon
Nickel
Chromium
Molybdenum
Copper
Titanium
Vanadium
Boron
Columbium (Niobium)
Columbium + Tantalum
Tantalum
Cobalt
Selenium
Lead
Nitrogen
Others alphabetically

6.7.4 The preferred order for listing elements for stainless steels is as stated in 6.7.3, except list chromium before nickel, nitrogen before copper, and columbium (niobium) before titanium.

6.7.5 *Significant Figures*:

6.7.5.1 It is recommended that Guide E 1282 be consulted as a guide for specifying the chemical compositions for steels.

6.7.5.2 It is recommended that for specifying chemical composition limits the number of figures for each element to the right of the decimal point does not exceed the following:

Chemical Concentration	Composition Limits
Up to 0.010 %	0.XXXX
0.010 to 0.10 %	0.XXX
0.10 to 3.00 %	X.XX
Over 3.00 %	X.X

NOTE 2—This recommendation should be used to reduce the number of significant figures, such as from 18.00 to 18.0 %; however a significant figure should not be added unless there is a technical reason for so doing.

6.7.5.3 For those cases in which the composition range spans 0.010, 0.10, or 3.00 %, the number of figures to the right of the decimal point is to be determined by that indicated by the upper limit of the range.

6.7.5.4 Technical considerations may dictate the employment of less than the maximum number of figures to the right of the decimal point as previously recommended.

6.7.6 A product analysis may be required or be optional in a product specification. When permissible variations for product analysis are included, the following language is recommended:

> The chemical composition determined by product analysis shall conform to the composition limits of Table X, within the permissible variations listed in Table Y.

6.7.7 The section on methods and practices for chemical analysis should be worded as follows:

> Methods and practices relating to chemical analysis shall be in accordance with Test Methods, Practices, and Terminology A 751.

6.8 *Mechanical Properties*:

6.8.1 This section should include separate sections, where applicable, for tests such as tension, hardness, and impact. The heading "Mechanical Properties" will be used only when two or more properties are specified. When only one property is specified, the section will be given the heading for the specific test, such as "Tension Test" or "Hardness Test."

6.8.2 Each section should include information on general requirements, including, but not limited to, number of samples, sample location (for example, width, length, thickness), specimen orientation, specimen size and shape (when relevant), and retest provisions.

6.8.3 *Test Methods*: