

INCH-POUND

MIL-S-24451A(SH)
31 JULY 1990

SUPERSEDING
MIL-S-24451(SHIPS)
18 June 1971

MILITARY SPECIFICATION

STEEL HEAT TREATED HEADS, ALLOY STRUCTURAL, HIGH YIELD STRENGTH (HY-80 AND HY-100)

This specification 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.

1. SCOPE

1.1 Scope. This specification covers HY-80 and HY-100 heat treated heads. The requirements for HY-80 apply to thickness to 8 inches inclusive, and HY-100 to thickness up to 3 inches inclusive. Two piece heads consist of heads made from two flat plates welded together and then formed as one piece.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. The following specifications and standards form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 55Z3, Department of the Navy, Washington, DC 20362-5101 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 9515

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

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SPECIFICATIONS

MILITARY

MIL-H-6875	Heat Treatment of Steel, Process for
MIL-S-16216	Steel Plate, Alloy, Structural, High Yield Strength (HY-80 and HY-100)
MIL-E-22200	Electrodes, Welding, Covered; General Specification for
MIL-E-22200/5	Electrodes, Welding, Mineral Covered, Iron-Powder, Low-Hydrogen, Low-Alloy Steel for Hardening and Tempering Heat Treatment Applications Only
MIL-E-22200/10	Electrodes, Welding, Mineral Covered, Iron-Powder, Low-Hydrogen, Medium, High Tensile and Higher-Strength Low Alloy Steels

STANDARDS

MILITARY

MIL-STD-248	Welding and Brazing Procedure and Performance Qualification
MIL-STD-271	Nondestructive Testing Requirements for Metals
MIL-STD-1684	Control of Heat Treatment
MIL-STD-1688	Fabrication, Welding, and Inspection of HY-80/100 Submarine Applications
MIL-STD-2149	Standard Procedure for Explosion Testing Ferrous and Non-Ferrous Metallic Materials and Weldments.

2.1.2 Other Government publications. The following other Government publications form a part of this specification to the extent specified herein. Unless otherwise specified, the issues shall be those in effect on the date of the solicitation.

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PUBLICATIONS

MILITARY

NAVSHIPS 0900-LP-003-8000	Surface Inspection Acceptance Standards for Metals
NAVSHIPS 0900-LP-003-9000	Radiographic Standards for Production and Repair Welds.

(Copies of specifications, standards, 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.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted shall be those listed in the issue of the DODISS specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS shall be the issue of the non-Government documents which is current on the date of the solicitation.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

A 370	Standard Test Methods and Definitions for Mechanical Testing of Steel Products; (DOD adopted)
A 700	Standard Practice for Packaging, Marking, and Loading Methods for Steel Products for Domestic Shipment
E 604	Standard Test Method for Dynamic Tear Testing of Metallic Materials; (DOD adopted)

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI/AWS B4.0	Method for Mechanical Testing of Welds; (DOD adopted)
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(Application for copies should be addressed to the American National Standards Institute, 1430 Broadway, New York, NY 10018.)

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(Non-Government 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.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein (except for associated detail specifications, specification sheets or MS standards), the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 First article. A sample shall be subjected to first article inspection prior to beginning production (see 4.3 and 6.3).

3.2 Material. Base metal material composition for heads shall be in accordance with MIL-S-16216, grade HY-80 or HY-100, as specified (see 6.2.1). The material from which the heads are produced shall be from a source which has met the first article testing requirements of MIL-S-16216.

3.2.1 Recovered materials. Unless otherwise specified herein, all material incorporated in the products covered by this specification shall be new and may be fabricated using materials produced from recovered materials to the maximum extent practicable without jeopardizing the intended use. The term "recovered materials" means materials which have been collected or recovered from solid waste and reprocessed to become a source of raw materials, as opposed to virgin raw materials. None of the above shall be interpreted to mean that the use of used or rebuilt products is allowed under this specification unless otherwise specifically specified.

3.3 Two piece heads (weldments). Welds in two piece heads shall meet all of the requirements as specified in the applicable fabrication document (see 6.2.1) following all forming, heat treatment, and resizing treatments. Two piece heads shall be joined with a heat treatable filler material. Unless otherwise specified, (see 6.2.1) two piece heads shall be joined by qualified welders and weld procedures approved in accordance with MIL-STD-248.

3.4 Mechanical properties. Test specimens shall be taken after the final tempering and resizing treatments, and shall meet the tensile and impact requirements in accordance with MIL-S-16216.

3.4.1 Two piece heads. Transverse weldment tensile and impact specimens shall meet the requirements of MIL-E-22200, MIL-E-22200/5 for HY-80 and MIL-E-22200/10 for HY-100 following all forming, heat treatment, and resizing treatments.

