ASME Y14.100-2004

(Revision of ASME Y14.100-2000)

Engineering Drawing Practices

Engineering Drawing and Related Documentation Practices

AN AMERICAN NATIONAL STANDARD



The American Society of Mechanical Engineers

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(Project DRPR-0361)

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Date of Issuance: September 6, 2005

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FOREWORD

This Standard establishes engineering drawing practices and ties together the engineering drawing and related documentation practices in the Y14 series. It is not the intent of this Standard to be a stand-alone document for the purpose of addressing basic practices. An accurate perception of engineering drawing practices is derived by treating ASME Y14.100, ASME Y14.24, ASME Y14.34M, and ASME Y14.35M as a composite set.

This Standard is a revision of ASME Y14.100-2000, Engineering Drawing Practices. The revision of this Standard was initiated after the official release of ASME Y14.100M-2000. The initial attempt to convert the DoD drawing practices standard, MIL-STD-100, to a nongovernment standard resulted in two drawing practices standards: ASME Y14.100M-1998, which consisted of basic practices common to DoD and industry, and MIL-STD-100G, which consisted of those practices and requirements unique to DoD. The impact on the community was that judgments on when to use which standard as a stand-alone or in combination were causing a good deal of confusion. Accordingly, the realization of the problems presented by the existence of two basic drawing practices standards is the basis for the issue of this revision. The consensus was that one standard was needed. To accomplish this, this Standard contains appendices that may be invoked and tailored by DoD, thereby making possible the cancellation of MIL-STD-100.

Changes contained in this revision are intended to improve standardization and harmonize practices and methodology between industry and government. The following is a summary of the significant differences between ASME Y14.100-2000 and this revision:

(a) Section 3 — added the reference to ASME Y14.34 to the definition for *associated lists*;

(b) Section 3 — added a definition for *Notes (flag, general, local)*;

(c) Para. 6.5 — deleted paras. 6.5 and 6.5.1 and replaced with the following new paras.:

(1) 6.5, Drawing Identification and Ownership

(2) 6.5.1, Drawing Identification

(3) 6.5.1.1, Design Activity Identification

(4) 6.5.2, Drawing Ownership, Current or Original Design Activity

(5) 6.5.2.1, Transferring Design Responsibility to Another Activity

(d) Added a new Fig. 1, Drawing Notations Indicating a Transfer of Design Responsibility;

(e) Renumbered remaining figures appropriately;

(f) Added new para. 7.6.1 and renumbered remaining para. 7.6.1 to 7.6.2;

(g) Para. 7.11, deleted reference to Fig. 4;

(h) Fig. 2, deleted two of the ESD Symbols leaving only the hand ESD Symbol;

(i) Deleted old Fig. 4, Location of CAD-Generated Drawing Note;

(j) Para. D9.8, corrected 15-character PIN to 32-character PIN; and

(k) Para. D9.9.1, Parent or Corporate CAGE Code — clarified the sentence to indicate that when a drawing remains within the jurisdiction of a corporate or parent entity, there is no requirement for drawing revision to indicate design activity transfer.

It is not the intent of this Standard to prevent individual organizations from designing specific drawing practices that meet their individual needs but rather to provide common engineering delineation standards to aid the increasing interchange of drawings between industry, government, and other users. It is well recognized that individual companies have many detailed requirements for their specific method of operation. Consequently, the minimum requirements set forth in this Standard will provide them flexibility in implementation. The appendices are intended for use by other than strictly commercial organizations, such as DoD; however, nothing prevents commercial organizations from using the appendices and tailoring them as necessary to meet their own needs.

The successful revision of this Standard is attributed to the subcommittee members and their respective companies and the department and agencies of the U.S. government.

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Suggestions for improvement of this Standard are welcome and should be sent to The American Society of Mechanical Engineers; Attention: Secretary, Y14 Main Committee; Three Park Avenue, New York, NY 10016-5990.

This revision was approved as an American National Standard on September 9, 2004.

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Engineering Drawing and Related Documentation Practices

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ENGINEERING DRAWING PRACTICES

1 GENERAL

1.1 Scope

This Standard establishes the essential requirements and reference documents applicable to the preparation and revision of engineering drawings and associated lists. It is essential that this Standard be used in close conjunction with ASME Y14.24, ASME Y14.34M, and ASME Y14.35M.

1.2 Application

Application of this Standard may necessitate tailoring to exclude unnecessary requirements. A tailoring guide, Nonmandatory Appendix A, has been included for that purpose.

1.3 Figures

The figures in this Standard are intended only as illustrations to aid the user in understanding the practices described in the text. In some cases, figures show a level of detail as needed for emphasis. In other cases, figures are incomplete to illustrate a concept or facet thereof. The absence of figures has no bearing on the applicability of the stated requirement or practice.

1.4 Notes

Notes depicted in this Standard in capital letters are intended to reflect actual drawing entries. Notes in lowercase letters are to be considered supporting data to the contents of this Standard and are, therefore, not intended for literal entry on drawings.

2 REFERENCES

The following is a list of publications referenced in this Standard. When the following American National Standards referred to in this Standard are superseded by a revision approved by the American National Standards Institute (ANSI), the revision shall apply.

ANSI Y14.7.1, Gear Drawing Standards — Part 1: For Spur, Helical, Double Helical, and Rack
ANSI Y14.7.2, Gear and Spline Drawing Standards — Part 2: Bevel and Hypoid Gears
ANSI Y14.13M, Mechanical Spring Representation
ANSI Y32.10, Graphic Symbols for Fluid Power Diagrams

Publisher: The American Society of Mechanical Engineers (ASME), Three Park Avenue, New York, NY 10016-5990; Order Department: 22 Law Drive, P.O. Box 2900, Fairfield, NJ 07007-2900

ANSI/AIIM MS4, Flowchart Symbols and Their Use in Micrographics

Publisher: Association for Information and Image Management (AIIM), 1100 Wayne Avenue, Silver Spring, MD 20910

ANSI/AWS A2.4, Standard Symbols for Welding, Brazing, and Nondestructive Examination
ANSI/AWS A3.0, Welding Terms and Definitions, Including Terms for Brazing, Soldering, Thermal Spraying, and Thermal Cutting

Publisher: American Welding Society (AWS), 550 NW Le Jeune Road, Miami, FL 33135

ANSI/IEEE 91, Graphic Symbols for Logic Functions
ANSI/IEEE 200, Reference Designations for Electrical and Electronic Parts and Equipment
ANSI/IEEE 260.1, Letter Symbols for Units of Measurement (SI Units, Customary Inch-Pound Units, and Certain Other Units)
ANSI/IEEE 260.3, Mathematical Signs and Symbols for Use in Physical Sciences and Technology
ANSI/IEEE 268, Standard Metric Practice
ANSI/IEEE 280, Letter Symbols for Quantities Used in Electrical Science and Electrical Engineering (Same as ANSI Y10.5)
ANSI/IEEE 315a, Supplement to Graphic Symbols for Electrical and Electronics Diagrams
ANSI/IEEE 991, Logic Circuit Diagrams

Publisher: Institute of Electrical and Electronics Engineers (IEEE), 445 Hoes Lane, Piscataway, NJ 08855

ANSI/IPC D-350, Printed Board Description in Digital Form
ANSI/IPC T-50F, Terms and Definitions for Interconnecting and Packaging Electronic Circuits

Publisher: Institute for Interconnecting and Packaging Electronic Circuits (IPC), 2215 Sanders Road, Northbrook, IL 60062

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ASME B46.1, Surface Texture (Surface Roughness, Waviness, and Lay)
ASME Y14.1, Decimal Inch Drawing Sheet Size and Format
ASME Y14.1M, Metric Drawing Sheet Size and Format
ASME Y14.2M, Line Conventions and Lettering
ASME Y14.3, Multiview and Sectional View Drawings
ASME Y14.4M, Pictorial Drawings
ASME Y14.5M, Dimensioning and Tolerancing
ASME Y14.6, Screw Thread Representation
ASME Y14.8M, Castings and Forgings
ASME/ANSI Y14.18M, Optical Parts
ASME Y14.24, Types and Applications of Engineering Drawings
ASME Y14.34M, Associated Lists
ASME Y14.35M, Revision of Engineering Drawings and Associated Documents
ASME Y14.36M, Surface Texture Symbols
ASME Y14.38, Abbreviations and Acronyms
ASME Y32.2.6, Graphic Symbols for Heat-Power Apparatus

Publisher: The American Society of Mechanical Engineers (ASME), Three Park Avenue, New York, NY 10016-5990; Order Department: 22 Law Drive, P.O. Box 2900, Fairfield, NJ 07007-2900

ASTM E 380, Standard Practice for the Use of the International System of Units (SI)
ASTM F 856, Standard Practice for Symbols — Heating, Ventilation, and Air Conditioning (HVAC)
ASTM F 1000, Standard Practice for Piping Systems Drawing Symbols

Publisher: American Society for Testing and Materials (ASTM), 100 Barr Harbor Drive, West Conshohocken, PA 19428

EIA 632, Processes for Engineering a System

Publisher: Electronic Industries Alliance (EIA), 2500 Wilson Blvd., Arlington, VA 22201

IEEE 91a, Supplement to Graphic Symbols for Logic Functions
IEEE 315, Graphic Symbols for Electrical and Electronics Diagrams

Publisher: Institute of Electrical and Electronics Engineers (IEEE), 445 Hoes Lane, Piscataway, NJ 08855

IPC D-325, Documentation Requirements for Printed Boards, Assemblies, and Support Drawings
IPC 2221, Generic Standard on Printing Wiring Board Design

Publisher: Institute for Interconnecting and Packaging Electronic Circuits (IPC), 2215 Sanders Road, Northbrook, IL 60062

SAE AS 1290, Graphic Symbols for Aircraft Hydraulic and Pneumatic Systems

Publisher: Society of Automotive Engineers (SAE), 400 Commonwealth Drive, Warrendale, PA 15096

3 DEFINITIONS

acceptance: the act of an authorized representative of the receiving activity to accept ownership of supplies tendered, or approve specific services rendered, as partial or complete performance of the contract.

altered item: an existing item, under the control of another design activity or defined by a nationally recognized standardization document, that is subject to alteration to meet the design requirements.

assembly: a number of parts or combination thereof that are joined together to perform a specific function and subject to disassembly without degradation of any of the parts (e.g., power shovel-front, fan assembly, audio-frequency amplifier).

NOTE: The distinction between an assembly and a subassembly is determined by individual application. An assembly in one instance may be a subassembly in another instance where it forms a portion of a higher assembly.

associated list: a tabulation of engineering information pertaining to an item depicted on an engineering drawing or by a set of drawings (e.g., parts, data, index, wire, and application lists). (ASME Y14.34M)

bulk items: those constituents of an assembly or part (such as oil, wax, solder, cement, ink, damping fluid, grease, flux, welding rod, twine, or chain) that satisfy one or more of the following criteria: the quantity required cannot readily be predetermined; the physical nature of the material is such that it is not adaptable to pictorial representation; the finished size is obtainable through use of such tools as shears, pliers, or knives, without further machining operation; and the final configuration is such that it can be described in writing without the necessity of pictorial representation.

Commercial and Government Entity (CAGE) Code: a five-character code that provides a unique activity identifier used by the government for activity identification. This method of activity identification has also been widely adopted by industry; CAGE Codes are listed in Cataloging Handbook H4/H8. Cataloging Handbook H4/H8 is available at the Defense Logistics Services Center, DLSC-USS, Federal Center, 74N Washington Ave. N, Ste 7, Battle Creek, MI 49017-3084.

contract: a mutually binding legal relationship obligating the seller to furnish the supplies or services (including construction) and buyer to pay for them. It includes all types of commitments that obligate the procuring activity to an expenditure of appropriated funds and that, except as otherwise authorized, are in writing. In addition to bilateral instruments, contracts include, but are not limited to, awards and notices of awards; job orders or task letters issued under basic ordering agreements; letter contracts; orders, such as purchase orders, under which the contract becomes effective by written acceptance or performance; and bilateral contract modifications.

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contractor: an individual, partnership, company, corporation, association, or other service having a contract for the design, development, manufacture, maintenance, modification, or supply of items under the terms of a contract.

copy: any reproduction or duplication, in any media, of an original.

critical safety characteristic: any feature, such as tolerance, finish, material composition, manufacturing, assembly, or inspection process or product that, if nonconforming or missing, could cause the failure or malfunction of the critical safety item.

Critical Safety Item (CSI): a part, assembly, installation, or production system with one or more critical characteristics that, if not conforming to the design data or quality requirements, would result in an unsafe condition.

design activity: an organization that has, or has had, responsibility for the design of an item.

current design activity: the design activity currently responsible for the design of an item. This may be the original design activity or a design activity to which the design responsibility has been transferred.

original design activity: the design activity originally responsible for the design and identification of an item whose drawing number and activity identification is shown in the title block of the drawings and associated documents.

design activity identification: the application of a unique identifier that distinguishes an activity or organization from another activity or organization. Examples of activity identification include activity name, activity address, or CAGE Code.

digital data: data stored on a computer system that employs a display on which the user and the computer interact to create or alter entities for the production of layouts, drawings, numerical control tapes, or other engineering data.

document: a term applicable to the specifications, drawings, lists, standards, pamphlets, reports, and printed, typewritten, or otherwise created information relating to the design, procurement, manufacture, testing, or acceptance inspection of items or services.

drawing: an engineering document or digital data file(s) that discloses (directly or by reference), by means of graphic or textual presentations, or by combinations of both, the physical or functional requirements of an item.

drawing format: the arrangement and organization of information within a drawing. This includes such features as the size and arrangement of blocks, notes, lists, and revision information and use of optional or supplemental blocks.

duplicate original: a replica of an engineering drawing created to serve as the official record of the item when the original has been lost.

engineering data: engineering documents such as drawings, associated lists, accompanying documents, specifications, standards, or other information prepared or used by a design activity and relating to the design, manufacture, procurement, testing, or inspection of items.

functionally required hardware: hardware included in system design to satisfy any requirement other than nuclear hardening.

Hardness Critical Item (HCI): an item of hardware or software that satisfies one or more of the following conditions: functionally required hardware whose response to the specified nuclear environments could cause degradation in system survivability unless additional provisions for hardness are included in the item specification, design, manufacture, item selection process, provisioning, configuration control, etc.; functionally required hardware or software that inherently provides protection[1] for the system or any of its elements against the specified nuclear environments and that, if modified, removed, or replaced by an alternate design could cause a degradation in system survivability; hardness dedicated hardware or software included in the system solely to achieve system nuclear survivability requirements; hardware items (at the level of application) to which a Hardness Critical Process (HCP) is applied; and/or, a subassembly or higher level of assembly that contains one or more HCIs.

