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DEPARTMENT OF DEFENSE
MANUFACTURING PROCESS STANDARD
IDENTIFICATION MARKING
REQUIREMENTS FOR
SPECIAL PURPOSE COMPONENTS



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MIL-STD-792F(SH)
19 May 2006

DEPARTMENT OF THE NAVY
NAVAL SEA SYSTEMS COMMAND

Washington, DC 20376-5160

Identification Marking Requirements for Special Purpose Components

1. This standard is approved for use by the Naval Sea Systems Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

2. Beneficial comments, recommendations, additions, deletions, clarifications, etc. and any data that may be of use in improving this document should be sent to: Commander, Naval Sea Systems Command, ATTN: SEA 05Q, 1333 Isaac Hull Avenue, SE, Stop 5160, Washington Navy Yard DC 20376-5160 or emailed to commandstandards@navsea.navy.mil, with the subject line "Document Comment". Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <http://assist.daps.dla.mil>.

MIL-STD-792F(SH)
19 May 2006

CONTENTS

	<u>Page</u>		
Paragraph	1.	SCOPE	1
	1.1	Purpose.....	1
	1.2	Applicability	1
	2.	REFERENCED DOCUMENTS	1
	2.1	General	1
	2.2	Government Documents	1
	2.2.1	Specifications, standards and handbooks	1
	2.2.2	Other Government documents	1
	2.3	Non-Government publications	2
	2.4	Order of precedence	2
	3.	DEFINITIONS	2
	3.1	Identification marking	2
	3.2	Permanent marking.....	2
	3.3	Temporary marking	2
	3.4	Low stress die stamps	2
	3.5	Authorized representative of Naval Sea Systems Command (NAVSEA)	3
	3.6	Layout marking	3
	4.	GENERAL REQUIREMENTS.....	3
	4.1	Permanent marking methods.....	3
	4.2	Temporary marking methods	3
	5.	DETAILED REQUIREMENTS	4
	5.1	Type I, vibrating marking tools	4
	5.2	Type II, electrochemical etching	4
	5.3	Type III, raised markings.....	4
	5.4	Type IV, nameplates	4
	5.5	Type V, die stamping	4
	5.6	Type VI, special marking.....	4
	5.7	Type VII, engrave marking.....	5
	5.8	Type VIII, laser engraving	5
	5.8.1	Type IX, dot matrix marking.....	5
	5.9	Limitations on identification marking	6
	5.10	Limitations on permanent identification marking.....	6
	5.11	Limitations on temporary identification or layout marking	7
	5.11.2.1.1	Surfaces without crevices or inaccessible areas	8
	5.11.2.1.2	Surfaces with crevices and inaccessible areas.....	8

MIL-STD-792E(SH)
12 August 1986

CONTENTS (continued)

	<u>Page</u>		
Paragraph	5.11.2.1.3	Halogenated solvents	8
	6.	NOTES.....	9
	6.1	Intended use	9
	6.2	Subject term (key word) listing.....	9
	6.3	Changes from previous issue	9

MIL-STD-792F(SH)
19 May 2006

1. SCOPE

1.1 Purpose. The purpose of this standard is to provide general requirements for the marking of raw materials, products and components.

1.2 Applicability. This standard provides general requirements for surface marking on components, component parts and piping for purposes of permanent identification, temporary identification and dimensional layout. Requirements for marking of raw materials as required by material specifications are not superseded by this standard. In the event of a conflict between the text of this standard and the marking requirements and prohibitions of product and component specifications and welding standards, this standard shall not take precedence.

2. REFERENCED DOCUMENTS

2.1 General. The documents listed in this specification are specified in sections 3, 4 or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of the documents cited in sections 3, 4 and 5 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards and handbooks. The following specifications, standards and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

Unless otherwise indicated, copies of federal specifications and standards are available from the ASSIST Online database at <http://assist.daps.dla.mil> or the Standardization Documents Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094).