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3.5 Resizing. If resizing for ovality or mean diameter is required after the final tempering treatment, it shall be carried out in accordance with the cold forming requirements as specified in MIL-STD-1688 or, when specified, the applicable fabrication document (see 6.2.1). The maximum cold forming temperature shall not exceed 500 degrees Fahrenheit (°F) (260 degrees Celsius (°C)). Mechanical testing of heads shall be performed following resizing.

3.5.1 The contractor will be allowed to resize the head by warm forming within the following limitations:

- a. The resizing temperatures shall be at least 50 °F below the tempering temperature and shall be above 1100 °F for HY-80 and 1050 °F for HY-100.
- b. The head shall be rapidly cooled after resizing.
- c. The mean diameter of the head shall not be changed more than 2 inches or one percent, whichever is less.
- d. A complete set of mechanical tests shall be performed after resizing.

3.6 Heat treatment. The contractor is responsible for determining the detailed procedure to produce heads meeting the mechanical requirements of this specification with the following restrictions:

- a. The heads shall be austenitized, quenched, and tempered. The final tempering temperature shall be not less than the temperature specified in table I.
- b. The contractor shall maintain a complete record of the heat treatment given each head. The final heat treatment record shall include the time and temperature for the final tempering cycle and resizing treatment, and the cooling method used.

TABLE I. *Minimum tempering temperature.*

Head thickness inches, nominal	Minimum tempering temperature in °F
HY-80 2-1/2 and less (64 mm)	1200 (650 °C)
HY-80 2-1/2 to 8 (64–203 mm)	1175 (635 °C)
HY-100 2-1/2 and less (64 mm)	1150 (620 °C)
HY-100 2-1/2 to 3 (64–76 mm)	1100 (593 °C)

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c. After tempering or resizing treatments, the heads shall be cooled quickly (furnace cooling not permitted) through the temperature range of 500 to 1050 °F (260 to 565 °C) and shall not be held for long periods in this temperature range to preclude temper embrittlement.

d. The heads may be water quenched after tempering at the option of the contractor.

3.6.1 Heat treatment, equipment and controls. The furnaces and temperature recording equipment shall be shown to correlate with the actual temperature of the heads and shall be maintained and calibrated on a regular scheduled basis in accordance with MIL-H-6875 or MIL-STD-1684. After the charge reaches the selected temperature control setting, furnace shall maintain the temperature of the heads at any point in the working zone within plus or minus 25 °F (16 °C).

3.7 Surface quality. The depth of rolled-in scale, pit clusters, or windowed condition shall not exceed 0.015 inch and shall not result in an undergauge condition. Isolated, individual pits not over 0.030 inch deep are acceptable provided head thickness is not reduced below the specified minimum. Surface imperfections may be removed by grinding, providing the thickness is not reduced below the minimum thickness permitted and the ground area is well faired into surrounding metal.

3.7.1 Weld repair of mill defects after heat treatment. When prohibited (see 6.2.1), weld repair after final heat treatment shall not be performed. If not prohibited, mill imperfections may be repair welded by the contractor or referred to the contracting activity for acceptance and so noted on the inspection reports with subsequent repair welding to be performed by the contracting activity. Areas of the head found to have less than the minimum specified thickness may have the thickness restored by welding the depressed area. When weld repairs after final treatment are permitted, the following limitations shall apply:

a. The total area to be repaired shall not exceed one percent of the surface of one side of the head.

b. The depth of any area to be repaired shall not exceed one-half the minimum head thickness specified or 1/2 inch (13 millimeters (mm)), whichever is less. The depth of the area to be repaired shall be a minimum of 1/16 inch (2 mm).

c. Areas within 2 inches (51 mm) of each other which require weld repair shall be combined to form a single repair.

d. Areas to be welded shall be ground to assure that the welds are made on clean, sound metal.

e. After preparation for repair and prior to welding, all of the depressed areas shall be magnetic particle inspected in accordance with MIL-STD-271, and shown to be free of linear discontinuities.

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f. Weld repairs shall be made in accordance with MIL-STD-1688 or, when specified, the applicable fabrication document (see 6.2.1). Procedures and personnel shall be qualified in accordance with MIL-STD-248.

g. The final repaired surface shall be ground smooth and shall be essentially flush with the adjacent surface and free of undercut in excess of 0.020 inch (0.5 mm). The finished weld surface shall also be free from underfill.

h. Heads or segments of heads containing surface weld repairs shall be magnetic particle inspected after final grinding (or subsequent heat treatment, if applicable) in accordance with MIL-STD-271. Welds and adjacent heat affected zone surfaces shall be free of relevant linear indications longer than 1/8 inch (3 mm).

i. Repaired areas shall be marked. The markings shall remain legible and shall not be removed prior to performing all inspections as specified herein.

j. Notations of such repaired areas shall be made on the head inspection form as part of the records.

k. If a non-heat treatable electrode is used, re-heat treatment of the head is prohibited. Warm resizing of heads which have been weld repaired with a non-heat treatable electrode is permitted provided the weld repair procedure is qualified in accordance with MIL-STD-248, following a simulated warm resizing heat treatment.