Hardness Critical Process (HCP): any fabrication, manufacturing, assembly, installation, maintenance, repair, or other process or procedure that implements a hardness design feature and satisfies system hardness requirements.

inseparable assembly: same as *part*

interchangeable item: an item that possesses functional and physical characteristics equivalent in performance to another item of similar or identical purposes, and is capable of being exchanged for the other item without selection for fit or performance, and without alteration of the items themselves or of adjoining items, except for adjustment.

item: a nonspecific term used to denote any unit or product including materials, parts, assemblies, equipment, accessories, and computer software.

item identification: the part, identifying number, or descriptive identifier for a specific item along with the original design activity identification.

master drawing: a document that shows the dimensional limits or grid locations applicable to any or all parts of

[1] For example, the item was not designed for its nuclear weapon response but has the intrinsic capability to perform adequately in the specified nuclear environments. This definition includes items whose design is modified to provide for nuclear survivability of other items, but not to provide for their own survivability.

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a rigid or flexible printed board, including the arrangements of conductive and nonconductive patterns or elements, size, type, and location of holes; and any other information necessary to describe the product to be fabricated (see IPC T-150).

nationally recognized standard: a specification or standard issued with the intent to establish common technical requirements. Such standards are developed by or for a govermment activity or by a nongovernmental organization (see ASME Y14.24).

nongovernmental organization: a private sector association, organization, or technical society that conducts professional standardization activities (e.g., the planning, developing, establishing, or publicly coordinates standards, specifications, handbooks, or related documents) and is not organized for profit.

nonpart drawing: an engineering drawing that provides requirements, such as procedures or instructions, applicable to an item when it is not convenient to include this information on the applicable part drawing (e.g., a test requirements drawing or logic diagram).

notes: textual information that further delineates the requirements of the item represented.

flag: apply only at specific areas or points on a drawing or associated lists.

general: apply to the entire drawing or associated list.

local: apply only to the areas or points indicated.

Observable Critical Item (OCI): any part or material specifically designed, selected, or qualified to meet specified observable requirements.

Observable Critical Process (OCP): any fabrication, manufacturing, assembly, installation, maintenance, and repair or other process or procedure that implements an observable design and satisfies observable system requirements.

original: the current design activity's drawing on which the official revision record is kept.

part: one item, or two or more items joined together, that is not normally subject to disassembly without destruction or impairment of designed use (e.g., transistor, composition resistor, screw, transformer, and gear).

Part or Identifying Number (PIN): the identifier assigned by the original design activity, or by the controlling nationally recognized standard, that uniquely identifies (relative to that design activity) a specific item.

procuring activity: the customer.

product: includes materials, parts, components, subassemblies, assemblies, and equipment. The term product whenever used in this document shall also encompass a family of products.

family of products: all products of the same classification, design, construction, material, type, etc., produced with the same production facilities, processes, and quality of material, under the same management and quality controls, but having the acceptable variety of physical and functional characteristics defined and specified in the applicable engineering documentation.

production master: a 1-to-1 scale pattern that is used to produce one or more rigid or flexible printed boards within the accuracy specified on the master drawing (see ANSI/IPC T-50F).

referenced documents: design activity standards, drawings, specifications, or other documents referenced on drawings or lists.

specification: a document that describes essential technical requirements for material and the criteria for determining whether those requirements are met.

standard: a document that establishes technical criteria, methods, processes, and practices.

company standard: a document produced by a company that establishes engineering and technical limitations and applications for items, materials, processes, methods, designs, and engineering practices unique to that particular company.

standardization document: a document developed for the purpose of standardizing items, materials, processes, or procedures.

subassembly: two or more parts that form a portion of an assembly or a unit replaceable as a whole but having a part or parts that are individually replaceable [e.g., gun mount stand, window sash, recoil mechanism, floating piston, telephone dial, Intermediate Frequency (IF) strip, terminal board with mounted parts].

symmetrically opposite parts: those parts that are mirror images of each other.

system (general): a composite of equipment, skills, and techniques capable of performing or supporting an operational role or both. A complete system includes all equipment, related facilities, material, software, services, and personnel required for its operation and support to the degree that it can be considered a self-sufficient unit in its intended operational environment.

tailoring: the process by which the requirements of specifications, standards, and related documents are modified to be suitable for a specific application or project (see EIA-632).

unit: an assembly or any combination of parts, subassemblies, and assemblies mounted together normally capable of independent operation in a variety of situations (e.g., hydraulic jack, electric motor, electronic power supply, internal combustion engine, electric generator, radio receiver).

NOTE: The size of an item is a consideration in some cases. An electric motor for a clock may be considered as a part because it is not normally subject to disassembly.

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4 GENERAL DRAWING PRACTICES

This paragraph establishes the essential general requirements for the preparation of engineering drawings and associated lists.

4.1 Nonmandatory Appendix B — Noncommercial Drawing Practices

Additional requirements for the preparation of engineering drawings that are intended for other than commercial applications are detailed in Nonmandatory Appendix B.

4.2 Types and Application of Engineering Drawings

Hardware and software drawings shall be in accordance with ASME Y14.24.

4.3 Associated Lists

Associated lists shall be in accordance with ASME Y14.34M.

4.4 Revisions of Engineering Drawings and Associated Lists

Revisions of engineering drawings and associated lists shall be in accordance with ASME Y14.35M.

4.5 Size and Format of Engineering Drawings

4.5.1 Metric. Metric drawing sheet sizes and format shall be in accordance with ASME Y14.1M.

4.5.2 Decimal Inch. Decimal inch drawing sheet sizes and format shall be in accordance with ASME Y14.1.

4.6 Application Data

When used, application data with "Next Assembly" and "Used On" columns are required for drawings whose detail part or assembly depicted thereon is for an element of a larger item. The "Next Assembly" ("NEXT ASSY") column shall show the drawing number(s), part, or identifying number (PIN) of the next higher assembly(ies) to which the drawing applies. The "Used On" ("USED ON") column shall show the model number or equivalent designator of the assembled unit(s) of which the part is an element. The application data shall be located near the title block on sheet 1, or placed on a separate referenced document, or provided on a separate parts list. When the application data appears on a separate referenced document, a cross reference note shall be included on each parent drawing to indicate that a separate referenced document is available. When application data is included on a separate parts list, the note required by ASME Y14.34M shall be expanded to read:

SEE SEPARATE PARTS LIST FOR
PARTS AND APPLICATION DATA

4.7 Preparation of Duplicate Original

Duplicate originals shall not be prepared for the purpose of maintaining duplicate records. Their application is limited to replacing lost original drawings.

4.8 Line Conventions and Lettering

Lines and lettering shall be in accordance with ASME Y14.2M.

4.9 Single, Multiple, and Sectional View Drawings

Single, multiple, and sectional views shown on engineering drawings shall be in accordance with ASME Y14.3.

4.10 Isometric and Pictorial Views

Isometric or pictorial views shall be in accordance with ASME Y14.4M and may be shown on engineering drawings provided that clarity is not degraded.

4.11 Projection Systems

Projection systems and associated symbols shall be in accordance with ASME Y14.3.

4.12 Dimensioning and Tolerancing

Dimensioning and tolerancing shall be in accordance with ASME Y14.5M.

4.12.1 Application. Reference to ASME Y14.5M on drawings shall always include the year of issue (e.g., ASME Y14.5M-1994).

4.13 Surface Texture

Surface texture, waviness, and lay shall be indicated in accordance with ASME B46.1.

4.13.1 Surface Texture Symbols. Surface texture symbols shall be in accordance with ASME Y14.36M.

4.14 Screw Thread Representation

Screw threads shall be represented in accordance with ASME Y14.6.

4.15 Gears

Gears shall be delineated in accordance with ANSI Y14.7.1 and ANSI Y14.7.2.

4.16 Mechanical Springs

Mechanical springs shall be delineated in accordance with ANSI Y14.13M.

4.17 Optical Elements and Optical Systems

Optical elements and optical systems shall be delineated in accordance with ASME/ANSI Y14.18M.

4.18 Castings and Forgings

Castings and forgings shall be delineated in accordance with ASME Y14.8M.

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4.19 Graphic Symbols, Designations, Letter Symbols, and Abbreviations

Graphic symbols, designations, letter symbols, and abbreviations used on engineering drawings and associated lists shall be in accordance with this Standard and the standards indicated below in paras. 4.19.1 through 4.19.12. Where graphic symbols, designations, letter symbols, and abbreviations are not covered by the standards indicated in paras. 4.19.1 through 4.19.12, they may be used provided they are explained on each drawing or referenced to an explanatory document. When nonstandard graphic symbols, designations, letter symbols, and abbreviations are used repeatedly, they should be forwarded to ASME for possible inclusion in the respective standard.

4.19.1 Graphic Symbols for Electrical and Electronics Diagrams. Graphic symbols for electrical and electronics diagrams shall be in accordance with IEEE 315 and Supplement ANSI/IEEE 315a.

4.19.2 Graphic Symbols for Logic Functions. Graphic symbols for logic functions shall be in accordance with ANSI/IEEE 91 and Supplement IEEE 91a.

4.19.3 Graphic Symbols for Flowchart Diagrams. Flowchart symbols for use in information processing shall be in accordance with ANSI/AIIM MS4.

4.19.4 Mechanical and Piping Symbols. Mechanical and piping symbols shall be in accordance with ASTM F 1000, ASTM F 856, or ASME Y32.2.6, as applicable.

4.19.5 Graphic Symbols for Aircraft Hydraulic and Pneumatic Systems. Graphic symbols for aircraft hydraulic and pneumatic systems diagrams shall be in accordance with SAE AS 1290.

4.19.6 Welding Symbols. Welding symbols shall be in accordance with ANSI/AWS A2.4, together with terms and definitions in accordance with ANSI/AWS A3.0.

4.19.7 Nondestructive Testing Symbols. Nondestructive testing symbols shall be indicated in accordance with ANSI/AWS A2.4.

4.19.8 Graphic Symbols for Fluid Power Diagrams. Graphic symbols for fluid diagrams shall be in accordance with ANSI Y32.10.

4.19.9 Reference Designations for Electrical and Electronics Parts and Equipment. Reference designations for electrical and electronics parts and equipment shall be assigned in accordance with ANSI/IEEE 200, IEEE 315, and Supplement ANSI/IEEE 315a.

4.19.10 Letter Symbols. When used, letter symbols on engineering drawings shall be in accordance with ANSI/IEEE 260.1 and ANSI/IEEE 280.

4.19.11 Mathematical Signs and Symbols. Mathematical signs and symbols shall be in accordance with ANSI/IEEE 260.3.

4.19.12 Abbreviations Abbreviations shall be in accordance with ASME Y14.38.

4.20 Logic Circuit Diagrams

Logic circuit diagrams shall be in accordance with ANSI/IEEE 991.

4.21 Printed Boards

4.21.1 Printed Board Drawings. Printed board drawings shall be in accordance with the requirements of IPC D-325 and IPC 2221, as applicable.

4.21.2 Printed Board Description in Digital Form. When printed board descriptions are in digital form, the description and form shall be in accordance with ANSI/IPC D-350.

4.22 Digital Data

Engineering drawings prepared by other than manual means (such as computer-generated drawings) shall provide all of the information required by the particular drawing type or level of design disclosure. Variations from the requirements as specified herein to accommodate document preparation will be acceptable so long as these variations meet the requirements relative to the information contents.

4.23 Scale

Scale expresses the ratio of the object size as drawn to its full size. Drawings shall be drawn to a scale that depicts all details of the item clearly and accurately, except as noted in para. 4.23.3.

4.23.1 Selection of Scale. Drawings should show an object or assembly to full scale. When full scale is not practicable, drawings may be prepared to reduced or enlarged scale. It is desirable, whenever practicable, that detail drawings be prepared to the same scale as pertinent assembly drawings.

4.23.2 Indication of Scale. The scale, or scales, to which drawings are prepared shall be indicated on the drawing. The scale to which the majority of views and sections are drawn shall be entered after "SCALE" in the space provided on the drawing. For multisheet drawings, the predominant scale used for each sheet shall be entered after "SCALE" in the space provided on that sheet. The options for depicting scale, fraction, ratio, or decimal are indicated as examples below. The scale of each view or section drawn to other than the predominate scale shall be entered directly below the title of the view or section. For example

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SECTION A-A
SCALE 1/2

SECTION A-A
SCALE 1:2

SECTION A-A
SCALE .5

4.23.3 Drawings Not to Scale. In the case of diagrams, pictorials, cable assemblies, and tabulated and other drawings not prepared to any scale, the word "NONE" shall be entered after "SCALE" in the space provided on the drawing format. Drawings consisting predominantly of textual content need not have an entry in the scale block.

4.24 Marking for Item Identification

When required, drawings shall specify marking requirements for items, including item identification.

4.24.1 Drawing Requirements for Part Identification Marking. Delineation of item markings on drawings shall be clear on such details as content, method of application (e.g., stamp, stencil, bag, or tag), and materials.

4.24.2 Marking Location and Size. The location and size of the identification marking shall be specified on the depiction of the item if it must be controlled due to functional or fit requirements or subsequent finish application. The location of identification marking on items that are subsequently coated and finished shall also be controlled and should be specified on surfaces that are not subjected to the coating or finish. For example, the location may be identified by a leader pointing to a chain line box or the actual information to be marked, indicating approximate marking location, or, if necessary, by dimensionally locating the marking where it will be applied.

4.24.3 Tags and Plates. Tags and plates shall be defined separately as parts by an applicable specification, standard, or drawing. The requirements for attaching an identification plate shall be specified on the using assembly drawing. The information to be included on the identification plate or tag when installed in the using item shall be specified on the assembly drawing, or, if applicable, on the identification plate drawing.

4.24.4 Printed Board Assemblies. Drawings pertaining to printed board assemblies shall specify marking location, content, method, size, material, priority of markings specified, the extent of applicability of IPC D-325 and IPC 2221, and associated sectional standards, as applicable.

4.25 Optional/Alternative Designs

Optional or alternative designs of manufacturing a part, such as "casting" versus "weldment," may be specified. Where the differences between the designs would cause confusion in one set of views, an additional view(s) shall be prepared with complete dimensional and other data specified thereon. The additional view(s) shall be labeled "OPTIONAL DESIGN" or "ALTERNATIVE DESIGN."

4.26 Drawing Notes

Drawing notes provide information that clarifies the requirements for the item delineated. They apply to either a portion of the drawing or to the entire drawing, providing additional treatment, finish, protection, and other considerations. The notes area of a drawing shall be identified with the heading "NOTES."

4.26.1 Language. Unless otherwise specified, drawings and associated lists shall be in the English language.

4.26.1.1 Language Style. Notes shall be concise statements using the simplest words and phrases for conveying the intended meaning.

