MIL-STD-1699A(YD)
24 May 1987
SUPERSEDING
MIL-STD-1699(YD)
15 December 1981

MILITARY STANDARD

NONDESTRUCTIVE EVALUATION OF BUTT WELDS IN CRANE AND RAILROAD RAILS

AMSC N4083

AREA NDTI

NAVAL FACILITIES
ENGINEERING COMMAND
ALEXANDRIA, VA 22332

NONDESTRUCTIVE EVALUATION OF BUTT WELDS IN CRANE AND RAILROAD RAILS

1. This military standard is approved by the Naval Facilities Engineering Command (NAVFAC), and is mandatory for use by activities under the cognizance of NAVFAC, effective on the date of issue.

2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commanding Officer (156), Naval Construction Battalion Center, Port Hueneme, CA 93043, using the self addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document, or by letter.

CONTENTS

FIGURES

1. SCOPE

1.1 Scope. This procedure describes the requirements for the nondestructive evaluation of butt welds in crane and railroad rails using visual and ultrasonic inspection techniques.

2. REFERENCED DOCUMENTS

2.1 Government Documents.

2.1.1 Standards and Publications. Unless otherwise specified, the following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of this standard to the extent specified herein.

STANDARDS

Military

MIL-STD-410 - Nondestructive Testing Personnel Qualifications and Certification. (Eddy Current, Liquid Pentrant, Magnetic Particle, Radiographic and Ultrasonic).

PUBLICATIONS

Naval Sea Systems Command

NAVSHIPS 0900-LP-006-3010 - Hull Structure Production-Repair Welds Ultrasonic Inspection Procedure, Acceptance Standards for.

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

2.2 Other publications. The following documents form a part of this standard 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 Department of Defense Index of Specifications and Standards (DODISS) specified in the solicitation. The issues of documents which have not been adopted shall be those in effect on the date of the cited DODISS.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B46.1 - Surface Texture.

(Applications for copies should be addressed to the American National Standards Institute, 1430 Broadway, New York, NY 10018)

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)

SNT-TC-1A - Nondestructive Test Personnel Qualification and Certification.

(Application for copies should be addressed to the American Society for Nondestructive Testing, 4153 Arlingate Plaza, Caller No. 28518, Columbus, OH 43228.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

E164 - Ultrasonic contact examination of weldments

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

AMERICAN WELDING SOCIETY (AWS)

D1.1 - Structural Welding Code.

(Application for copies should be addressed to the American Welding Society, Inc., 2501 N.W. 7th St., Miami, FL 33125.)

(Non-Government standards are generally available for reference from libraries. They are also distributed among non-Government standards bodies and using Federal agencies.)

2.3 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 A-Scan. A method of data presentation utilizing a horizontal base line that indicates distance, or time, and a vertical deflection from the base line which indicates amplitude.

3.2 Search Units. A device incorporating one or more electro-accoustical devices for converting electrical energy into acoustical energy and vise versa.

3.3 Couplant. A substance used between the search unit and test surface to permit or improve transmission of ultrasonic energy.

3.4 Shear Wave. Wave motion in which the particle motion is perpendicular to the direction of propagation.

3.5 Longitudinal Wave. A compressional wave in which the particle motion is in the same direction as the propagation of the wave.

3.6 Roughness average (Ra). An approximation of the average roughness using the arithmetic average of the absolute values of the measured profile height deviations taken within the sampling length and measured from the graphical centerline.

4. GENERAL REQUIREMENTS

4.1 Method of inspection. The ultrasonic inspection of rail butt welds shall be performed using the pulse-echo technique. Pulsed sound waves in the shear and longitudinal mode shall be introduced into the test material by coupled contact of the search unit(s), utilizing the manual scan technique. The speed of scanning will be consistent with ordinary ultrasonic practices and further governed by surface conditions and the quality of the weld being tested.

4.1.1 Evaluation for acceptance. The longitudinal and shear wave methods described in Section 5 shall be employed when performing final evaluations for acceptance.

4.1.2 Surface condition. To allow for adequate scanning, the running surface and both sides of the head shall be free of weld spatter and extreme roughness. The weld reinforcement on the running surface and sides of the head shall be flushed to provide a scanning surface that blends smoothly with the rail surfaces adjacent to the weld. The scanning surface condition shall be clean and free of all loose dirt, sand, rust, and scale for a distance of 4.50 times the height of rail on each side of the joint and shall have a finish of 250 microinch roughness average (Ra) or smoother in accordance with ANSI B46.1.