SPECIFICATIONS

MILITARY

MIL-PRF-16173 - Corrosion Preventive Compound, Solvent Cutback,
Cold-Application.

MIL-DTL-24466 – Polyethylene Sheet, Bags, and Tubing, Green.

2.2.2 Other Government documents. The following other Government document forms a part of this standard to the extent specified herein.

CODE OF FEDERAL REGULATIONS (CFR)

27 CFR 21.47 - Code of Federal Regulations, Subpart D, Alcohol,
Tobacco Products and Firearms

MIL-STD-792F(SH)
19 May 2006

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington, DC 20402.)

(Copies of specifications and publications required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.3 Non-Government publications. The following document forms a part of this standard to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
B4.0 - Methods for Mechanical Testing of Welds. (DoD adopted)
(Application for copies should be addressed to the American National Standards Institute Inc., 25 West 43rd Street, New York, NY 10036.)

(Nongovernment standards and other publications are normally available from the organizations which prepare or which distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.4 Order of precedence. In the event of a conflict between the text of this standard and the references cited herein, the text of this standard shall take precedence.

3. DEFINITIONS

3.1 Identification marking. Identification marking consists of letters, numbers, directional arrows or symbols intentionally added to metal surfaces of components, components parts, or piping for identification or instructional purposes. Marking can be separated into two categories: permanent and temporary.

3.2 Permanent marking. Permanent marking is marking which is intended to remain integral with a component, component part or piping for purposes of permanent identification.

3.3 Temporary marking. Temporary marking is marking which is intended to remain integral with a component, component part or piping for a limited time only. Temporary marking may be applied for identification, recording inspection information or dimensional layout or control.

3.4 Low stress die stamps. A low stress die stamp is defined as a round bottom impression tool producing an indentation conforming to the tabulated dimensions:

MIL-STD-792F(SH)
19 May 2006

<u>Character Size</u>	<u>Minimum tip radius</u>	<u>Nominal impression width for 0.010 inch depth</u>
1/16 inch	0.005 inch	0.020 inch
3/32	.006	.021
1/8	.007	.022
3/16	.008	.026
1/4	.010	.031
3/8	.014	.042
1/2	.020	.062

3.5 Authorized representative of Naval Sea Systems Command (NAVSEA). An authorized representative of NAVSEA is the direct contractor, other than a shipbuilder, who has design and/or procurement responsibility. Vendors for the authorized representative normally communicate directly with the authorized representative and not NAVSEA.

3.6 Layout marking. Layout markings are those markings and reference points (and lines) intentionally added to components and component parts to aid in manufacture, fit-up, assembly and inspection.

4. GENERAL REQUIREMENTS

4.1 Permanent marking methods. The following methods shall be used for permanent identification on components, component parts or piping, subject to the limitations as specified in 5.9 and 5.10:

- Type I - Vibrating marking tool
- Type II - Electrochemical etch
- Type III - Raised markings
- Type IV - Nameplates
- Type V - Die stamping
- Type VI - Special marking
- Type VII - Engrave marking
- Type VIII - Laser engraving
- Type IX - Dot matrix marking

4.2 Temporary marking methods. Any method as specified in 4.1 acceptable for permanent identification by this standard is acceptable for temporary marking, subject to the limitations as specified in 5.11. In addition, the following methods may also be used subject to the limitations as specified in 5.11:

- Type A - Fluid or solid marking materials
- Type B - Removable tape
- Type C - Removable tag
- Type D - Scribe mark
- Type E - Center punch
- Type F - Fabric tip marking pen

MIL-STD-792F(SH)
19 May 2006

4.3 Exceptions to the permanent or temporary marking methods described herein must be submitted to NAVSEA or its authorized representative for approval.

4.4 The Office of the Secretary of Defense (OSD) mandated Unique Item Identification (UII) marking of U.S. Military property in 2004. In accordance with this mandate, NAVSEA procured and managed material will be marked in accordance with Standard Logistics procedures.