3.7.2 Weld repairs of mill defects prior to heat treatment. Weld repairs of mill imperfections may be accomplished prior to heat treatment within the limitations of 3.7.1 using an acceptable heat treatable electrode.

3.8 Form and dimensions. Heads shall be made to form and dimension as specified (see 6.2.1).

3.9 Tolerances. The minimum thickness, the maximum thickness, contour, and ovality of the head shall meet that specified (see 6.2.1). Ultrasonic gauging shall be performed in accordance with MIL-STD-271 for plate thickness.

3.10 Ultrasonic inspection (base material for soundness). Ultrasonic inspection shall be performed on the base metal of all heads in accordance with MIL-S-16216 and meet the acceptance requirements therein.

3.11 Cleaning and preservation. Unless otherwise specified (see 6.2.1), the surfaces of the heads shall be descaled and coated as specified in MIL-S-16216.

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3.12 Explosion bulge. When first article testing is required of two piece heads, the weld used in the production of these heads shall be explosion bulge tested (see 4.8.2). Two crack starter and four explosion bulge specimens shall be tested and meet the requirements of MIL-S-16216.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein (see 6.2.2). Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items must meet all requirements of section 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. First article inspection (see 4.3)
- b. Quality conformance inspection (see 4.4).

4.3 First article inspection. First article inspection shall consist of the tests and examinations specified in 4.5 and 4.8.

4.3.1 First article sample. The first article sample shall consist of a steel head representative of normal production (including resizing). Acceptability as a source for Naval acquisitions of heads will be limited to the grade of material, the thickness, two piece or one piece, subjected to first article testing unless otherwise approved by NAVSEA.

4.4 Quality conformance inspection.**4.4.1 Sampling for quality conformance inspection.**

4.4.1.1 Lot. A lot shall consist of all heads made from the same heat, of the same thickness and heat treated in the same furnace at the same time.

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4.4.1.2 Sampling for chemical or spectrographic analysis. Drillings for chemical analysis shall be taken from tensile test specimens from each of two heads from each lot. When only one head is produced from a lot, only one test is required. Solid samples may be taken from tensile coupons for spectrographic analysis.

4.4.1.3 Sampling for tension and hardness tests.

4.4.1.3.1 Sampling for tensile and hardness tests-one piece heads up to 48 inches inclusive outside diameter (od). After final heat treatment and resizing of the heads, one tension test specimen shall be taken from each of two heads from the same lot. The test specimen shall be taken parallel to the open end of the head and oriented transverse to the final plate rolling direction. When only one head is produced from a lot, only one tension test specimen shall be required. Heads not tension tested shall be Brinell hardness tested on the interior and exterior of the head, 180 degrees apart from one another and shall meet the range of 207 to 255 for HY-80 and 241 to 277 for HY-100. Those heads not meeting this range shall be rejected or shall be tension tested, in which case the results of the tension tests shall rule (see figure 1).

4.4.1.3.2 One piece heads over 48 inches od. After final heat treatment and resizing of the head, two tension test specimens shall be taken from each head, parallel to the open end, and oriented transverse to the final plate rolling direction, 180 degrees apart from one another (see figure 2).

4.4.1.3.3 Two piece heads. After final heat treatment and resizing of the head, two tension test specimens shall be taken, 180 degrees apart, from each half of the head adjacent to the weld seam. The specimens shall be taken parallel to the open end of the head and oriented transverse to the final plate rolling direction. Additionally, one tension test specimen shall be taken across the weld to represent the heat treated weld metal (see figure 3).

4.4.1.4 Sampling for impact tests. A set of impact specimens shall consist of three Charpy V-notch specimens taken with their longitudinal dimensions parallel to the open end of the head and oriented transverse to the final plate rolling direction. The axis of the notch shall be perpendicular to the spherical surfaces of the head. Test specimens shall be obtained from locations shown on figures 1, 2, 3, and 4. For base metal in one and two-piece heads, impact sets shall be tested at minus 120 and 0 °F. For weld metal in two-piece heads, impact sets shall be tested at minus 60 and 0°F. In heads for which plate thicknesses and head curvature permit the removal of dynamic tear test specimens, dynamic tear testing shall be performed in lieu of the Charpy V-notch test. In such cases, a dynamic tear test set shall consist of two specimens and the number, location, and orientation of specimen sets shall be identical to those of Charpy V-notch specimens. For base metal, a dynamic tear set shall be tested at minus 40 °F and for weld metal, sets shall be tested at 30 and minus 20 °F. In addition, a base metal dynamic tear set shall be tested at 0 °F for information only.