4.26.2 Commonly Used Words and Phrases. Certain words and phrases are frequently used on a drawing. The following rules shall be applied.

(a) Reference documents shall be cited using "per," "conforming to," "as specified in," and "in accordance with" (or "IAW").

(b) The phrase "unless otherwise specified" shall be used to indicate the generally applied requirements and should appear at the beginning of the note or denoted at the head of the "NOTES" column. This phrase shall be used when providing a reference to another document, or requirement on the drawing, that clearly specifies the exception(s).

4.26.3 Use of Shall, Will, Should, and May

(a) "Shall" establishes a mandatory requirement.

(b) "Will" establishes a declaration of purpose on the part of the design activity

(c) "Should" and "may" are used when it is necessary to express nonmandatory provisions.

4.26.4 Indefinite Terms. Indefinite terms such as "and/or," "etc.," "e.g.," and "i.e." shall not be used.

4.26.5 Location of Notes. Notes shall be located on sheet 1, or a reference shall be included on sheet 1 indicating note location (e.g., "SEE SEPARATE PARTS LIST FOR PARTS AND NOTES"). When notes are continued beyond a given drawing sheet, information to that effect shall be inserted in the next note position of the applicable sheet (e.g., "NOTES CONTINUED ON SHEET 4").

4.26.5.1 Associated Lists and Drawings In Book-Form. For associated lists and drawings in book-form,

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the notes or textual data may be prepared and grouped on continuation sheet(s) of the drawing.

4.26.6 Drawing Notes — Contents. Drawing notes are pertinent data given in word form and used to complement the delineation of other given data. Drawing notes shall be concise, grammatically correct statements. The arrangement of notes shall not be interpreted as an order of precedence, or sequence in manufacturing or assembly, unless specified as such on the drawing. The following shall be applicable in the preparation or use of notes:

(a) General notes apply to the entire drawing or associated list.

(b) Local notes are notes that are located at the specific area or point of application. Local notes are not included in the listing of general and flag notes. Requirements specified by local notes apply only to the areas or points indicated.

(c) Flagnotes are notes that are located with the general notes but apply only at specific areas or points on the drawing. A flagnote shall be identified with a flagnote symbol in accordance with para. 4.26.6(f). The flagnote symbol, including the note number, shall be shown at each point of application. The flagnote symbol is placed around the note number in the notes area to indicate that it applies at specific areas on the drawing. The flagnote symbol, however, need not be shown in the "NOTE" column of the PL or in the "NOTE" column in a table.

(d) General notes and flagnotes shall be numbered consecutively as a single listing starting with Note 1. Filling in voids (open spaces) to accommodate deletions is not required. Note numbers of deleted notes shall not be reused.

(e) Reference to standardization documents shall be by basic identifier, excluding revision level, except where identification of a specific issue is essential to drawing interpretation.

(f) Flagnote symbols, such as



are placed around the note number when the note is referenced in the field of the drawing. A flagnote symbol need not be used when specific direction is given to a drawing note, such as "SEE NOTE 3," or when the note number is indicated in an area of a table or column identified as "NOTES." The same flagnote symbol shall be used throughout the drawing. Careful consideration should be given to the use of flagnotes on intricate or cluttered drawings. Flagnote symbols shall not conflict with or resemble other symbols used on the drawing. Nonstandard symbols or annotations other than flagnotes shall be defined.

(g) A separate note shall be used for each unrelated requirement to be specified in the drawing notes.

(h) Reference to other documents for the purpose of specifying requirements or drawing interpretation shall be as specific as possible. The whole of a given document shall not be made applicable by reference unless all of its provisions are required. When a portion of a document is applicable, the extent of its applicability shall be stated. However, reference to paragraph numbers in other documents shall not be made. Reference shall be made to a method, identified requirement, class, grade, or type. Reference shall be made only to documents whose technical accuracy and availability are assured.

(i) Parts and assemblies associated with special items and processes shall be identified in accordance with para. 7. Drawing notes may provide the basis for the special item and process or make direct or parenthetical reference to documentation that provides such information.

(j) Notes shall not include contractual requirements, such as statements of costs; time and place of delivery; methods of payment; and requirements for submission, approval, or distribution of data, reports, or plans.

4.27 Drawing Verification and Approval

The design activity shall verify that engineering drawings and associated lists are technically accurate, in conformance with all requirements, and have been approved. Approval shall be signified in the signature block on the original by signature or approval indicator established by the design activity. An approval indicator may be any symbol adopted by the design activity. A signature or approval indicator may be either handwritten or electronically affixed as long as it is unique to an individual, capable of verification, and under the individual's sole control.

4.28 Dating Drawings

The method of specifying dates on drawings shall be numerical by year-month-day for entry in the "DATE" block. For example, June 10, 1989 would be indicated as 1989-06-10, 89-06-10, 19890610, 890610, 1989/06/10, or 89/06/10.

4.29 Reference Identifiers

A reference identifier may be used to provide supplementary identification of an item that has been identified previously on the drawing or on a subordinate drawing. The use of reference identifiers shall be limited to instances that add substantially to drawing clarity. In order to differentiate from the item identification callouts, the following format shall be used:

(a) The reference identifier shall be either the basic name or the basic name preceded by modifier(s) or PIN as necessary (in instances where there are more than one part with the same basic name, such as "PLATE" or "SCREW").

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(b) The reference identifiers shall be in parenthesis or followed by the notation "REF." For example

(12345678)
12345678 REF

TRANSMISSION REF
(TRANSMISSION)

FRONT BUMPER REF
(FRONT BUMPER)

4.30 In-House Peculiar Information

Design activity identifying numbers may be indicated in brackets, [ ], to identify in-house peculiar identities. Engineering drawings and part lists using bracketed identification shall carry a note thereon indicating bracketed identities are for in-house information only.

NOTE: Documents identified as bracketed information are not considered referenced documents as defined herein and therefore are not considered part of the engineering drawing, data, or design package.

4.31 Use of Specifications and Standards

When applicable specifications and standards do not completely fulfill the design requirements of the item, engineering drawings may specify the requirements of the specifications and standards and the variations necessary to fulfill the design requirements of the item, in lieu of preparing new documentation.

4.32 Metric Practices

4.32.1 Metric Designs. The measurement system in which the part, item, or any of its features is designed shall be used in the documentation for that part, item, or feature. It may be necessary for any one drawing or associated document to contain both metric units and inch-pound units to accommodate the interfacing of items. When a document contains some features in rounded, rational metric units and other features in rounded, rational inch-pound units, each measurement shall be appropriately labeled with the applicable measurement unit; or, a general note shall be used for the most predominant unit, and other measurement system units shall be clearly marked on the appropriate measurement.

4.32.2 Metrics. Metric units, practices, and uses for the documentation shall be in accordance with the International System of Units (SI), in accordance with ASTM E 380 and IEEE 268.

4.32.3 Soft Conversion. Soft conversion should not be used on drawings. Soft conversion is the process of changing inch-pound measurement units to equivalent metric units, or vice versa, within acceptable measurement tolerances without changing the physical configuration.

5 DRAWING TITLES

This paragraph establishes procedures for creating titles for engineering drawings and names for items detailed thereon.

5.1 Nonmandatory Appendix C — Drawing Titles

A system of titling in widespread use but intended for other than commercial application is detailed in Nonmandatory Appendix C.

5.2 General Rules

The title is the name by which the drawing or item will be known and consists of a basic name and modifier, when required, to differentiate like items.

The following rules apply to all titles:

(a) The title shall be as brief as possible, describe the item, and distinguish between similar items.

(b) The title shall consist of a noun or noun phrase (basic name). Modifiers may be used to distinguish between items with the same basic name.

(1) A modifier may be a single word or phrase. The first modifier narrows the concept established by the basic name, and succeeding modifiers continue the process.

(2) The conjunction "or" and preposition "for" shall not be used.

(c) The noun or noun phrase establishes the basic concept of an item.

(1) A compound noun or noun phrase is used when a single noun is not adequate.

(2) The noun or noun phrase describes the part and the usage of the part, not material or method of fabrication.

(d) The noun or noun phrase shall be used in singular form, except

(1) where the only form of the noun is plural, as in "TONGS"

(2) where the nature of the item requires the plural form, as in "GLOVES"

(3) where multiple single items appear on the same drawing, as in "FUSES"

(e) An ambiguous noun is not used alone but may be used as part of a noun phrase. For example

Preferred	Not Preferred
CIRCUIT CARD ASSEMBLY	ASSEMBLY, CIRCUIT CARD
PRINTED CIRCUIT BOARD	BOARD, PRINTED CIRCUIT

(f) When an item is not a container or material, but its name involves the use of a noun that ordinarily

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designates a container or material, a noun phrase shall be used as the basic name. For example

Preferred	Not Preferred
JUNCTION BOX	BOX, JUNCTION
SOLDERING IRON	IRON, SOLDERING

(g) Abbreviations should be avoided.

(h) The title shall be consistent with the title of the next assembly.

(i) When titles are used on continuation sheets, the title shall be the same on each sheet.

(j) Reference to major assemblies or end items shall not be used except when necessary to differentiate similar items.

(k) Nonpart drawings, such as schematic diagrams, shall include the drawing type as part of the title. For example

TRANSFORMER ASSY, SCHEMATIC DIAGRAM

6 NUMBERING, CODING, AND IDENTIFICATION

This paragraph identifies the minimum essential requirements for establishing a numbering, coding, and identification system for application to engineering drawings and associated lists.

6.1 Nonmandatory Appendix D — Numbering, Coding, and Identification

A system of numbering, coding, and identification in widespread use but intended for other than commercial application is detailed in Nonmandatory Appendix D.

6.2 Drawing Numbers

Drawing numbers consist of numeric, alpha, or special characters, or combinations thereof. Spaces are not used between any of the elements of a drawing number. The drawing number is developed, assigned, and controlled by the original design activity. The drawing numbering system used may be significant or nonsignificant. A nonsignificant numbering system is preferred.

6.2.1 Drawing Number Length. Although there is no national consensus limitation on drawing number length, many drawing number systems limit themselves to 15 characters, including the base number and any required prefixes, suffixes, and separators. When developing the drawing number length, requirements for the limitation of characters for the Part or Identifying Number (PIN) shall be considered to ensure compatibility. See para. 6.6 for PIN.

6.3 Special Characters

Special characters may consist of keyboard entries such as dash (—), slash (/), or asterisk (*). Special characters should be selected in a manner that does not hinder drawing interpretation or have adverse effect on legibility or information systems.

6.4 Drawing Number Prefixes and Suffixes

A prefix or suffix may be used to identify such considerations as class of drawing, product, or product line. Prefixes, such as PL for Parts Lists, DL for Data Lists, or WL for Wire Lists, may also be used to identify data related to, or associated with, a base or upper level drawing. For example, an assembly drawing, 1234567, may have an associated Parts List, PL1234567.

6.5 Drawing Identification and Ownership

6.5.1 Drawing Identification. In recognition of the fact that drawing numbers are assigned and controlled by individual design activities and not by a common national or industry wide issuing authority, a drawing number in itself does not establish a unique identity for the drawing. Unique drawing identification is established through the association of the drawing number and the original design activity identification.

6.5.1.1 Design Activity Identification. There are different methods of identifying a design activity. The CAGE Code is used by the government and many industrial activities for design activity identification. See para. 3.13.

6.5.2 Drawing Ownership, Current or Original Design Activity. The original design activity is the owner of the drawing until the design responsibility is transferred to another activity. The design activity whose name appears in the title block is the original design activity. The original drawing design activity identification shall never be changed. When design responsibility changes, a transfer of design activity responsibility shall be accomplished by adding the current design activity to the drawing in accordance with para. 6.5.2.1 and ASME Y14.35.

6.5.2.1 Transferring Design Responsibility to Another Activity. When the design responsibility for engineering drawings is transferred from one design activity to another, the drawing number(s) and PIN(s) shall be transferred to the new design activity for administration. The design activity identification of the new assignee shall be added to the first sheet of the drawing by revision action to identify the change in design responsibility. The original drawing identification, which includes the original design activity identifier, shall not be changed, relocated, lined through, or deleted. Figure 1 illustrates an example of drawing notations indicating a transfer of design responsibility. All sheets of a drawing shall be assigned the original design activity identifier.

NOTE: Identification of the original design activity specified in the item identification marking requirement shall not be changed.

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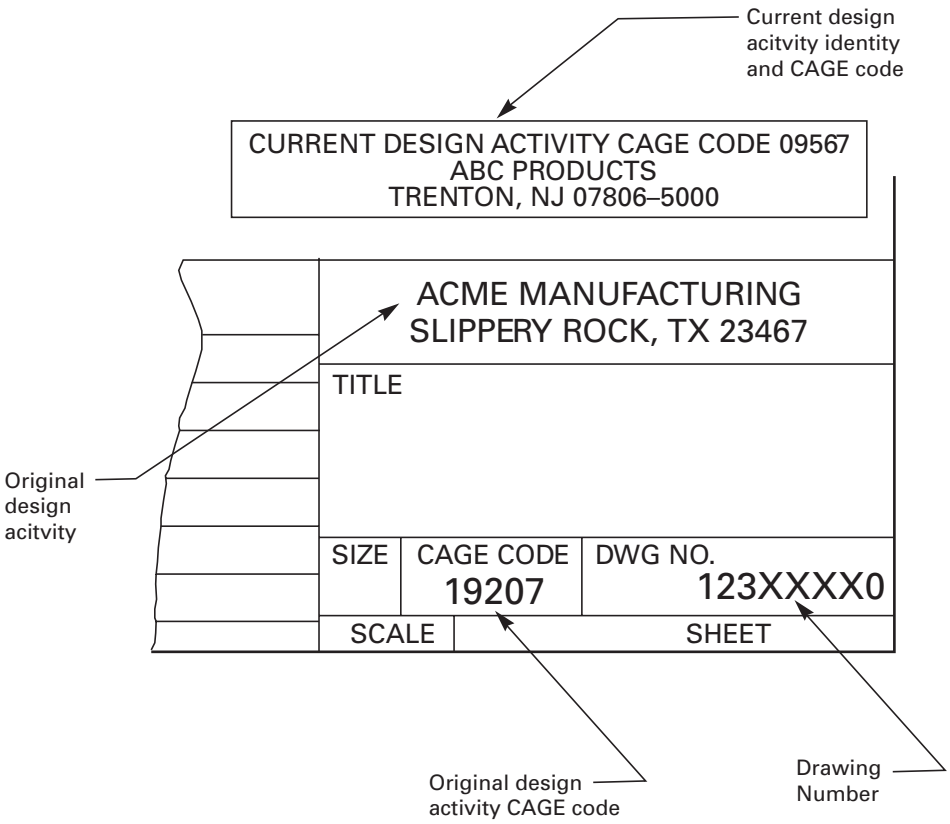


Fig. 1 Drawing Notations Indicating a Transfer of Design Responsibility

6.6 Part or Identifying Number

The Part or Identifying Number (PIN) is an identification assigned by the original design activity or by the controlling nationally recognized standard for the purpose of uniquely identifying a specific item. A PIN is the same as, or is based on, the controlling drawing number. The PIN does not include the drawing revision identifier, drawing size, or activity identification. A widely recognized limitation on PIN number length is 32 characters.