5. DETAILED REQUIREMENTS

5.1 Type I, vibrating marking tools. Vibrating tools shall be fitted with a carbide marking point, or equivalent, and shall be adjusted to provide a legible shallow rounded impression not exceeding 0.010 inch in depth. The marking tool tip minimum radius shall be 0.005 inch. The minimum character size scribed by the marking tool shall be approximately 3/32 inch high to insure legibility. The marking tool tips shall not be cadmium plated.

5.2 Type II, electrochemical etching. The electrolyte used shall be compatible with the base material to be marked. Electrolyte containing bromine, chlorine, fluorine, sulfur and lead in excess of 250 parts per million (p/m) each shall not be used. Certified test results shall be submitted with each batch or mix of electrolyte to establish compliance with this limit. The certified test report shall also identify the analysis method(s) utilized. Etching shall be covered by a written procedure which includes as a minimum the specification of the electrolyte and cleaning methods. This procedure shall be made available to the authorized representative of NAVSEA concerned upon request. The depth of marking by electrochemical etching should be approximately 0.0005 inch deep or greater.

5.3 Type III, raised markings. Raised identification markings that are cast or forged integrally with the part are acceptable.

5.4 Type IV, nameplates. The method of attaching nameplates to parts shall be indicated on applicable drawings and shall minimize stress concentrations. Nameplates, where welded, shall be welded in accordance with the requirements of the applicable equipment specification.

5.5 Type V, die stamping. Die stamping can induce residual stresses in base materials and therefore is not a preferred marking method. To reduce the effects of residual stresses in base material caused by application of die stamping, the following additional requirements shall be met:

- (a) Only round bottom, low stress die stamps in accordance with 3.4 shall be used. Impression depths shall not exceed 0.010 inch.
- (b) The marking shall be applied as specified in 5.9.5.

5.6 Type VI, special marking. For certain marking applications, such as the serializing of internal component parts, the use of marking tools not permitted by the above requirements may simplify marking procedures and may not adversely affect the integrity of the parts where such markings are applied in areas of low stress. Any special marking applications that take exception to the requirements of this standard shall be specifically indicated on the applicable

MIL-STD-792F(SH)
19 May 2006

design drawings or in the applicable fabrication procedures and shall be submitted to the authorized representative of NAVSEA for approval prior to use.

5.7 Type VII, engrave marking. Engraved characters shall be restricted to the following dimensional limitations: maximum depth - 0.010 inch, minimum depth - 0.004 inch and minimum root radius - 0.005 inch.

5.8 Type VIII, laser engraving. Laser engraved characters shall have a nominal depth of 0.001 to 0.003 inch deep, but a maximum depth of the characters shall be no greater than 0.005 inch.

- (a) User activities are advised that variability exists among different laser engraving machines in producing controlled depth and contour of engraved marks.
- (b) Each user activity shall have a formal qualification procedure for the laser engraving machine. The qualification procedure shall be approved by NAVSEA or their authorized representative. The qualification procedure must demonstrate that the laser engraving machine will provide a round bottom contour and the required size and depth of engraving for each material to be engraved. The demonstration shall include a minimum of five lines engraved on each material sample. A string of all alpha (a to z) and numeric (0 to 9) characters shall be engraved beneath each line using the character type and size to be used in production. The engraved samples shall be inspected as follows:

A transverse cross-section shall be removed from each sample. The samples shall be examined at 100X and evaluated for conformance to the depth and contour requirements. Cracks and loose or easily removed recast material are not permitted.

A portion of each demonstration sample shall be tested in accordance with the ANSI B4.0 requirements for the bend testing of a weld. One face bend specimen shall be tested. The bend radius shall be selected to obtain a minimum 20 percent elongation or the minimum required elongation of the base material, whichever is less. The markings in the bend region shall be examined at 100X. Cracks and loose or easily removed recast material are not permitted.