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4.4.1.4.1 One piece heads up to 48 inches od inclusive. After final heat treatment and resizing, two sets of impact specimens shall be taken 180 degrees apart from each of two heads from the same lot (see figure 1). When only one head is produced from a lot, two sets of impact specimens shall be taken from that head.

4.4.1.4.2 One piece heads over 48 inches od. After final heat treatment and resizing of the head, two sets of impact specimens shall be taken from one side of the head and two sets from the opposite side of the head, 180 degrees apart (see figure 2).

4.4.1.4.3 Two piece heads. After final heat treatment and resizing, four sets of impact specimens shall be taken from each half of each head adjacent to the weld seam. Additionally, two sets of impact specimens shall be taken from the weld metal seam (see figures 3 and 4).

4.4.2 Mechanical property test locations.

4.4.2.1 Heads up to 2 inches thick inclusive. Base metal impact and tensile tests must be taken a minimum distance of one T (T is defined as the gauge of the plate used to make the head) from the heat treated edge of the head. Specimens shall include the materials thickness centerline. For thicknesses less than 5/8 inch, rectangular tensile specimens shall be used. For thicknesses 5/8 inch and greater, the standard 1/2 inch round tensile specimens shall be used.

4.4.2.2 Heads over 2 inches thick. Base metal impact and tensile tests shall be taken a minimum distance of three T from the heat treated edge of the head. Base metal tensile tests shall be located at 1/4 T or deeper towards the material's thickness centerline. Base metal impact tests shall contain the material's thickness centerline. Tensile tests shall use the standard 1/2 inch round specimen.

4.4.2.3 Weldment test specimens. Transverse weldment tensile and impact test specimens shall contain the head's thickness centerline and be taken a minimum distance of one T from the heat treated edge for heads up to 2 inches thick or 3T from the heat treated edge for heads over 2 inches thick.

4.4.2.4 Buffer plate requirements. In the cases where it is impossible to obtain the test coupons the proper distance from the heat treated edge of the head, buffer plates shall be seal welded to the edge of the head, prior to heat treatment, to main the proper distances from the heat treated edges. The buffer plate shall be a minimum of 6T by 1T for heads up to 2 inches thick and 6T by 2T for heads over 2 inches thick. The test coupon shall be centered under the buffer plate.

4.4.2.5 Location of test specimens in the head. The specimens shall be located and oriented as shown in figures 1, 2, 3, and 4. Figures 1 and 2 are for one piece heads and figures 3 and 4 are for two piece heads.

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4.4.2.6 Marking of test specimens. The test specimens shall be marked in a way that will ensure positive identification.

4.5 Examination.

4.5.1 Visual and dimensional examination. Each head shall be examined visually and dimensionally after final heat treatment and resizing for conformance to the requirements of this specification and contract drawings.

4.5.2 Radiography and magnetic particle inspection of two piece head weldments. Unless otherwise specified (see 6.2.1), after all heat treatment and forming operations including resizing, all full penetration welds shall be subjected to magnetic particle and radiographic inspection in accordance with MIL-STD-271. The radiographic inspection results shall meet the class 2 requirements of NAVSEA 0900-LP-003-9000. Magnetic particle inspection results for undercut shall meet the class 2 requirements of NAVSEA 0900-LP-003-8000.

4.6 Tests procedures.

4.6.1 Chemical or spectrographic analysis. The sample selected in accordance with 4.4.1.2 shall be analyzed to determine whether the requirements of 3.2 are met. If the samples selected for analysis fail to meet the requirements of 3.2, the heads in question shall be subject to rejection. Samples may be taken from each head; those heads meeting the requirements of 3.2 will be accepted and those failing to meet the requirements shall be rejected.

4.6.2 Tensile test. Tensile test specimens selected in accordance with 4.4.2 shall be tested in accordance with ASTM A 370 to determine whether the material meets the requirements of 3.4. Unless otherwise specified (see 6.2.1), the ultimate tensile strength shall be recorded for information only.

4.6.2.1 Tensile tests, two piece head. The base metal tensile test shall be conducted in accordance with ASTM A 370. The transverse weldment tensile test shall be conducted in accordance with ANSI/AWS B4.0.

4.6.3 Impact tests. Impact tests shall be Charpy V-notch type tested in accordance with ASTM A 370 or dynamic tear in accordance with ASTM E 604 to determine whether the material meets the requirement of 3.4.

4.6.4 Nondestructive inspections. Nondestructive inspection procedures shall be qualified in accordance with MIL-STD-271. Butt welds shall be radiographed for 100 percent of their length.

4.6.5 Explosion bulge tests of two piece head weldments. The explosion bulge tests shall be conducted and specimens fabricated in accordance with MIL-STD-2149, with the exception that the two piece head weld shall be used as the weld in the joint evaluated.