6.6.1 PIN Prefixes and Suffixes. Prefixes and suffixes may be used in association with a basic PIN for such purposes as indicating the existence of available variations to a basic item. Prefixes and suffixes of a PIN are subject to the same structure and length limitations of the basic PIN.

6.7 Reference to Items

Each item (detailed part, assembly, installation, or software) shall be identified as follows:

(a) An item defined by a standardization document shall be identified by the document PIN.

(b) An item defined by a standardization document containing a part identification system and used without alteration shall be identified by that specification part identification and applicable specification number. For example

RNC55H1001FS
PER MIL-R-55182/2
and
4-4-160143BA
PER SAE J516

(c) Design activities using items other than their design without alteration or selection shall identify such items by the original design activity item identification.

(d) All other items shall be assigned an item identification.

6.8 Item Identification

The combination of the original design activity PIN and activity identification establishes an identification unique to that item.

6.8.1 Change Requiring New Identification. New PINs shall be assigned when a part or item is changed in such a manner that any of the following conditions occur:

(a) When performance or durability is affected to such an extent that the previous versions must be discarded or modified for reasons of safety or malfunction. A new PIN shall also be assigned to all subsequent higher

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assemblies up to the level at which interchangeability is reestablished.

(b) When the new version of an item is not interchangeable with the previous version.

(c) When a repair part within an item is changed so that it is no longer interchangeable with its previous version. A new PIN shall also be assigned to all subsequent higher assemblies up to the level at which interchangeability is reestablished (Either the original or the new item may be used in all units of all next higher assemblies.).

(d) When the previous version of an item is limited to use in specific articles, or models of articles, and its new version is not so limited. A new PIN shall also be assigned to all subsequent higher assemblies up to the level at which interchangeability is reestablished.

(e) When an item is changed in such a way that it necessitates a change to an operational test, self test, or maintenance test computer program. A new PIN shall be assigned to all subsequent higher assemblies up to the level at which computer programs are no longer affected.

6.9 Model Number or Catalog Number

The model number or catalog number identifies a product line and may be used in lieu of a PIN. The number consists of alpha, numeric, or special characters, or a combination thereof, and may include suffix identifiers for identifying design characteristics and options.

6.10 Serial Number

A serial number is a unique number identifying individual units within a series of like items. The serial number does not establish the PIN but tracks the number of items that were produced under the PIN. Serial numbers should be assigned to all functional and major assemblies requiring special tracking.

6.11 Version Number

Version numbers are usually used to identify changes to software. The first digit of a version number (reading left to right) identifies a major revision of an issue of software, and subsequent numbers, separated from the major revision by a dot, identify minor revisions (e.g., 3.1.1).

6.12 Data Base Number

A data base number may itself be a drawing number, or part or cross reference number, that is used to identify design data related to a drawing. When selecting a data base number system, computer system limitations should be considered.

7 MARKINGS ON DRAWINGS

This paragraph establishes requirements for application of markings on engineering drawings and associated lists. These markings are used in support of, and in addition to, graphics and text to convey information about the drawing, the list, or items depicted thereon. The intent of this section is to standardize marking nomenclatures, to control symbology graphics, and to indicate the minimum requirements for management data that are currently mandatory for drawing and associated list maintenance and application by design or procuring activities.

Table 1
Acronyms for Special Items and Processes

Acronym	Description
CSI	Critical Safety Item
CSP	Critical Safety Process
ENI	Environmental Impact
ESD	Electrostatic discharge Sensitive Devices
ESS	Environmental Stress Screening
HAZ	HAZardous conditions, processes, or materials
HCI	Hardness Critical Item
HCP	Hardness Critical Process
I/R	Interchangeability/Repairability
INT	INTerface control
ODC	Ozone-Depleting Chemical
ODS	Ozone-Depleting Substance

7.1 Nonmandatory Appendix E — Markings on Engineering Drawings

Additional requirements for markings on drawings that are intended for other than comercial application are detailed in Nonmandatory Appendix E.

7.2 Items and Processes — Special Notations

When items or processes require special notations on the drawing, relevant drawings shall identify such items, or processes, or both, as applicable, with specific markings, or notations, or both. Acronyms, descriptions, and relevant references are shown in Table 1.

7.3 Marking for Special Items and Processes

When required to identify a special consideration item(s), or process(es), or both, the appropriate symbol(s), such as shown in Fig. 2, shall be prominently displayed near the title block and shall use the same size letters as the drawing title. The appropriate symbol(s) shall also be placed at the line entry of the applicable item(s) or process(es) in the parts list, and shall use the same size lettering as the parts list entries.

7.4 Feature Identification

When a specific drawing feature is the cause for special item or process status, that feature shall be identified with the appropriate symbol. The symbol shall be placed adjacent to the note or dimension(s) defining the characteristic. For tabulated dimensions or features, the table shall contain an entry for the applicable symbol.

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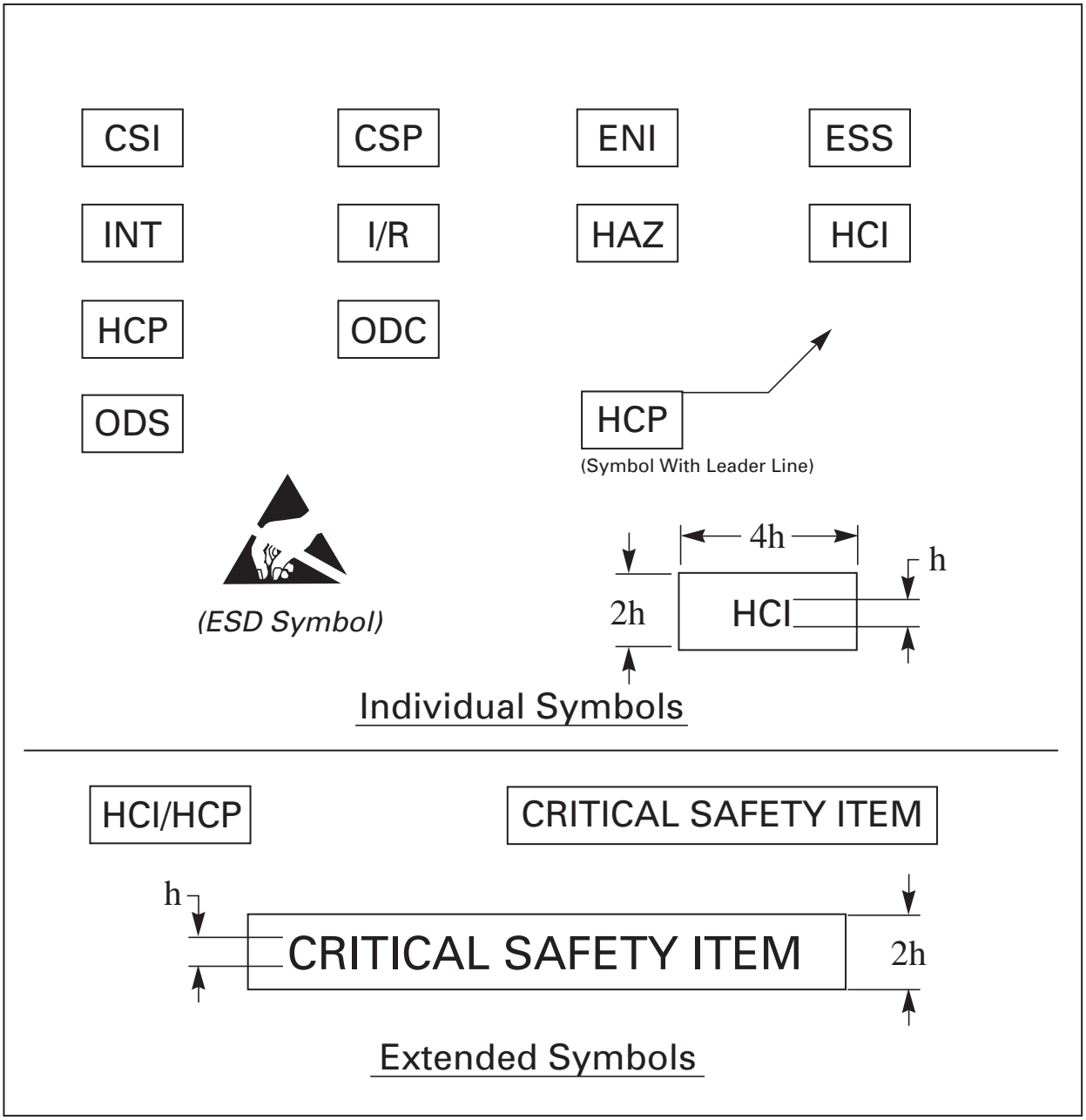


Fig. 2 Symbology

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7.5 Symbology

7.5.1 Established Symbology. For those items and processes that have unique symbology established through existing standardization documentation, that symbology shall be marked on drawings and lists in accordance with the requirements of this Standard and the applicable supporting standardization documentation. Examples of acronyms associated with such established symbologies are shown in Table 1. Examples of established symbologies are shown in Fig. 2.

7.5.2 Symbology Without Established References. Those items and processes for which there is no existing supporting standardization documentation shall be marked on drawings and lists in accordance with the acronyms and symbology established in this Standard (see Table 1 and Fig. 2).

7.6 Notes

On an assembly drawing, special items or processes that are assembly method(s) or procedure(s) shall be reflected in the drawing notes. Notes that reference a special item or process shall use established symbology for the item or process and be placed within the note area as follows:

Preferred

5. CSI HEAT TREAT PER _____

Alternate

5. HEAT TREAT PER _____ *CSI*

7.6.1 ESD Symbol in Nontext Application. The ESD symbol shown in Fig. 2 shall be used in nontext applications.

7.6.2 Exceptions to Boxed Symbols. For systems that cannot produce the boxed symbols, and for standard text, alternate symbols such as *HCI*, -CSI-, *ODC*, or *INT*, in applicable note and text size, may be used. The same symbology structure shall be used throughout the drawing or list.

7.7 Item Replacement Notations

7.7.1 Interchangeable Items. When an item is replaced by another existing or new item that is physically and functionally interchangeable, and is intended for stocking as a fielded replacement, the notation "PIN 9876... INACTIVE FOR NEW DESIGN, USE INTERCHANGEABLE PIN 1234..." shall be entered on the drawing of the part being replaced in characters the same height as the drawing title. The addition of the note constitutes a change; therefore, an applicable entry in the revision history block in accordance with ASME Y14.35M is required.

7.7.2 Noninterchangeable Items. When an item is to be replaced by another existing or new item that provides a design improvement but is not interchangeable, the notation "PIN 9876... INACTIVE FOR NEW DESIGN, USE NONINTERCHANGEABLE PIN 1246..." shall be entered on the drawing of the part being replaced in characters the same height as the drawing title. The addition of the note constitutes a change; therefore, an applicable entry in the revision history block in accordance with ASME Y14.35M is required.

7.7.3 Drawings of Multiple Items. When all of the items on a drawing are not replaced, the notation information cited in paras. 7.7.1 and 7.7.2 shall be contained in a drawing flagnote or table for each affected item.

7.7.4 Superseded Drawings. When a drawing is redrawn (new original with the same drawing number) and the superseded drawing is to be retained, the word "SUPERSEDED" shall be added to the old original above the title block. Revision history block entries shall be in accordance with ASME Y14.35M. The "SUPERSEDED" notation shall be in characters the same size as the lettering height of the drawing title.

7.7.5 Identifying Substitute Parts. Drawings and parts lists show parts, materials, or methods as substitute to permit establishment of alternate sources of supply, to permit production of parts by alternate methods of manufacture, or to permit fabrication of items with substitute parts or materials. If parts are identified on the field of the drawing by part number callout, then substitute parts or assemblies shall be identified directly or by reference, on assembly or installation drawings, with notations (or combination) such as:

127XXXX1 - PREFERRED
128XXXX3 - SUBSTITUTE
128XXXX4 - ALTERNATE

7.8 Rights in Data Legends on Drawings

Proprietary restrictions, such as limited rights and licensing rights, shall be marked on applicable drawing sheets with the appropriate approved legend. Care should be taken to assure that the legend is delineated in the field of the drawing, within the margins. On drawings that are reproduced in segments, the legend should appear in each segment. Drawings in book-form need only delineate the legend on the title sheet.

7.9 Duplicate Original

NOTE: The following requirement applies to manually prepared drawings. For CAD drawings, refer to para. 7.10.

When a lost drawing is replaced, the notation "DUPLICATE ORIGINAL" shall be added to the drawing in the lower right hand margin, near the title block, with lettering the same size as the drawing title. See Fig. 3. The revision level shall not be advanced. When

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changes are required, the drawing shall be considered "REDRAWN WITH CHANGE." See ASME Y14.35M.

7.10 Duplicate Production Master (Stable Base Artwork)

Duplicates of a production master, made from the original stable base artwork or CAD system, shall be marked "DUPLICATE PRODUCTION MASTER. DO NOT REVISE" in the revision history block area, as shown in Fig. 4, or above the title block. Marking may be accomplished by use of a label or lettering applied directly on the drawing, or by other suitable means.

7.11 Reproductions From Digitally Maintained Data

Copies derived from data that are stored and maintained digitally may include a note similar to the following, applied beneath the last entry of the revision history block area or above the title block.

CAD MAINTAINED. CHANGES SHALL BE INCORPORATED BY THE CURRENT DESIGN ACTIVITY

Design activities may add additional information to this note to identify peculiar in-house requirements.

7.12 Ozone-Depleting Substances

The identification of ozone-depleting substances must be in conformance to para. 602(a) of the Clean Air Act Amendments of 1990 (42USC 7671a), as identified in Section 326 of PL 102-484.

7.12.1 Ozone-Depleting Substances Note. The following note is used when the use of ozone-depleting substances is delineated on the drawing.

THIS (enter the word DRAWING or PARTS LIST, as appropriate) IDENTIFIES THE USE OF A CLASS I OZONE-DEPLETING SUBSTANCE (ODS).

