

INCH-POUND

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SUPERSEDING
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DETAIL SPECIFICATION

HUBS AND DIES FOR HERALDIC ITEMS

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers steel hubs and dies used primarily for extracting working dies used in the manufacture of heraldic insignia.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or 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 documents cited in sections 3 and 4 of this specification, whether or not they are listed.

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

ASTM INTERNATIONAL

ASTM-A681 - Tool Steels Alloy, Standard Specification For
ASTM-E18 - Standard Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials

(These standards can be obtained from ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959 or www.astm.org.)

Comments, suggestions, or questions on this document should be addressed to Department of the Army, The Institute of Heraldry, Technical and Production Division, 9325 Gunston Road, Building 1466, Room S112, Fort Belvoir, VA 22060-5579 or haassw@tioh.belvoir.army.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at www.dodssp.daps.mil.

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2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Design. The heraldic design of the hub or die shall be transferred by reducing device from the Government-loaned drawing or sculpted model to the size specified in the procurement document (see 6.2). When an existing hub or die is used for manufacturing purposes, the heraldic design of the new hub or die shall be an exact replica of the Government-loaned hub or die.

3.2 Material. Material for hubs and dies shall be alloy tool steel conforming to S7 or L6 of ASTM-A681. (For verification, see 4.2.1.) Typical composition is shown in Table I. The use of any other steel shall not be permitted under this specification.

TABLE I. **Steels and their typical composition.**

Name	C*	Mn*	Si*	Cr*	Mo*	Ni*	Remainder*
S7	0.50	0.75	0.25	3.25	1.40	--	Fe
L6	0.70	0.60	0.25	0.70	--	1.40	Fe

* carbon (C), manganese (Mn), silicon (Si), chromium (Cr), molybdenum (Mo), nickel (Ni), and iron (Fe)

3.3 Construction.

3.3.1 Sizes of hubs and dies. The minimum height of hubs and dies shall be 2 inches for heraldic designs under 4 inches in length, width, or diameter. The minimum height of hubs and dies for heraldic designs 4 inches and over in length, width, or diameter shall be 2-1/2 inches. The width, length, or diameter of any hub shall provide a minimum of 3/8 inch clearance between the outside edge of the design and the edge of the hub. The length, width, or diameter of any die shall provide a minimum of 1/2 inch clearance between the outside edge of the design and the edge of the die. There shall be sufficient cutaway or relieved area around the embossing on each hub (driving area) to insure penetration past the embossed design when driving the hub into the working die.

3.3.2. Shapes of hubs and dies. Unless otherwise specified (see 6.2), the shape of the hubs and dies shall be round, square, or rectangular.

3.3.3 Cutting of hubs and dies.

3.3.3.1 Cutting of hubs and dies for items with no enamel/epoxy. For designs with outer rims, hubs and dies for items requiring no enamel or epoxy shall be cut with a minimum depth of 0.030 inch from the top of the design to the bottom of the design. For designs without outer rims, hubs and dies requiring enamel shall be cut with a minimum depth of 0.020 inch from the top of the design to the bottom of the design. The height or depth of modeled areas or detail lines shall be determined by the tool-maker as appropriate for the individual design of the heraldic item. Design walls shall be cut with a cutting tool

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having a bevel of $16^\circ + 6^\circ - 0^\circ$ to prevent undercutting and subsequent breaking of design elements.

3.3.3.2 Cutting of hubs and dies for items requiring enamel. The cutting requirements for hubs and dies for items requiring enamel shall be as stated above (3.3.3.1) except for the following: Areas to be enameled (dike areas) shall be cut to a minimum depth of 0.015 inch. In order to prevent stoning off of the modeled detail in the polishing process, modeled areas or detail lines shall be cut shallower than the dike lines to a minimum height/depth of 0.007 inch.

3.3.4 Design strikes. A lead or pewter strike from the die of the master set (see 3.5) shall be submitted for Government approval and acceptance before the hub or die is hardened.

3.3.5 Heat treating. Hubs and dies shall be normalized as required, hardened, and tempered. Hardness shall be Rockwell 59C to 61C for hubs and Rockwell 57C to 58C for dies when tested as specified in 4.2.5.

3.3.6 Finishing.

3.3.6.1 Finish of dies. The top and bottom surfaces of all dies shall be ground parallel to one another. The area of the top surface which surrounds the design shall be ground smooth. The entire bottom surface shall be ground smooth.

3.3.6.2 Finish of hubs. The entire bottom surface of all hubs shall be ground smooth. The top surface shall have a minimum of three areas, spaced 120° apart, which are ground parallel to the bottom surface and which shall have sufficient smoothness for hardness testing.

3.4 Marking for identification. Hubs and dies shall be legibly marked on the outer periphery by engraving or metal stamping with the following information:

- a. name of item
- b. type of steel
- c. date hubs and/or dies were completed
- d. name or trademark of manufacturer
- e. the words "U.S. Property" or "U.S. Prop" in characters not less than 1/8 inch high.
- f. TIOH hub or die number (unless manufactured for another government organization)

3.5 Master set for new development items. A master set is considered to be the original die or the original hub and die and is to be used in making the design strikes for a new heraldic metal item. Only master sets shall be accepted as Government-owned hubs and dies for new development items.