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4.7 Retests.

4.7.1 Tensile retest. If the results on an original tensile specimen are within 1,000 pounds per square inch of the required yield strength, or within 2 percent of the required elongation or within 2 percent of the required reduction in area, a retest on a duplicate specimen (selected from the same approximate location) will be permitted. If the percentage of elongation or reduction in area of any tensile specimen is less than the specified requirements and any part of the fracture is outside the gauge length, or within the gauge length and less than 25 percent of the gauge length from either datum point, another specimen from essentially the same location may be selected in its place and retested.

4.7.2 Impact retest. In the event that any of the impact test specimens, from a given set, representing a lot is below the specified minimum for a single impact test value, a retest of an impact set will be permitted on the same head. If one or more retest specimens falls below the specified minimum for a single impact test value, the head shall be subject to rejection and each individual head of the lot (see 4.4.1.1) shall be impact tested in accordance with 4.4.1.4 and 4.6.3 to determine whether it meets the impact requirements. If an impact test from a head from the same lot as the original impact failure fails to meet the impact requirements, the entire lot shall be subject to rejection.

4.7.3 Defective specimen. If any test specimen shows an obvious flaw or discontinuity in the metal, it may be discarded and another selected.

4.7.4 Reheat treatment. The contractor will be permitted to reheat-treat heads which fail to meet tensile or impact requirements of this specification. Inspection tests originally performed on the failed head or heads, except chemical analysis and ultrasonic examination (if previously performed), shall be repeated.

4.8 First article tests. Prior to delivering steel heads to this specification, the contractor shall demonstrate that his facility produces acceptable heads.

4.8.1 Heads, base metal tests. The following tests shall be performed:

a. *Chemical composition.* A ladle analysis and check analysis shall be made of the heat or melt of steel and the rolled mill product involved, respectively, in the first article test and shall conform to MIL-S-16216.

b. *Tensile tests.* Test acceptance standards and procedures shall be as specified in 4.4. and 4.6.

c. *Impact test.* Test acceptance standards and procedures shall be as specified in 4.4 and 4.6.

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4.8.2 Weld metal tests. For first article tests of two piece welded heads, the weld procedure must be approved by NAVSEA. In addition to the data required in MIL-STD-248, all weld metal tensile data and a dynamic tear test transition curve shall be required from the mid-thickness of the weld metal after final heat treatment and resizing. Two dynamic tear tests at each of the following temperatures are required: minus 60 °F, minus 20 °F, minus 40 °F, 0 °F, and 30 °F. The dynamic tear tests shall show that the material has attained the upper shelf of the transition curve by 0 °F. The yield strength of the weld metal tensile specimens shall exceed the minimum required base metal yield strength. Explosion bulge testing in accordance with MIL-STD-2149 shall be required of a welded test plate and meet the requirements of MIL-S-16216.

4.9 Inspection of packaging. Sample packages and packs, and the inspection of the preservation-packaging, packing and marking for shipment and storage shall be in accordance with the requirements of section 5 and the documents specified therein.

5. PACKAGING

(The packaging requirements specified herein apply only for direct Government acquisition. For the extent of applicability of the packaging requirements of referenced documents listed in section 2, see 6.4.)

5.1 Preservation, packaging, packing, and marking. Heads shall be packaged, packed, and marked as specified (see 6.2.1). Preservation shall be in accordance with 3.11. Product packing, marking, and loading shall be in accordance with ASTM A 700.

6. NOTES

6.1 Intended use. HY-80 and HY-100 heat treated heads are intended primarily for use in critical structural applications where a notch tough, high strength material is required.

6.2 Ordering data.

6.2.1 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification
- b. Steel grade required (HY-80 or HY-100) (see 3.2)
- c. When weld procedures other than those specified in MIL-STD-248 are required (see 3.3)
- d. When weld repair after heat treatment is prohibited (see 3.7.1)
- e. Form and dimensions of heads required (see 3.8)

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- f. Tolerances required (see 3.9)
- g. Type of coating required if other than MIL-S-16216 (see 3.11)
- h. When magnetic particle and radiographic inspection is not required (see 4.5.2).
- i. When ultimate tensile strength is not recorded for information only (see 4.6.2)
- j. Packaging, packing, and marking required (see 5.1)
- k. Applicable fabrication document, if other than MIL-STD-1688 (see 3.3 and 3.5).

6.2.2 Data requirements. When this specification is used in an acquisition and data are required to be delivered, the data requirements identified below shall be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved Contract Data Requirements List (CDRL), incorporated into the contract. When the provisions of DOD FAR Supplement, Part 27, Sub-Part 27.475.1 (DD Form 1423) are invoked and the DD Form 1423 is not used, the data specified below shall be delivered by the contractor in accordance with the contract or purchase order requirements. Deliverable data required by this specification are cited in the following paragraphs.