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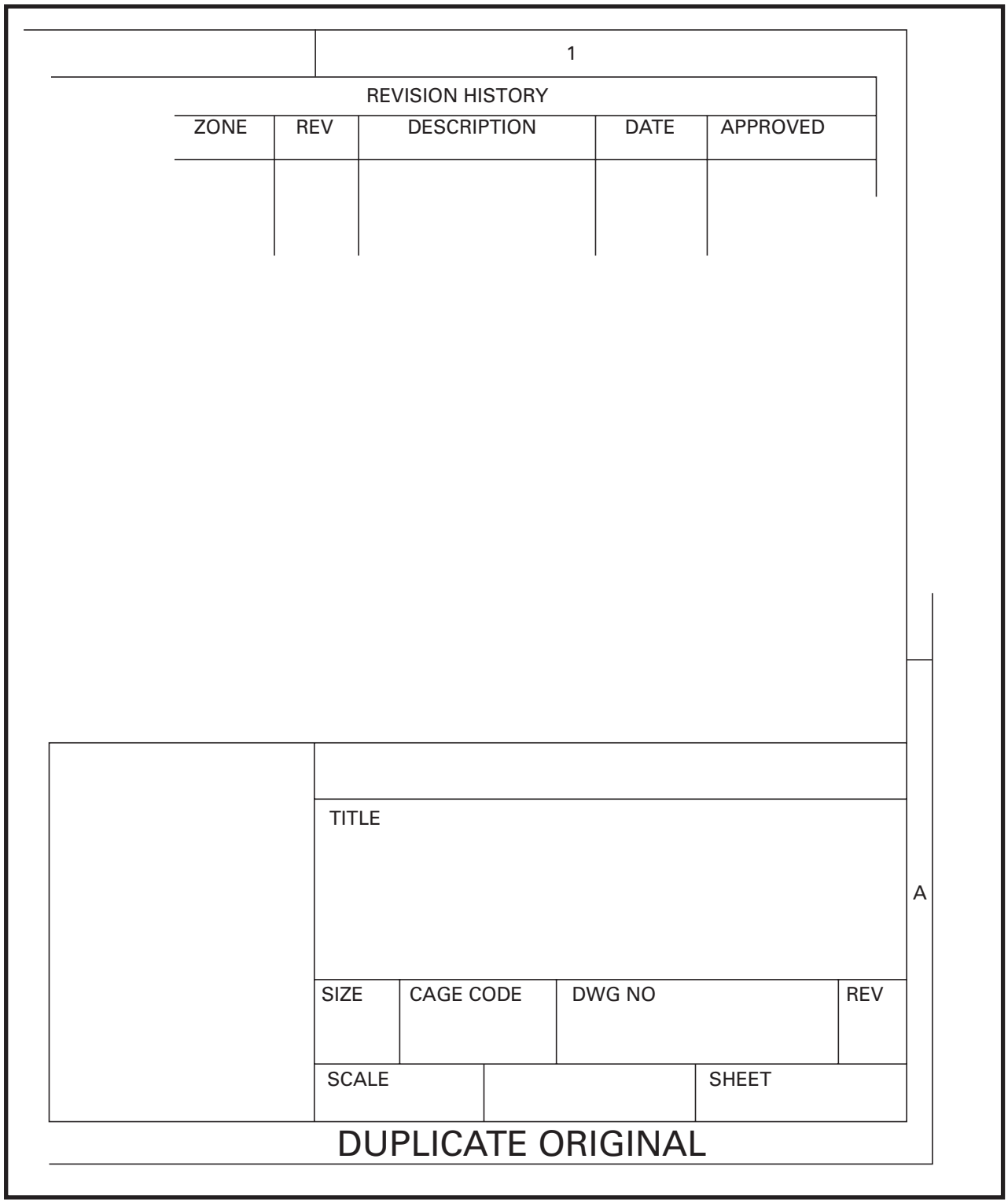


Fig. 3 Duplicate Original Notation

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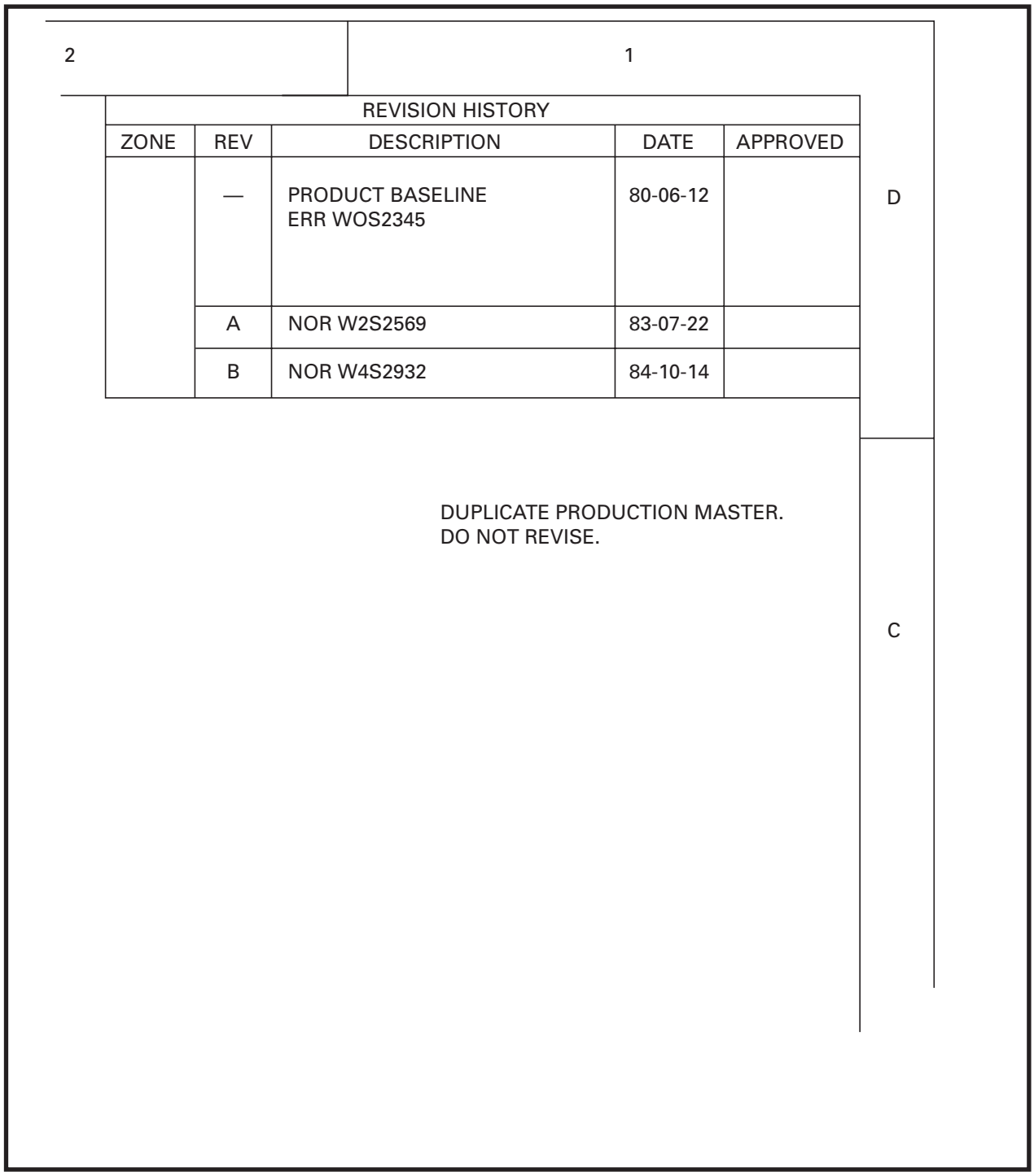


Fig. 4 Duplicate Production Master Drawing Notation

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NONMANDATORY APPENDIX A
TAILORING

A-1 GENERAL

In order to avoid overstated requirements and unnecessary costs in engineering drawing preparation, ASME Y14.100-2004 shall be carefully tailored to meet the user needs. It is essential that the applicability of the numerous referenced documents, especially regarding basic practices, be as definitive as possible. Many users will have limited need for the detail contained in Nonmandatory Appendices B through E. Accordingly, consideration should be given to any application of these Appendices as the user will conclude that the detail contained therein is well beyond their contractual or application intent. The manner and extent of needed tailoring will vary with end-item requirements, the design activity's needs and systems, and customer requirements. In addition, the use of other associated ASME Y14 Standards may require tailoring to meet the needs of both design activities and users of engineering drawings. Therefore, Table A-1, a checklist to aid in tailoring, is provided as a minimum for consideration.

Table A-1 Tailoring Checklist

A. Drawing Media (Choose all that apply)	
(1) Nondigital (Specify _____)	☐
(2) Digital Data (Specify _____)	☐
(3) Other (Specify _____)	☐
B. Drawing Format (Choose one)	
(1) Contractor	☐
(2) Government (forms supplied by the Government)	☐
(3) Government (forms supplied by the Contractor)	☐
C. Drawing Sheet Size and Format (Choose one)	
(1) ASME Y14.1	☐
(2) ASME Y14.1M	☐
D. Application Data (Choose all that apply)	
(1) Contractor's option	☐
(2) Required	
(a) On drawing	☐
(b) By reference (Specify _____)	☐
(c) Contractor's option	☐
(3) General use or multi-use notations	
(a) allowed	☐
(b) not allowed	☐
E. Drawing Detail (ASME Y14.24) (Choose all that apply)	
(1) Monodetail	☐
(2) Multidetail	☐
(3) Tabulated	☐

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Table A-1 Tailoring Checklist (Cont'd)

F. Dimensioning and Tolerancing (Choose all that apply)	
(1) Metric	☐
(2) Decimal-inch	☐
(3) Application of ASME Y14.5M	
(a) Specific issue (revision) required (Specify issue _____)	☐
(b) Issue in effect (Specify issue _____)	☐
G. Drawing Notes (Choose one)	
(1) On drawing	☐
(2) By reference (Specify _____)	☐
(3) Contractor's option	☐
H. Types of Drawings (ASME Y14.24) (Choose one)	
(1) Contractor selects	☐
(2) Government selects	☐
I. Maintenance of Multi-Sheet Drawings (ASME Y14.35M) (Choose all that apply)	
(1) Drawing revision level (DOD preferred)	☐
(2) All sheets same revision level	☐
(3) Sheet revision level	☐
J. Redrawn Drawings (redrawing without change) (ASME Y14.35M) (Choose one)	
(1) Advance revision level	☐
(2) Revision level is not advanced	☐
K. Maintenance of Revision History (Choose all that apply)	
(1) Contractor's option	☐
(2) Optional methods	
(a) Remove one or more revision record as required	☐
(b) Remove all previous revision history	☐
(c) Remove all revision history but retain line entry for revision authorization and date of revision	☐
(d) Remove all except revision preceding current	☐
(e) Maintain revision history in its entirety	☐
L. Adding Sheets (ASME Y14.35M) (Choose all that apply)	
(1) Contractor's option	☐
(2) Optional methods	
(a) Renumber sheets using consecutive whole numbers	☐
(b) Number added sheets in decimal-number sequence	☐
(c) Number added sheets in alpha-numeric sequence	☐
M. Deleting Sheets (ASME Y14.35M) (Choose all that apply)	
(1) Contractor's option	☐
(2) Optional methods	
(a) Renumber all affected remaining sheets	☐
(b) Affected remaining sheets not renumbered (revision status of sheets block is updated with notations such as CANC or DEL)	☐
N. Markings on Engineering Drawings (Choose one)	
(1) Special items and processes apply	
(a) Applicable symbols (Specify _____)	☐
(b) Applicable special notes (Specify _____)	☐
(2) Special items and processes do not apply	☐

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Table A-1 Tailoring Checklist (Cont'd)

O. Associated Lists (ASME Y14.34M) (Choose all that apply)	
(1) Nondigital (Specify _____)	☐
(2) Digital Data (Specify _____)	☐
(3) Other (Specify _____)	☐
P. Types of Associated Lists (ASME Y14.34M) (Choose all that apply)	
(1) Parts Lists	☐
(a) Integral	☐
(b) Separate	☐
(c) Contractor's option	☐
(2) Application List	☐
(3) Data Lists	☐
(4) Index Lists	☐
(5) Indentured Data List	☐
(6) Wire List	☐
(7) Other (Specify _____)	☐
Q. Angle of Projection (ASME Y14.3M) (Choose one)	
(1) 3rd Angle	☐
(2) 1st Angle	☐
R. Language (Choose one)	
(1) English required	☐
(2) Other (Specify _____)	☐
S. Applicability of Appendices	
(1) Appendix B	
(a) as detailed herein	☐
(b) as modified _____	☐
(2) Appendix C	
(a) as detailed herein	☐
(b) as modified _____	☐
(3) Appendix D	
(a) as detailed herein	☐
(b) as modified _____	☐
(4) Appendix E	
(a) as detailed herein	☐
(b) as modified _____	☐

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NONMANDATORY APPENDIX B
NONCOMMERCIAL DRAWING PRACTICES

B-1 GENERAL

This Appendix, in combination with Section 4 of ASME Y14.100-2004, establishes essential general requirements and reference standards in excess of that required for commercial applications in the preparation of engineering drawings and associated lists.

B-1.1 Commercial Practices

Commercial practices, including associated referenced standards, that are specific to preparation of engineering drawings and associated lists are contained in Section 4 of ASME Y14.100-2004. The detail contained herein is intended to provide visibility of those requirements that are in use in other than commercial applications.

B-1.2 Application

In the event of a conflict between the contents of this Appendix and the practices detailed in Sections 1 through 7 of ASME Y14.100-2004, this Appendix shall take precedence when invoked.

B-2 REFERENCES

The following documents form a part of this Appendix to the extent specified herein. The issue in effect shall be that specified in a solicitation.

A-A-2946, Paper, Tracing

L-F-340, Film, Diazotype, Sensitized, Moist and Dry Process, Roll and Sheet

L-P-519, Plastic Sheet, Tracing, Glazed and Matte Finish

Publisher: General Services Administration (GSA); DoDSSP, Standardization Documents Order Desk, Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-HDBK-780, Standardized Microcircuit Drawings

MIL-PRF-5480, Data, Engineering and Technical, Reproduction Requirements for MIL-PRF-28000, Digital Representation for Communication of Product Data: IGES Application Subsets

MIL-PRF-28001, Markup Requirements and Generic Style Specification for Electronic Printed Output and Exchange of Text

MIL-PRF-28002, Raster Graphics Representation in Binary Form

MIL-STD-25, Ship Structural Symbols for Use on Ship Drawings

MIL-STD-129, Marking for Shipment and Storage

MIL-STD-130, Identification Marking of U. S. Military Property

MIL-STD-883, Test Methods and Procedures for Microelectronics

MIL-STD-1285, Marking of Electrical and Electronic Parts

MIL-STD-1840, Automated Interchange of Technical Information

Publisher: Department of Defense (DoD); DoDSSP, Standardization Documents Order Desk, Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094

B-3 DEFINITIONS

Initial Graphics Exchange Specification (IGES): a neutral file format for the representation and transfer of product definition data among dissimilar interactive graphics systems.

product definition data: denotes the totality of data elements required to completely define a product. Product definition data includes geometry, topology, relationships, tolerances, attributes, and features necessary to completely define a component part or an assembly of parts for the purpose of design, analysis, manufacture, test, and inspection.

production master: a 1-to-1 scale pattern that is used to produce one or more printed boards (rigid or flexible) within the accuracy specified on the Master Drawing. See ANSI/IPC-T-50.