3.6 Workmanship. Hubs and dies shall be clean, well made, and free from imperfections which may adversely affect their durability and serviceability in manufacturing high quality heraldic insignia.

3.7 Protection. Prior to storage, packing, or shipping, the tops of all hubs and dies shall be covered with an oil-exuding wax or a wax-like coating equal to or better than HR-49 from

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Seal-Peel, Inc (see 6.4). As alternate forms of protection, the tops of hubs and dies may be covered with mirror strikings in red brass, gilding metal, or plastic.

4. VERIFICATION

4.1 Provisions and conditions for inspection. Inspection shall be in accordance with the provisions and conditions set forth herein, except where otherwise indicated (see 6.2). One hundred percent inspection shall be made for the defects applicable to 4.2.

4.1.1 Responsibility. Unless otherwise specified (see 6.2), the contractor is responsible for the performance of all inspections, examinations, and tests set forth in this section. Except as otherwise specified (see 6.2), the contractor may use his own or any other facilities suitable for the required examinations and tests, unless the facilities are disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where it deems them necessary to insure that the hubs and dies conform to requirements.

4.2. Inspections, examinations, and tests.

4.2.1 Testing of steel composition. Unless prohibited by the contract or purchase order (see 6.2), the steels and their composition listed in 3.2 may be accepted on a contractor's certificate of compliance with ASTM-A681.

4.2.2 Pre-hardening inspection. Visual inspection of the design strike specified in 3.3.4 shall be performed to determine conformance with the heraldic design requirements specified in 3.1.

4.2.3. Visual examination of the end item. All defects found during this examination shall be classified as critical.

TABLE II Visual examination of the end item.

EXAMINE	DEFECT
Design	Design of hub or die not an exact replica of the Government furnished design. Design of hub or die not reduced size replica of the Government furnished design when required. Any significant detail unclear, marred, missing, reduced, or obliterated; hub or die does not compare favorably with the applicable drawing, sculpted model, or hub/die used to make it.
Construction	Not shaped as required, i.e., not round, square, rectangular, or as otherwise specified. Driving room on hub omitted. Die too shallow. Design walls of hub or die are undercut.
Workmanship	Contains imperfections such as scratches, tool marks, holes, gouges, dents, burrs, splinters, rough edges, sharp or jagged edges, any of which may affect durability or serviceability. Sunken, fractured, cracked, or broken.

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TABLE II **Visual examination of the end item.** - Continued

EXAMINE	DEFECT
	Malformed, damaged, warped, twisted, distorted, bent out of shape, or otherwise impaired to an extent affecting durability or serviceability. Not clean, i.e., scale, corrosion, bark, rust, or sludge deposits.
Quality of Metal	Not fabricated from specified material. Surface spotted or open grained, i.e., scale, corrosion, bark, rust, or sludge deposits.
Identification Marking	Missing, incorrect, illegible, or text incomplete. Words "U.S. Property" or "U.S. Prop" in characters less than 1/8 inch high.
Finish	Surfaces not ground as required.

4.2.4 Examination for end item dimensions. Any dimension that is not within specified tolerances shall be classified as a critical defect.

4.2.5 Hardness testing of the end item. Testing of the completely fabricated hub or die shall be performed in accordance with guidelines specified in 3.3.5 and ASTM E18. Results shall be reported to the nearest whole number. Care should be exercised to limit hardness readings to areas where indentations will not damage the heraldic design.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful but is not mandatory.)

6.1 Intended use. The hubs and dies covered by this specification are intended to be loaned to contractors for extracting their working dies in the manufacture of heraldic items. This specification also covers master dies to be retained by the Government and used for replacement of Government hubs.

6.2 Acquisition requirements. Acquisition documents should specify the following:

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- a. Title, number (including specific issue/revision), and date of this specification and of referenced documents (see Section 2).
- b. Manufacturing drawing, sculpted model, hub, or die to be used (see 3.1).
- c. Size of hub and/or die required (see 3.1 and 3.3.1).
- d. Shape of hub and/or die required (see 3.3.2).
- e. Packaging requirements (see 5.1).
- f. Special requirements for or exceptions to testing and inspections (see Section 4.)

6.3 Government-loaned property. The contracting office should arrange to loan the manufacturing drawing, sculpted model, hub, or die to be used (see 6.2).

6.4. Seal Peel, Inc. The address for Seal Peel, Inc. is P.O. Box 250, Troy, Michigan 48099. HR-49 (see 3.7) is defined by Seal-Peel, Inc. as "thermoplastic, wax-like, with oil odor" and as a "cellulose acetate butyrate hot dip."

6.5 Subject term (key word) listing.

Cutting tool
Dike line
Driving area
Embossed
Hardened
Normalized
Steel
Tempered
Tool

6.6 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodians:
Army - IH
Air Force - 11
Navy - NU

Preparing activity:
Army - IH

Review activities:
Navy - MC
Coast Guard - CG

(Project No. 8455-0109/001)

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