Paragraph No.	Data requirement title	Applicable DID No.	Option
4.1	Certification/data report	DI-MISC-80678	—

(Data item descriptions related to this specification, and identified in section 6 will be approved and listed as such in DOD 5010.12-L, AMSDL. Copies of data item descriptions required by the contractors in connection with specific acquisition functions should be obtained from the Naval Publications and Forms Center or as directed by the contracting officer.)

6.2.2.1 The data requirements of 6.2.2 and any task in sections 3, 4, or 5 of this specification required to be performed to meet the data requirement may be waived by the contracting/acquisition activity upon certification by the offeror that identical data were submitted by the offeror and accepted by the Government under a previous contract for identical item acquired to this specification. This does not apply to specific data which may be required for each contract regardless of whether an identical item has been supplied previously (for example, test reports).

6.3 First article. When a first article inspection is required, the item should be a first article sample. The first article should consist of one unit. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examinations, approval of first article test results and disposition of first articles. Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection to

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those bidders offering a product which has been previously acquired or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending contract.

6.4 Sub-contracted material and parts. The packaging requirements of referenced documents by the contractor listed in section 2 do not apply when material and parts are acquired by the contractor for incorporation into the equipment and lose their separate identity when the equipment is shipped.

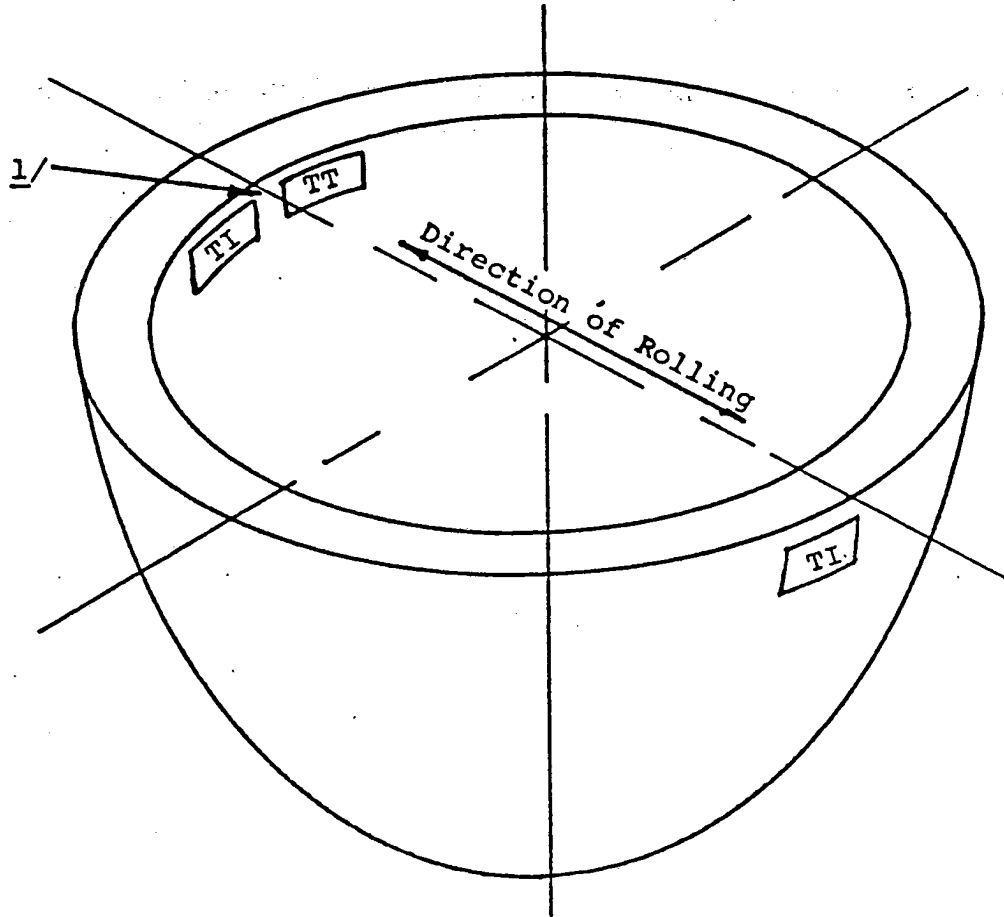
6.5 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Preparing activity:
Navy – SH
(Project 9515–N030)

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TT - Transverse Tensile Specimen Location

TI - Transverse Impact (Charpy or Dynamic Tear) Set Location



¹ Test specimens shall be taken at least 1T from a heat treated edge for heads up to 2 inches thick inclusive, and 3T for heads over 2 inches thick.