B-4 GRAPHIC SYMBOLS, DESIGNATIONS, LETTER SYMBOLS, AND ABBREVIATIONS

Graphic symbols, designations, letter symbols, and abbreviations used on engineering drawings and associated lists shall be in accordance with the standards indicated below, and Section 4 of ASME Y14.100-2004. Where graphic symbols, designations, letter symbols, and abbreviations are not covered by the listed standard; they may be used provided they are explained on each drawing or referenced to an explanatory document. The referenced explanatory documents for nonstandard symbols shall be furnished with the engineering drawings. When nonstandard graphic symbols, designations, letter symbols, and abbreviations are used repeatedly, they should be forwarded to ASME for possible inclusion in the respective standard.

B-4.1 Ship Structural Symbols

Ship structural symbols shall be in accordance with MIL-STD-25.

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B-5 DATA PREPARATION, MAINTENANCE, DELIVERY, OR ACCESS

B-5.1 Materials

B-5.1.1 Plastic Sheet or Roll. Originals on plastic sheet shall be in accordance with L-P-519, Type I or II, Class 2. Undimensioned drawings, printed wiring artwork masters, production masters, and master pattern drawings shall be in accordance with MIL-PRF-5480, Class 2, Type A or B; or L-P-519, Type I or II, Class 1.

B-5.1.2 Film, Diazotype. Copies on sensitized, diazotype film shall be in accordance with L-F-340, Type and Class as specified.

B-5.2 Digital Data

Engineering drawings prepared by other than manual means (such as computer-generated drawings) shall provide all of the information required by the particular drawing type or level of design disclosure. Variations from the requirements as specified herein to accommodate document preparation will be acceptable so long as these variations meet the requirements relative to the information contents.

B-5.2.1 Plotters. If originals are maintained as digital data, copies resulting from plotters need not meet the material, erasure, and aging requirements of L-P-519.

B-5.3 Maintenance

Requirements for erasure, aging, and paper do not apply to associated lists prepared by automatic data processing or drawings prepared and maintained as digital data.

B-5.4 Associated Lists, Materials

Associated lists prepared from digital data need not meet the requirements of paras. B-5.1.1 or B-5.1.2.

B-5.5 Physical Media

The physical media of digital product definition data shall conform to MIL-STD-1840.

B-5.6 Initial Graphics Exchange Specification (IGES)

IGES data files shall be Class II application data subsets in conformance to MIL-PRF-28000 and MIL-STD-1840.

B-5.7 Raster Data Files

Raster data files shall be in accordance with MIL-PRF-28002 and MIL-STD-1840.

B-5.8 Standardized General Markup Language (SGML)

SGML data files for predominantly textual engineering drawings shall be in conformance to MIL-PRF-28001 and MIL-STD-1840.

B-6 MARKING FOR ITEM IDENTIFICATION

Drawings shall specify marking requirements for items, including item identification.

B-6.1 Drawing Requirements for Part Identification Marking

Delineation of part identification markings on a drawing shall be consistent with the requirements of Section 6 of ASME Y14.100-2004 and MIL-STD-130 and clear on such details as method of application, e.g., stamp or stencil, and materials, e.g., ink per A-A-208.

B-6.2 Packaged Items

Drawing requirements for package identification shall be consistent with the requirements of MIL-STD-129.

B-6.3 Altered, Selected, Vendor Item Control, or Source Control Item Identification

Altered, selected, vendor item, and source control items shall be identified in accordance with MIL-STD-130.

B-7 PRINTED BOARD ASSEMBLIES

Drawings pertaining to printed board assemblies shall specify marking location, content, method, size, material, priority of markings specified, and the extent of applicability of MIL-STD-1285, IPC-D-325, IPC 2221, and associated Sectional Standards, as applicable.

B-8 CODE IDENTIFICATION, FSCM, AND CAGE CODE

Terms such as “FSCM” or “Code Identification” on existing documents or pre-prepared formats in stock need not be updated to “CAGE Code” or “CAGEC.”

B-9 TYPES AND APPLICATIONS OF ENGINEERING DRAWINGS

Types and applications of engineering drawings shall be in accordance with ASME Y14.24 and para. B-9.1.

B-9.1 Standardized Microcircuit Drawing (SMD)

An SMD shall disclose the applicable configuration, envelope dimensions, mounting and mating dimensions, interface dimensional characteristics, specified performance requirements, nuclear effects, and inspection and acceptance test requirements for microcircuits in a military application. Vendor item control drawings, as defined in ASME Y14.24, shall not be used to depict microcircuits, Federal Supply Class 5962, that comply with MIL-STD-883. Microcircuits compliant with MIL-STD-883 shall be depicted on an SMD. Guidance concerning SMDs is contained in MIL-HDBK-780.

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NONMANDATORY APPENDIX C
DRAWING TITLES

C-1 GENERAL

This Appendix establishes procedures for creating titles for engineering drawings and names for items detailed thereon as required by other than basic commercial applications.

C-1.1 Application

In the event of a conflict between the contents of this Appendix and the practices detailed in Sections 1 through 7 of ASME Y14.100-2004, this Appendix shall take precedence, when invoked.

C-2 REFERENCES

The following documents form a part of this Appendix to the extent specified herein. The issue in effect shall be that specified in a solicitation.

MIL-STD-196, Joint Electronics Type Designation System

MIL-HDBK-1812, Type Designation, Assignment, and Method of Obtaining

MIL-STD-1464, Army Nomenclature System

MIL-STD-1661, Mark and Mod Nomenclature System

Publisher: Department of Defense (DoD); DoDSSP, Standardization Documents Order Desk, Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094

DoD Cataloging Handbook H6, Federal Item Name Directory for Supply Cataloging

Publisher: Defense Logistics Services Center (DLSC), Battle Creek, MI 49017-3084

C-3 DEFINITIONS

approved item name: a name approved by the Directorate of Cataloging, Defense Logistics Services Center and published in the Cataloging Handbook H6, Federal Item Name Directory for Supply Cataloging.

end-product (end-item): an item, such as an individual part or assembly, in its final or completed state (ASME Y14.24).

C-4 DRAWING TITLE

The drawing title shall be the name by which the part or item will be known and consist of a basic item name, government type designator, if applicable, and sufficient modifiers to differentiate like items in the same major assembly. Reference to major assemblies or end items shall not be included as part of the drawing title for subassemblies and parts except when necessary to differentiate such items from similar items.

C-4.1 Approved Item Names

Approved item names are those item names listed in Cataloging Handbook H6, Federal Item Name Directory for Supply Cataloging. Approved item names are preferred for use in drawing titles. Item names not listed in H6 should be submitted, through the government design or procuring activity, to the Defense Logistics Services Center (DLSC) for approval.

C-4.2 Type Designators

Type designators, letters, numbers, or a combination thereof, assigned by the government for the purpose of item identification, are assigned in accordance with approved type designator-nomenclature systems such as:

Joint Electronics Type Designation System	MIL-STD-196
Army Nomenclature System	MIL-STD-1464
Mark and Mod Nomenclature System	MIL-STD-1661
Type Designation, Assignment, and Method of Obtaining	MIL-HDBK-1812

C-5 ASSEMBLY

The term ASSEMBLY when used as a part of the drawing title shall conform to the definition contained herein and meet the requirements of Cataloging Handbook H6.

C-6 PROCEDURES FOR CREATING DRAWING TITLES

Titles for drawings requiring modifiers shall be in two parts. The first part shall be the name. The second part shall consist of those additional modifiers and government type designators necessary to complete the identification of the item.

C-6.1 General Rules

The following rules apply to all drawing titles:

(a) No abbreviations of any portion of the name (first part of the title) shall be made, except those necessarily

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used trademarked names and the words ASSEMBLY (ASSY), SUBASSEMBLY (SUBASSY), or INSTALLATION (INSTL). Abbreviations may be used in the second part of the title. Approved abbreviations are listed in ASME Y14.38. In general, the use of abbreviations should be avoided.

(b) Titles of subassembly and detail drawings shall be consistent with the titles of the next assembly drawings, except where interchangeability of parts between assemblies makes consistency impractical or is prohibited by the government design or procuring activity, or when such use limits application. The drawing title shall be shown in uppercase letters.

(c) When a drawing is prepared to replace an existing drawing with a different number and the title of the drawing being replaced is in accordance with instructions contained herein, the same title shall be used. When the title of the drawing being replaced is not in accordance with these instructions, a new drawing title shall be developed.

(d) A drawing title shall be as brief and simple as possible, describe the item, and distinguish between similar items.

(e) The names of parts detailed on a drawing shall consist of a noun or noun phrase. Modifiers may be used to distinguish between similar parts on the same drawing.

(f) For words with dual or multiple definitions, the Military definitions as published in the Federal Item Name Directory for Supply Cataloging, Section A, Cataloging Handbook H6 shall have precedence.

(g) If the drawing title appears on each sheet of a multisheet drawing, the exact same title shall appear on all sheets.

C-6.2 First Part of Title

The first part of the title shall be one of the following in order of preference:

(a) An approved item name selected from the Federal Item Name Directory for Supply Cataloging, Section A, Cataloging Handbook H6, whose definition describes the item ("PIN, STRAIGHT, HEADED," "SPRING, HELICAL, COMPRESSION," "ENGINE, GASOLINE," "RIB, WING SECTION, INNER," "MODIFICATION KIT, RIFLE RACKS, MOUNTING").

(b) Where the procedure outlined in para. C-6.2(a) does not provide a suitable name, the following procedures shall be followed:

(1) The basic name shall be a noun or noun phrase. Modifiers shall be included as required by para. C-6.2(c).

(2) This noun or noun phrase shall establish a basic concept of an item. A compound noun or noun phrase shall be used only when a single noun is not adequate to establish a basic concept of an item. Cataloging Handbook H6 shall be used as a guide in establishing the noun or noun phrase.

(3) The noun or noun phrase shall describe the part and the usage of the part and not the material or method of fabrication. A noun such as "casting," "forging," or "weldment" shall not be used except when a casting, forging, or weldment shall be subject to further fabrication to make the designed part. In lieu of such a name, a noun or noun phrase shall be assigned that indicates what the item is or what it does, for example, "BRACKET" in the title "BRACKET, SUPPORT MIXING VALVE."

(4) The noun or noun phrase shall be used in singular form, except:

(a) where the only form of the noun is plural, as in "TONGS"

(b) where the nature of the item requires the plural form, such as in "CLIMBERS" or "GLOVES"

(c) multiple single items appearing on the same drawing, as in "Fuses," "Connectors," or "Fasteners"

(5) The word "ASSEMBLY" shall be used in names selected from Cataloging Handbook H6 exactly as published therein ("CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL"). When no applicable name appears in Cataloging Handbook H6, the word "ASSEMBLY" shall be used as the last word of the noun phrase ("INTAKE-MANIFOLD ASSEMBLY, GASOLINE ENGINE").

(6) An ambiguous noun, or one which designates several classes of items, shall not be used alone but may be used as part of a noun phrase.
Example:

Acceptable	Unacceptable
SLIDE RULE	RULE, SLIDE
SOLDERING IRON	IRON, SOLDERING
CIRCUIT CARD ASSEMBLY	ASSEMBLY, CIRCUIT CARD
PRINTED WIRING BOARD	BOARD, PRINTED WIRING
PRINTED CIRCUIT BOARD	BOARD, PRINTED CIRCUIT

NOTE: One of the most difficult tasks in naming any item is the determination as to when a noun should be qualified as being ambiguous. The general rule quoted above is amplified to some extent in the succeeding paragraph. When a noun does not expressly fit under any of these rules, one step in determining whether the selected noun is or is not ambiguous, is to refer to Cataloging Handbook H6 to see if it is listed. For example, if there is a question on the noun "plate," a review of the index will reveal many item names with the noun "plate" used, indicating the noun is not considered as being ambiguous.

(7) A trade-marked or copyrighted name shall not be used as the noun or noun phrase except where the technical name is extremely difficult ("FREON 12" rather than "DICHLORODIFLUOROMETHANE") or where no other name is available.

(8) When an item is not a container or material, but its name involves the use of a noun that ordinarily designates a container or material, a noun phrase shall be used as the basic name.

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Examples:

Acceptable	Unacceptable
JUNCTION BOX	BOX, JUNCTION
CABLE DRUM	DRUM, CABLE
SOLDERING IRON	IRON, SOLDERING

(9) The following words shall never be used alone as a basic name but may be the last word of a noun or noun phrase:

Apparatus	Equipment	Plant
Assembly	Group	Ship
Assortment	Installation	Subassembly
Attachment	Kit	Tackle
Compound	Machine	Tool
Device	Mechanism	Unit
Element	Outfit	Vehicle

EXAMPLE: In certain instances, some of the listed words may be used as the first word in a basic noun phrase, as in "MACHINE SHOP" or "TOOL KIT."

(c) When the noun or noun phrase represents an item to which types, grades, or varieties are applicable, the remainder of the first part of the title shall consist of one or more modifiers.

(1) A modifier may be a single word or a qualifying phrase. The first modifier shall serve to narrow the area of concept established by the basic name, and succeeding modifiers must continue a narrowing of item concept by expressing more particular characteristics. A word qualifying a modifying word shall precede the word it qualifies, thereby forming a modifying phrase ("BRACKET, UTILITY LIGHT"). It is to be noted the word "UTILITY" qualifies the word "LIGHT" and precedes it in the modifying phrase.

(2) A modifier shall be separated from the noun or noun phrase by a comma and from any preceding modifier by a comma. The hyphen in compound words and the dash in type designators are not punctuation marks.

(3) The conjunction "or" and the preposition "for" shall not be used.

(4) The first part of the title shall be separated from the second part of the title by a dash.