5.8.1 Type IX, dot matrix marking. The depth of the marking shall be nominally 0.001 to 0.002 inch and no deeper than 0.004 inch. Dot matrix marking shall have a 135° included angle nominally and a minimum tip radius of 0.015 inch. For each material to be marked, the minimum tool force necessary to obtain characters of nominal depth shall be used. The marking tool tips shall not be cadmium plated. Type IX marking may be used as a substitute for type I marking where vibrating tool marking is allowed. Where type IX is used as a substitute for type I, the tip radius and depth requirements for type I shall apply.

5.9 Limitations on identification marking.

5.9.1 Electric arc marking pencils shall not be used for any marking applications.

MIL-STD-792F(SH)
19 May 2006

5.9.2 No marking shall reduce the wall thickness of the part below the minimum required by the applicable drawing or specifications.

5.9.3 Tube and pipe shall not be marked with the type V permanent marking method.

5.9.4 All marking shall be legible.

5.9.5 Permanent identification marking shall be applied on low stressed areas such as a flange rim, top of nut, top of stud or an integral pad or boss as determined by considering applied loads on individual parts.

5.9.6 Where possible, marking shall be located so that the marking will not be defaced during installation (for example, not marked near welds, wrenching surfaces, on flange faces, and so forth).

5.10 Limitations on permanent identification marking.

5.10.1 Permanent identification markings and their locations shall be indicated on the applicable drawings or in a specification or procedure. Permanent marking may be characterized by the following attributes for inclusion in detail manufacturing instructions, manufacturing procedures or detail part drawings:

- (a) type of marking
- (b) specific characters to be applied
- (c) approximate location of characters on a specific part
- (d) minimum character size
- (e) other characteristics as appropriate.

5.10.2 Hardened materials shall be marked only by the type II method. Hardened material is any material, except carbon steel with a specified carbon content of 0.35 percent or less, which has had its mechanical strength increased by quenching and tempering, aging or cold working.

5.10.3 Base material or pressure boundary parts less than 1/8 inch thick shall be permanently marked by the type II method. The base material thickness of pipes is considered to be the nominal wall thickness. The base material thickness for tubing is considered to be the minimum wall thickness specified.

5.10.3.1 Piping less than 1/8 inch thick may also be permanently marked using the type IX method with the following exceptions:

- (a) No marking shall be applied in bent or welded areas (including heat affected zones) of pipe or areas which will be bent after marking.
- (b) No marking shall be applied to areas of pipe which will be flared or flanged.

5.10.4 Type II permanent marking shall not be used on carbon steels except as specified in 5.10.2 and 5.10.3.

MIL-STD-792F(SH)
19 May 2006

5.10.5 Type I, type II, type VII, type VIII and type IX permanent markings used on carbon steel shall be covered with a preservative to prevent corrosion of the marking. The preservative shall be in accordance with MIL-PRF-16173.

5.10.5.1 Permanently marked carbon steel items may be stored without a preservative for 30 days or less. This short term storage must be dry indoor storage. For shipyards, storage times may be greater than 30 days based on their standard practices and experience that assure the legibility of marking is maintained.

5.10.5.2 Small permanently marked carbon steel items do not require a preservative if they are stored indoors in sealed polyethylene bags. The polyethylene bags shall conform to MIL-DTL-24466.

5.10.6 Type V permanent marking may be used on carbon steel, except carbon steel with a specified carbon content of greater than 0.35 percent. Type V permanent marking may be used on other materials only when specified or approved by NAVSEA or an authorized representative as defined in 3.5. This does not supersede requirements as specified in 5.9.2 or 5.9.3.

5.10.7 Type VIII permanent marking shall be used only on surfaces that are unwetted in service. When type VIII marking is used on materials which require post weld heat treatment, it shall be performed before the post weld heat treatment.

5.11 Limitations on temporary identification or layout marking.

5.11.1 Type I, type V, type VII, type VIII, and type IX permanent marking and type D and type E temporary marking may be used only when the depression is blended smoothly into the general contour without violating the minimum wall thickness. The radius at the bottom of all areas resulting from the removal of such markings shall be at least three times the depth of the depression.