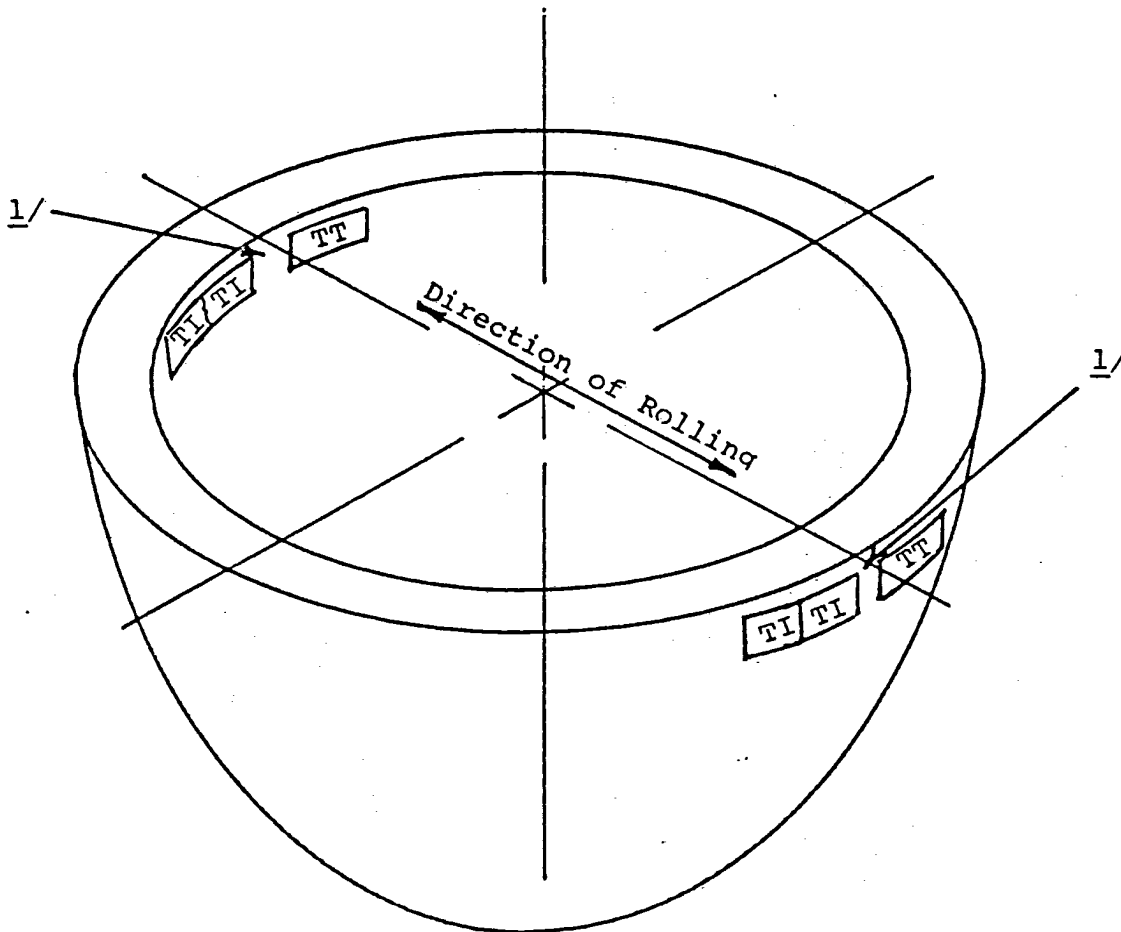
SH 132317603

FIGURE 1. One piece head up to 48 inches od inclusive - test layout.

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TT - Transverse Tensile
Specimen Location

TI - Transverse Impact
(Charpy or Dynamic
Tear) Set Location



¹ Test specimens shall be taken at least 1T from a heat treated edge for heads up to 2 inches thick inclusive, and 3T for heads over 2 inches thick.

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FIGURE 2. One piece head over 48 inches od - test layout.