C-6.3 Second Part of Title

The second part of the title shall consist of such additional modifiers, modifying phrases, or government type designators as required. Modifiers indicating what an item is (its shape, structure, or form) or what the item does (its function) are preferable to modifiers indicating the application (what it is used for) or location of the item (where it is used). Example:

SPRING, HELICAL COMPRESSION	RECOIL ADAPTER
First part of title	Second part of title

(a) When two or more drawings are similar, and the parts detailed on them perform the same general function, they shall be distinguished by additional modifiers indicating their location, relative position, forms, or dimensions, for example:

RIB, WING SECTION, INNER — STATION 276

(b) Nonpart drawings (such as schematic and wiring diagrams) should include the drawing type in the second part of the drawing title, for example:

AMPLIFIER, FIRE CONTROL —
SCHEMATIC DIAGRAM

C-7 DISCLOSURE OF SECURITY CATEGORIES

No word(s), symbol(s), nor any of their possible combinations that would disclose information in any of the established security categories, shall be used in drawing titles.

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NONMANDATORY APPENDIX D
NUMBERING, CODING, AND IDENTIFICATION

D-1 GENERAL

This Appendix details numbering, coding, and identification procedures for engineering drawings, associated lists, and documents referenced thereon as required by other than strictly commercial applications. It also provides identification direction for parts, materials, processes, and treatments specified on these engineering drawings and associated lists.

D-1.1 Application

In the event of a conflict between the contents of this Appendix and the practices detailed in Sections 1 through 7 of ASME Y14.100-2004, this Appendix shall take precedence, when invoked.

D-2 REFERENCES

DoD Cataloging Handbook H4/H8, Commercial and Government Entity (CAGE) Cataloging Handbook
Publisher: Defense Logistics Services Center (DLSC), Battle Creek, MI 49017-3084.

D-3 DEFINITIONS

Department of Defense Index of Specification and Standards (DoDISS): the DoD publication that lists unclassified Federal and military specifications and standards, related standardization documents, and voluntary standards approved for use by DoD.

find number or item number: a reference number assigned to an item in lieu of the item's identifying number on the field of the drawing and entered as a cross reference to the item number of the parts lists where the item name and identification number are given. Reference designations in accordance with ANSI/IEEE 200 may be used as find or item numbers (see ASME Y14.34M).

group: a collection of units, assemblies, or subassemblies that is a sub-division of a set or system but that is not capable of performing a complete operational function (e.g., antenna group, indicator group).

manufacturer: an individual, company, corporation, firm, or government activity who

(a) controls the production of an item,

(b) produces an item from crude or fabricated materials, or

(c) assembles materials or components, with or without modification, into more complex items.

matched parts: those parts, such as special application parts, that are machine or electrically matched, or otherwise mated, and for which replacement as a matched set or pair is essential.

nongovernment standard (or document): a standardization document developed by a private sector association, organization, or technical society that plans, develops, establishes, or coordinates standards, specifications, handbooks, or related documents. Nongovernment standards adopted by the DoD are listed in the DoDISS.

repair parts: those support items that are an integral part of the end item or system that are coded as nonrepairable.

repairable: having the capability of being repaired.

selected item: an existing item, under the control of another design activity or defined by a nationally recognized standardization document, that is subjected to refined acceptance criteria (such as fit, tolerance, performance, or reliability) to meet design requirements.

set: a unit or units and necessary assemblies, subassemblies, and parts connected or associated together to perform an operational function (e.g., radio-receiving set; sound-measuring set, which includes parts assemblies and units such as cable, microphone, and measuring instruments; radar-homing set). Set is also used to denote a collection of like parts such as a toolset or a set of tires.

D-4 COMMERCIAL AND GOVERNMENT ENTITY CODE (CAGE CODE)

The CAGE Code is a five-position code, of numeric or alphanumeric characters, applicable to activities that have designed, produced, or are producing or supplying items used by the government. It also applies to government activities that control design or are responsible for the development of certain specifications, drawings, or standards which control the design of items. These codes are assigned in conformance with CAGE Cataloging Handbook, H4/H8. Activities not assigned a CAGE Code shall request such identification in conformance with the CAGE Cataloging Handbooks. Organizations which neither manufacture nor control design, such as dealers, agents, or vendors of items produced by others, are assigned type "F" CAGE Codes and shall not be included as a design activity on a drawing. Type "A" CAGE Codes, for manufacturers, are applicable for use

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on drawings. CAGE Codes shall be entered in the appropriate block of the engineering drawing or associated list format and shall be preceded by the phrase "CAGE CODE." If necessary, because of space limitations, the phrase "CAGEC" may be used.

D-5 DRAWING NUMBER

The drawing number consists of letters, numbers, or a combination of letters and numbers, which may or may not be separated by dashes. The number assigned to a particular drawing and the CAGE Code provide a unique drawing identification. The drawing number shall be assigned from numbers controlled by the design activity whose CAGE Code is assigned to the drawing.

D-6 DRAWING IDENTIFICATION

The drawing number and original design activity CAGE Code establish a drawing identification that shall be unique to that drawing. The relationship of drawing number and original design activity CAGE Code is inviolate, providing for drawing identification regardless of drawing ownership, design responsibility, adding of sheets, or current design activity.

D-7 PART OR IDENTIFYING NUMBER

The Part or Identifying Number (PIN) shall consist of letters, numbers, or combinations of letters and numbers, which may or may not be separated by dashes or slashes that are assigned to uniquely identify a specific item. The PIN shall be or shall include the design activity drawing number and may include a suffix identifier, when applicable. See para. D-9.6. The PIN assigned to a specific item and the CAGE Code assigned to the drawing provide the basis for unique item identification.

D-8 FIND NUMBER

A find number may be assigned to an item for the purpose of cross-referencing an item identified in a Parts List (PL) or table on the drawing to the location of the item in the field of the drawing, in lieu of using the PIN in the field of the drawing. The use of find numbers or direct reference to PINs is an option. However, the option selected should be applied consistently throughout any given drawing. Item identifications for parts or assemblies that are assigned a find number shall be itemized in the integral or separate PL or in a table on the drawing. Items identified as substitutes may be assigned the same find number as the items for which they may be substituted. The same find number may also be used to identify approved design variations. Find numbers are for cross-referencing purposes only within the drawing and associated lists and shall not be used for procurement or marked on the items they represent or the assemblies containing the items. Reference designations in accordance with ANSI/IEEE 200 and IEEE 315 may be used as find numbers (see ASME Y14.34M).

D-9 IDENTIFICATION REQUIREMENTS

All drawings, associated lists, and items shall be assigned identifications as follows:

D-9.1 New Drawings and Associated Lists

New drawings and associated lists shall be assigned a CAGE Code in accordance with Section D-4 and para. D-9.4; drawing numbers in accordance with Section D-5 and para. D-9.5. Items shall be assigned PINs in accordance with Section D-7, para. D-9.6. and Section D-10.

D-9.2 Existing Drawings and Associated Lists

Existing drawings and associated lists that do not contain a CAGE Code, FSCM, or Code Identification shall be assigned a CAGE Code in accordance with Section C-4. The CAGE Code shall be placed as near as possible to the title block or associated list number. The CAGE Code shall be preceded by the phrase "CAGE CODE" or "CAGEC."

D-9.3 Referenced Documents

All documents, other than government or nongovernment standardization documents referenced on drawings, shall be assigned a document identification number, and a CAGE Code. Reference documents shall be identified on the drawings in accordance with Section D-11. The contractor design activity is responsible for assigning or obtaining document numbers and the CAGE Code for documents used with drawings. Technical orders, pamphlets, and recordings are not considered referenced documents and, therefore, shall not be referenced on engineering drawings without government design or procuring activity approval.

D-9.4 CAGE Code

The CAGE Code shall be the CAGE Code of the design activity whose drawing number is assigned to the drawing and shall be entered on the drawing in the appropriate block, as shown in Fig. D-1. CAGE Code assignment shall establish a relationship between the assigned Code and the design activity name and address (appearing on the drawing), at the time of assignment (Notice of change in design activity name or address are subject to review by the government and are forwarded to Defense Logistics Services Center, Defense Logistics Agency, Battle Creek, Michigan 49016.).

D-9.5 Drawing Number Structure

The drawing number shall not exceed 32 characters. These characters may include numbers, letters, and dashes with the following limitations (see para. D-9.6):

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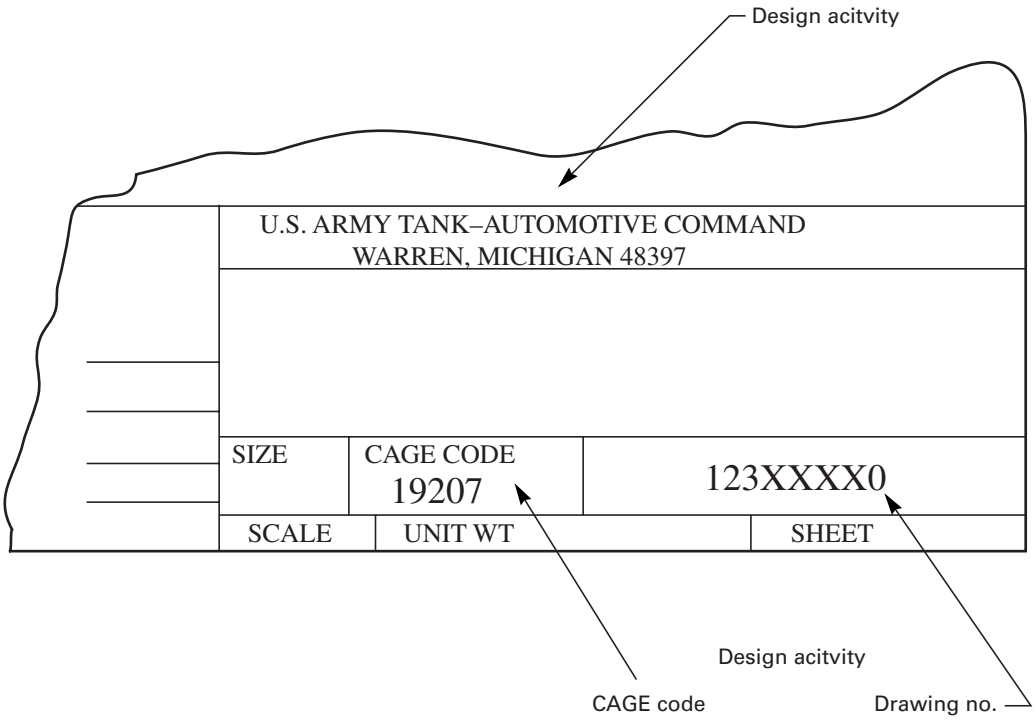


Fig. D-1 Example of Cage Code, Drawing No., and Design Activity Relationship as Originally Specified

(a) Letters "I," "O," "Q," "S," "X," and "Z" shall not be used; however, letters "S" and "Z" may be used only if they are a part of the existing drawing numbering system. They shall not be used in the development of new drawing numbering systems.

(b) Letters shall be uppercase (capital letters). Numbers shall be Arabic numerals. Fractions, decimals, and roman numerals shall not be used.

(c) Blank spaces are not permitted.

(d) Symbols such as: parentheses (), asterisks *, degree °, plus +, shall not be used, except when referencing the government or nongovernment standardization document whose identification contains such a symbol.

(e) The CAGE Code, drawing format size letter, and drawing revision letter are not considered part of the drawing number.

(f) Drawing numbering systems shall preclude duplication of assigned numbers. Numbering systems may be based on either nonsignificant or significant numbers.

D-9.6 PIN Length and Application

PINs shall not exceed 32 characters. This number shall be or include the drawing number indicated on the drawing on which the item is described. Where more than one item is described on a drawing, unique identification shall be provided by the addition of a suffix identifier (formerly called dash number), with the following limitations (for bulk items, see Section D-14):

(a) The total length of the PIN including the suffix identifier shall not exceed 32 characters.

(b) The suffix identifier shall have the same characteristics as drawing numbers (see para. D-9.5).

(c) Suffix identifiers may be used even if only one item is described on a drawing.

(d) PINs shall not include the drawing revision [see para. D-9.5(e)].

(e) Once assigned, PINs shall not be changed except as permitted or required by Sections D-10 and D-13. When additional items are added to a drawing, the PINs of existing items shall not be changed, even if no suffix identifier was originally assigned.

NOTE: Contractor-manufacturer part and drawing numbering systems. Contractors and manufacturers are encouraged to forward an explanation of their part and drawing number systems to the Commander, Defense Logistics Services Center, ATTN: DLSC-FBA, Federal Center, Battle Creek, Michigan 49016.

D-9.7 Records

A complete and accurate record of drawing numbers shall be maintained by the design activity allocating or assigning the numbers. Duplicate drawing number assignment within an assigned CAGE Code shall be avoided.

D-9.8 Associated Lists

Associated lists shall be assigned the same identifying numbers as the parent drawing to which it pertains.

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This identifier shall be prefixed by the letters "PL" (for Parts List), "DL" (for Data List), "IL" (for Index List), "WL" (for Wire List), "AL" (for Application List), or "ID" (for Indentured Data List), as applicable. This prefix becomes an integral part of the list identifier. When no parent drawing exists, associated lists shall be assigned a drawing number with the associated prefix "PL," "DL," "IL," "WL," "ID," or "AL." The 32-character PIN limit shall not apply in those instances where the applicable associated list prefix plus the drawing number exceeds 32 characters.

D-9.9 Transferring Design Responsibility to Another Activity

When the design responsibility for engineering drawings is transferred from one design activity to another, the drawing number(s) and PIN(s) shall be transferred to the new design activity for administration. The new assignee shall add his CAGE Code, name, and address on the drawing by revision action to identify change in design responsibility. In no case will the original drawing identity be changed or relocated to indicate a new CAGE Code. Figure D-2 illustrates an example of drawing notations indicating a transfer of design responsibility. All sheets to a drawing shall be assigned the same CAGE Code.

NOTE: In addition, the CAGE Code of the original design activity specified in the item identification marking requirement shall not be changed.

D-9.9.1 Parent or Corporate CAGE Code. The current design activity for a drawing may be administratively transferred to a parent or corporate entity assigned its own CAGE Code. Where there is expectation that there will be numerous or rapid transfers of drawings among activities with different CAGE Codes, the option to transfer design activity to a parent or corporate CAGE Code may be exercised. Where a drawing remains within the jurisdiction of a corporate or parent entity, there is no requirement for drawing revision to indicate design activity transfer. New drawings released by an entity may indicate a parent or corporate design activity as the original design activity.

D-9.9.2 Maintaining Design Activity Identities. When drawings are redrawn, the original design activity CAGE Code and drawing number shall be shown in their applicable locations as on the original documentation. See Fig. D-2.

D-10 ITEM IDENTIFICATION AND PIN

Each item shall be identified as follows:

(a) Design activity items shall be assigned PINs that meet the requirements of para. D-9.6.

(b) When several items are detailed on a single drawing by tabulation, or through multi-detail, detail assembly, or installation drawing, each item shall be assigned a separate PIN meeting the requirements of para. D-9.6.