5.11.2 Type A, B, and F temporary marking shall be removed prior to being exposed to thermal treatments including preheat and heat of welding, except that type A and type F marking may remain on materials provided:

- (a) It has been demonstrated by the organization proposing to use the marking fluid for temporary identification through thermal treatments that any material so marked is not affected when exposed to the thermal treatment.
- (b) Each lot of marking material is demonstrated by test to be non-detrimental for each material so marked. Two specimens (marked as in production marking) of each material to be marked along with one unmarked specimen shall receive a heat treatment at the maximum temperature for the maximum time as that used during production heat treatment. One longitudinal specimen shall be removed from each specimen and shall be metallographically inspected at a minimum of 100X magnification to assure that there has been no interaction of the marking material with the base

MIL-STD-792F(SH)
19 May 2006

material and no evidence of cracking, pitting, or corrosion caused by the marking material. Also, one marked and the unmarked sample shall be given guided-bend tests in accordance with ANSI/AWS B4.0. The bend test samples shall exhibit no cracking.

5.11.2.1 Type A and type F marking and residue from type B marking shall be removed using one of the following solvents:

- (a) Unused or redistilled acetone
- (b) Denatured alcohol (formula 23-A of k)
- (c) Isopropanol
- (d) Perchloroethylene (tetrachloroethylene)
- (e) Trichloroethylene

"WARNING"

Vapor of solvents (d) and (e) are toxic.
Spills have caused death at low concentrations.
Use only in well ventilated areas.

ESCAPE IMMEDIATELY IF STRONG VAPOR ODORS ARE DETECTED.

5.11.2.1.1 Surfaces without crevices or inaccessible areas. Parts or surfaces containing no crevices or inaccessible areas may be cleaned by degreasing using any of the above solvents.

5.11.2.1.2 Surfaces with crevices and inaccessible areas. Parts or surfaces containing crevices or areas inaccessible to inspection for proper drainage shall be degreased only by immersion in solvents (a), (b), or (c) of the above list with no time restrictions. All parts shall be dried.

5.11.2.1.3 Halogenated solvents. Solvents (d) or (e) of the above list shall not be used on parts or surfaces with crevices. Caution shall be taken when using halogenated solvents (d) or (e) of the above list since decomposition into corrosive agents may occur. Corrosive agents which are generated at temperatures such as those produced during brazing and welding may attack materials of construction, notably corrosion resistant steel. When cleaned with halogenated materials, hardware shall be dried with clean air or inert gas.

5.11.3 All temporary markings shall be removed from material surfaces prior to fabrication operations which render markings inaccessible and prior to final heat treatment. The area exposed by mechanical removal of temporary markings shall be inspected by the same method (limited to liquid penetrant, magnetic particle or visual inspection) originally specified for the base material and shall meet the original base material acceptance criteria.

5.11.4 Temporary marking on the surface of hard, brittle materials such as 17-4PH stainless steel or cold worked Haynes 25 shall be applied by ink using rubber stamps or fabric marking pens or by electrochemical etching.

MIL-STD-792F(SH)
19 May 2006

5.11.5 Type II temporary markings shall not be used on carbon steels.

5.11.6 Metallic tags used for temporary marking and the materials used to attach the tag shall be of the same material as that which is being marked or of a material which affords cathodic protection to the material being marked.

6. NOTES

6.1 Intended use.

Not applicable.

6.2 Subject term (key word) listing.

Die stamp, low stress
Electrochemical etching
Engrave marking
Identification marking
Laser engraving
Marking, metal surface
Vibrating marking

6.3 Changes from previous issue. The outside margins of this standard have been marked with vertical side bars to indicate where changes from the previous issue have been made. This has been done as a convenience only and the issuing agency assumes no liability for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content as written, regardless of the marginal notations and relationship to the last previous issue.

Preparing Activity
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