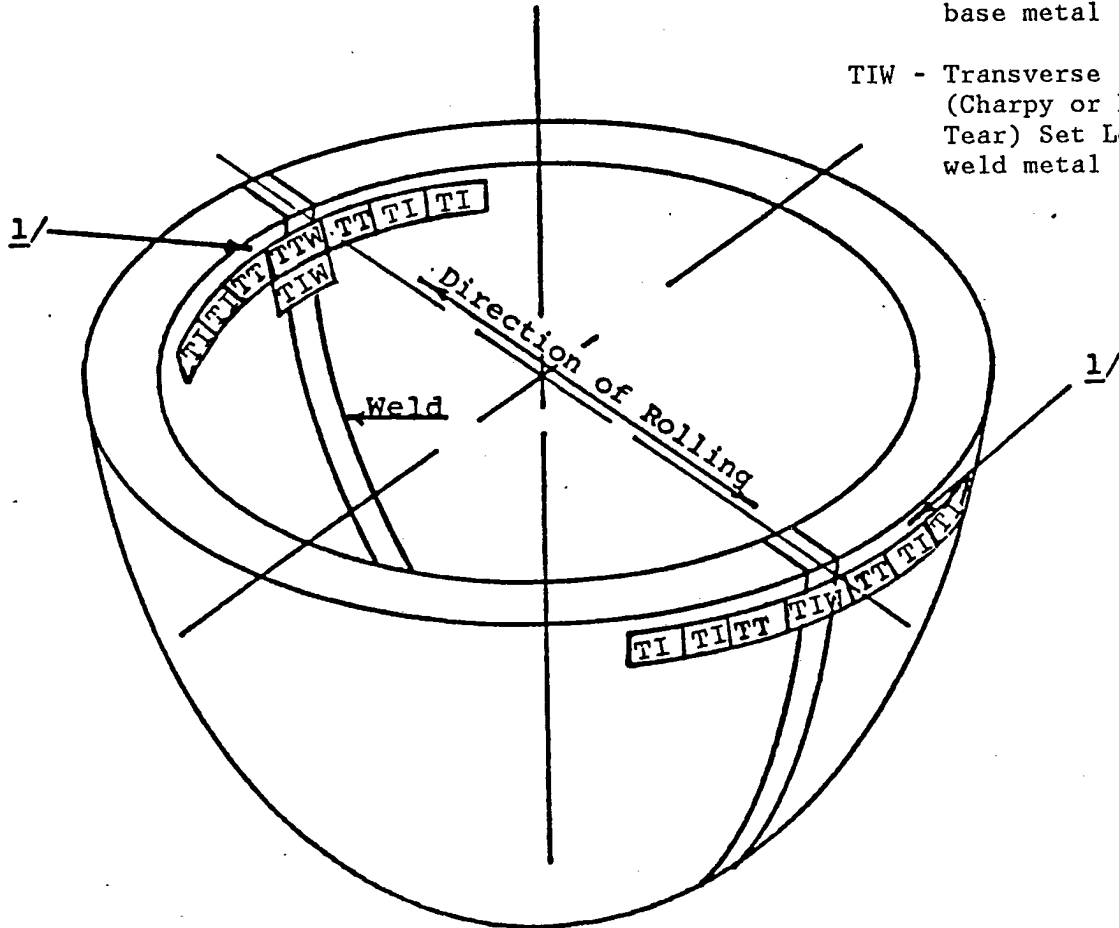
MIL-S-24451A(SH)

TT - Transverse Tensile Specimen Location - parent metal

TIW - Transverse Tensile Specimen Location - weld metal

TI - Transverse Impact (Charpy or Dynamic Tear) Set Location - base metal

TIW - Transverse Impact (Charpy or Dynamic Tear) Set Location - weld metal

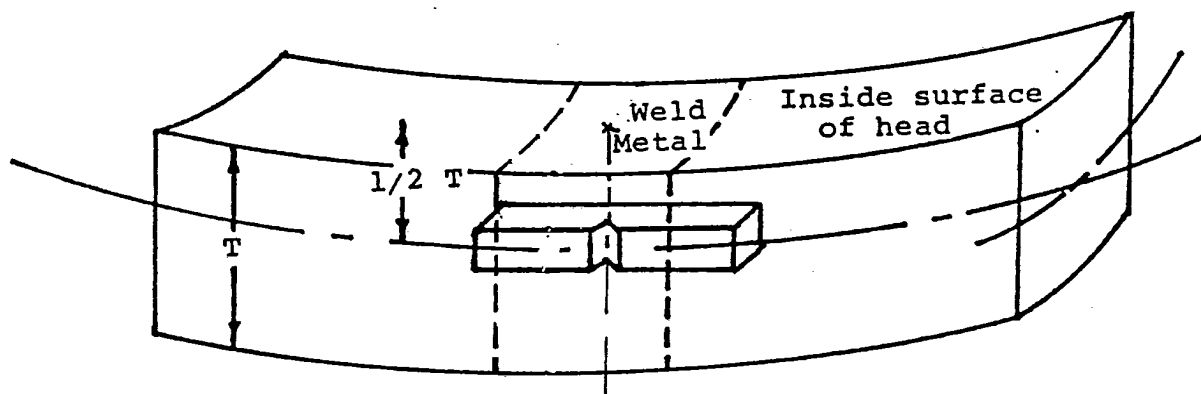


¹ Test specimens shall be a minimum of 1T from a heat treated edge for heads up to 2 inches thick inclusive, and 3T for heads over 2 inches thick.

SH 131761

FIGURE 3. Two piece head - test layout.

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FIGURE 4. *Location and orientation of weld metal Charpy and dynamic tear impact specimens on two piece heads.*