(c) Altered and selected items shall be assigned a PIN meeting the requirements of para. D-9.6.

(d) Source control items shall be assigned a PIN meeting the requirements of para. D-9.6. See Note (1).

(e) The PIN for an item delineated on a vendor item control drawing shall be the part number assigned by the vendor. However, reference to the items depicted shall be to an administrative control number established by the vendor item control drawing and, as applicable, suffix identifiers. Administrative control numbers shall have the same requirements as a PIN. See Note (2).

(f) When interchangeable items are repairable, but the repair parts are not interchangeable, each item shall be assigned a separate PIN.

NOTES:
(1) Source control drawing numbers along with applicable suffixes establish PINs. When more than one vendor is listed on a source control drawing for items that are repairable and the repair parts are not interchangeable between the vendors, each vendor item shall be assigned a suffix identifier of the source control drawing.
(2) Vendor item control drawing numbers (and applicable associated suffix identifiers) shall not be used as a PIN to physically reidentify the item. Vendor item control drawing numbers are used as a cross reference to vendor part numbers for administrative and documentation control purposes.

D-10.1 Identification Cross-Reference

When items are identified by more than 15 characters or do not meet the other requirements of paras. D-9.5 and D-9.6 and a design activity has no control over this assignment, an administrative control number may be assigned to the item in order to meet the identification requirements of paras. D-9.5 and D-9.6. This includes items controlled by government and nongovernment standardization documents. The administrative control number shall identify the item for administrative purposes. See also "Identification Cross-reference Drawing," ASME Y14.24. Accordingly, the assigned administrative control number may reflect an actual identification cross-reference drawing or a database entry.

D-11 REFERENCES TO ITEMS

References to items shall be made as follows:

(a) Reference to items shall be made by complete PINs (see Section D-10), find numbers (see Section D-8), reference designators, or administrative control numbers.

(b) When an item is referenced on a document having the same number as the item, only the suffix identifier need be shown.

(c) Reference to items covered by a published standardization document shall be made by the PIN established by the standardization document. If the standardization document number is not discernible from the PIN, it shall also be shown.

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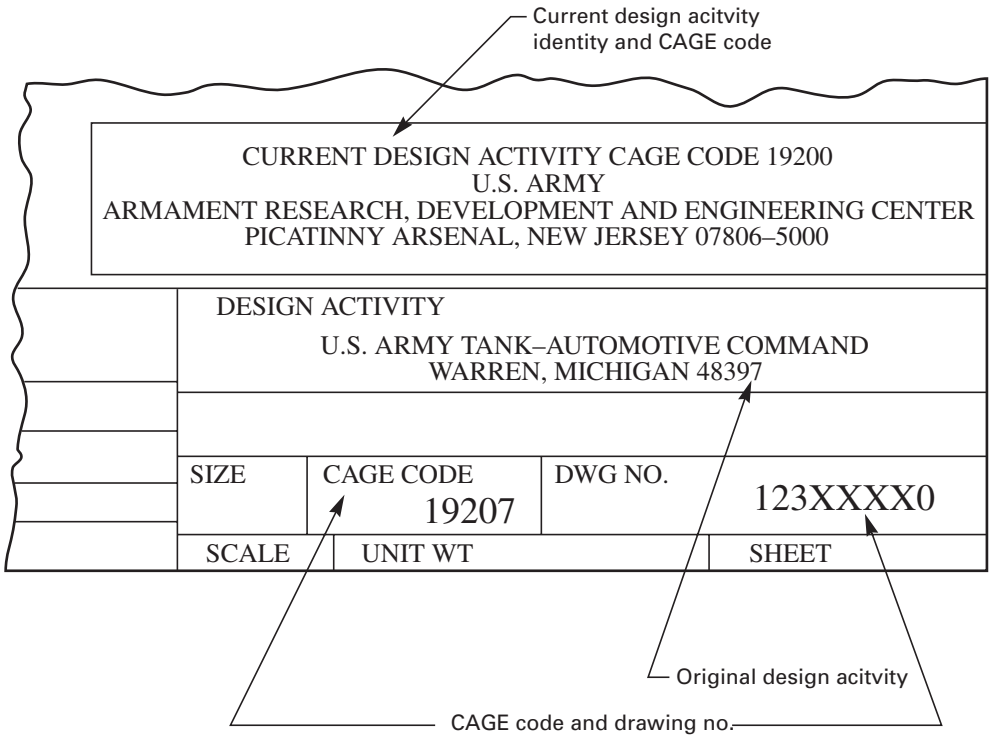


Fig. D-2 Example of Drawing Notation When Design Responsibility is Transferred

Examples:

RNC55H1001FS PER MIL-R-55182/1
and
4-4-160143BA PER SAE J516

(d) Reference to altered or selected items shall be by the design activity assigned PIN.

(e) Reference to source controlled items shall be by the design activity assigned PIN.

(f) Reference to items delineated on vendor item control drawings shall be by the administrative control number.

D-11.1 Vendor Item Control and Source Control Notations

When an item delineated on a vendor item control or source control drawing is referenced on the next assembly, or other applicable drawing or parts list, the reference [paras. D-11(e) and (f)] shall be accompanied by one of the following applicable notations:

"VENDOR ITEM — SEE VENDOR ITEM CONTROL DRAWING"
or
"VENDOR ITEM — SEE SOURCE CONTROL DRAWING"

D-11.2 CAGE Code As a Prefix

PINs and referenced documents shall be preceded by the CAGE Code of the original design activity except:

(a) When the part is a standard or specification item, the documentation for which is listed in the Department of Defense Index of Specifications and Standards (DoDISS).

(b) When the referenced document is listed in the DoDISS.

(c) When the CAGE Code for the item identified or document being referenced (detail callout) is common to the code of the document on which it is listed or referenced.

(d) When the CAGE Code is shown in the PL, it may be omitted from the part callout on the face of the drawing.

D-12 NUMBERING OF RELATED PARTS

Numbers to identify special relationships between parts shall be assigned as follows.

D-12.1 Matched Part Designation

Matched parts shall be marked with the word "SET" next to the PIN assigned to identify the matched set or pair of parts. See also ASME Y14.24.

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D-12.2 Symmetrically Opposite (Mirrored) Parts

Symmetrically opposite parts, if not described by separate drawings, shall be described using one of the following methods:

(a) Detail each part in a separate view. Each part shall be identified by the suffix identifier system. See para. D9.6. Do not specify "SHOWN" and "OPPOSITE."

(b) Detail one of the parts in a view and identify each part by the suffix identifier system. See para. D-9.6. For example, include on the drawing under the view the designation "765432-1 SHOWN" and "765432-2 OPPOSITE" or "-1 SHOWN" and "-2 OPPOSITE." The use of odd suffix identifiers for the parts shown and even suffix identifiers for the opposite parts is preferred. This method is useful if the view is clear enough to distinguish the opposite part.

D-12.3 Inseparable Assembly

When two or more pieces are permanently fastened together by welding, riveting, brazing, cementing, bonding, or other processes to form an inseparable assembly, the assembly shall be assigned an identifying number. The individual pieces may be assigned PINs as described in Section D-9 and called out on the inseparable assembly.

D-13 Change Requiring New Identification

When a repair part within an item is changed so that it is no longer interchangeable with its previous version, it shall be assigned a new PIN. A new PIN shall also be assigned to the next higher assembly for the changed repair part and to all subsequent higher assemblies up to and including the level at which interchangeability is re-established. The design or procuring activity shall assign new PINs when a part or item is changed in such a manner that any of the following conditions occur:

(a) Condition 1. Performance or durability is affected to such an extent that superseded items must be discarded or modified for reasons of safety or malfunction.

(b) Condition 2. Parts, subassemblies, or complete articles are changed to such an extent that the superseded and superseding items are not interchangeable.

(c) Condition 3. When superseded parts are limited to use in specific articles or models of articles and the superseding parts are not so limited to use.

(d) Condition 4. When an item has been altered, selected, or is a source control item. See ASME Y14.24.

D-13.1 Computer Program

When an item is changed in such a way that it necessitates a corresponding change to a computer program for operation, self test, or maintenance test, the PIN of the item and its next assembly and all progressively higher assemblies shall be changed up to and including the assembly where computer programs are affected.

D-13.2 Changes Not Requiring New Identification

When a part or assembly is changed in such a manner that conditions of Section D-13 do not occur, the PIN shall not be changed. Under no condition shall the PIN be changed only because a new application is found for an existing part. When an item has been furnished to the government, the applicable PIN shall not be changed unless conditions in Section D-13 apply. However, when a design activity desires to create a tabulated listing or a standard because of a multiple application of an item, the aforementioned need not apply. The superseded drawing shall identify the document that superseded it. The superseding document shall identify the PINs replaced and provide a complete cross-reference of superseded PINs to replacement PINs.

D-14 Identification of Materials, Processes, and Protective Treatment

Materials, processes, and protective treatment necessary to meet the design requirements of an item shall be identified on the drawing or PL by reference to the item identification, identification cross-reference, or to the applicable specifications or standards, including type, grade, class, or condition as applicable. Revision or amendment symbol of the specification or standard shall not be indicated unless it can be established that a particular revision level or existing amendment has a critical relationship to drawing interpretation or item function. Additional reference to other equivalent specifications is permitted. If necessary, these items may be reidentified in accordance with para. D-10.1.

D-14.1 Group Identification

A set of requirements common to items delineated on different drawings may be consolidated into a single document and referred to by a single document identifier. This document shall be part of the drawing set. A single document prepared to group together several requirements shall not be used to circumvent the requirement to prepare a specification.

D-14.2 Other Identification

When parts, materials, processes, and protective treatments are used which cannot be identified adequately in accordance with Section D-10, a separate drawing or specification shall be prepared when applicable. See para. D-10.1. The document or PIN shall be specified on applicable drawings.

D-14.3 Formulation Identification

Formulation (such as chemical constituents of explosives, propellants, pyrotechnics, or fillers) shall be considered and treated as a part and identified in accordance with para. D-9.6 (PINs) or para. D-11(c) (specification or standard-based identifications).

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D-14.4 Bulk Items Identification

Bulk items shall be identified by a discrete identifier in accordance with Sections D-9 or D-14. Where practicable, the quantity or measurement of material shall be included. Separate engineering drawings shall not be prepared for specific quantities of bulk items, unless the conditions specified in para. D-14.4.1 apply.

D-14.4.1 Drawings for Bulk Items. Any bulk item, requiring assignment of National Stock Number and not having an associated PIN system, shall require a drawing and PIN if no supporting documentation exists (such as a military specification or standard or nongovernment standard). Bulk items, which have a finite shape, such as wire, tubing, cable, chain, tape, and hose, and are required for logistics support, shall be identified as a component on assembly or installation drawings through a discrete PIN consisting of a document number and suffix identifiers, as applicable to identify each size, length, or quantities used in the assembly or installation. Accordingly, the absence of controlling documentation and PIN system shall require a separate drawing. See Identification Cross-Reference Drawing in ASME Y14.24. Separate drawings shall not be prepared for bulk items covered by existing specifications or standards except where there is a support requirement and an absence of a PIN.

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NONMANDATORY APPENDIX E
MARKINGS ON ENGINEERING DRAWINGS

E-1 GENERAL

This Appendix establishes requirements for application of markings on engineering drawings and associated lists for other than commercial practices.

E-1.1 Application

In the event of a conflict between the contents of this Appendix and the practices detailed in Sections 1 through 7 of ASME Y14.100-2004, this Appendix shall take precedence, when invoked.

E-2 REFERENCES

The following documents form a part of this Appendix to the extent specified herein. The issue in effect shall be that specified in a solicitation.

MIL-HDBK-263, Electrostatic Discharge Control Handbook for Protection of Electrical and Electronic Parts

MIL-HDBK-2164, Environmental Stress Screening Process for Electronic Equipment

MIL-STD-882, System Safety Program Requirements

MIL-STD-1686, Electrostatic Discharge Control Program for Protection of Electrical Equipment (Excluding Electrically Initiated Explosive Devices)

Publisher: Department of Defense, Copies of DoD published documents are available from the DoDSSP, Standardization Documents Order Desk, Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

E-3 DEFINITIONS

distribution statement: a statement used in marking a technical document to denote the extent of its availability for distribution, release, and disclosure without need for additional approvals and authorizations from the controlling DoD office.

E-4 SYMBOLOGY

See Table E-1 and Section 7 of ASME Y14.100-2004.

E-5 SPECIALIZED NOTES

E-5.1 Hardness Critical Note

The following note shall be used for nuclear hardness critical items and processes:

THIS (enter the word DRAWING or PARTS LIST, as appropriate) DEPICTS HARDNESS CRITICAL ITEMS (HCI) AND (OR) HARDNESS CRITICAL PROCESSES (HCP). ALL CHANGES TO, OR PROPOSED SUBSTITUTIONS OF, THESE HCI OR HCP SHALL BE EVALUATED BY (enter the engineering activity responsible for nuclear survivability).

E-5.2 Ozone-Depleting Chemicals Note

The following note shall be used when the use of ozone-depleting chemicals is delineated on the drawing:

THIS (enter the word DRAWING or PARTS LIST, as appropriate) DEPICTS CLASS I OZONE-DEPLETING CHEMICALS (ODC).

E-6 RIGHTS IN DATA LEGENDS ON DRAWINGS

Proprietary restrictions, such as limited rights and government purpose license rights, shall be marked on applicable drawing sheets with the appropriate approved legend, as specified by the applicable subpart of the Defense Federal Acquisition Regulation Supplement (DFARS). Care should be taken to assure that the legend is delineated in the field of the drawing, within the margins. On drawings that are reproduced in segments, the legend should appear in each microfilm segment. Drawings in book-form need only delineate the legend on the title sheet.

E-7 DISTRIBUTION STATEMENTS

Distribution Statements and associated Export Control Notices shall be in accordance with DoD Directive 5230.24. Distribution Statements shall be as specified by the government design or procuring activity.

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Table E-1 Acronyms for Special Items and Processes

Acronym	Description	Reference
CSI	Critical Safety Item	MIL-STD-882
CSP	Critical Safety Process	MIL-STD-882
ENI	Environmental Impact	
ESD	Electrostatic discharge Sensitive Devices	MIL-STD-1686/MIL-HDBK-263
ESS	Environmental Stress Screening	MIL-HDBK-2164
HAZ	HAZardous conditions, processes, or materials	
HCI	Hardness Critical Item	
HCP	Hardness Critical Process	
I/R	Interchangeability/Repairability	
INT	INTerface Control	
OCI	Observable Critical Item	
OCP	Observable Critical Process	
ODC	Ozone-Depleting Chemical	
ODS	Ozone-Depleting Substance	

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ASME Y14.100-2004

ISBN 0-7918-2950-2





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