4.1.3 Temperature. Final inspection for acceptance shall be performed at ambient temperature. However, tests shall not be performed at temperatures beyond the operational limits of the test equipment.

4.1.4 Inspection zone. The inspection zone for the rail butt weld shall include the weld volume within the rail head, the web, and that portion of the base directly under the web (see figure 1).

4.1.5 Rail measurement. Prior to the start of ultrasonic inspection, the inspector shall determine, by either ultrasonic or mechanical techniques, the rail height (labeled "T" in figure 2) and the rail head width (labeled "W" in figure 3) of the rail under test.

4.1.6 Repairs. Repaired weld areas shall be inspected in the same manner as the original weld. The extent of reinspection shall include the entire inspection zone as specified in 4.1.4.

4.1.7 Visual inspection. Visually inspect for cracks, incomplete welds, and satisfactory removal of weld reinforcement and weld risers from the running surface and rail-head sides.

4.1.8 Inspector certification. Personnel performing visual and ultrasonic inspections to the requirements specified herein shall have a current certification in accordance with MIL-STD-410 or ASNT SNT-TC-1A, level II.

4.1.9 Calibration. The ultrasonic test equipment (see 4.2) shall be calibrated in accordance with the polar coordinate method as specified in ASTM E164.

4.2 Equipment. The ultrasonic equipment shall consist of the inspection instrument, search units, couplant, and accessories. The equipment package shall be capable of producing, receiving, amplifying, and displaying high-frequency electrical pulses on the cathode-ray tube (CRT) at the required frequencies and energy levels.

4.2.1 Instrument. The instrument shall be of the pulse-echo type with an "A" scan presentation and shall meet the equipment functional qualification requirements of NAVSHIPS 0900-LP-006-3010 or AWS D1.1, section 6, part C.

4.2.2 Search units. The type of transducer(s) to be used shall be compatible with the test instrument. The size and frequency are dependent on the intended application, as covered in the following paragraphs.

4.2.2.1 Straight beam search. The transducer for the ultrasonic longitudinal wave inspection shall be 1.0 inch diameter, with a nominal frequency of not less than 2.25 megahertz (MHz).

4.2.2.2 Angle beam search. The transducer(s) for shear wave inspection shall be 0.75 inch by 1.0 inch size, with a nominal frequency of not less than 2.25 MHz, and shall be affixed to suitable wedges that produce a refracted 45 $\pm$3 degree shear wave in the material under test. Wedge profiles shall be such that when the dual search unit method is employed, the design will allow close proximity positioning of the search units (see figure 5).

4.2.3 Couplant. The couplant selected shall be any suitable fluid that gives satisfactory results for the equipment in use and the surface conditions prevailing.

4.3 Instrument Adjustment Procedure.

4.3.1 Longitudinal wave inspection. Place the search unit described in 4.2.2.1 on the rail running surface adjacent to the weld deposit to be inspected, and adjust the instrument range and delay controls so that the reflected signal from the bottom of the rail is in the right-hand portion of the viewing screen. Adjust the instrument gain controls so that the amplitude of the reflection from the bottom surface is 80 percent of full screen height. Due to attenuation characteristics, additional instrument amplification may be necessary when the search unit is placed over the weld deposit.

4.3.2 Shear wave inspection (scanning from the running surface). Attach a co-axial T-connector to the terminal on the instrument normally used for single search unit operations. Select two of the search units as described in 4.2.2.2 and attach one to each side of the co-axial T-connector. This arrangement allows both search units to transmit and receive simultaneously.

4.3.2.1 Response adjustment (scanning from the running surface). On a nonwelded portion of the rail running surface, position the two search units with their sound beams directed toward each other at a distance, between the sound exit points, equal to twice the height of the rail (2T). With sufficient instrument gain, a through-transmission signal will appear on the viewing screen. Using range and delay controls, position the signal to coincide with 40 percent of the distance across the viewing screen horizontal baseline. Increase the spacing of the search units to a distance of 4 times the height of the rail (4T) between sound exit points. With sufficient instrument gain a through-transmission signal will appear on the viewing screen to the right of the 2T signal location and shall be positioned at 80 percent of the viewing screen horizontal baseline. Repeat this procedure using the range and delay controls to ensure that the 2T and 4T signals are properly alined at these locations (see figure 2). Obtaining maximum signal amplitudes at established 2T and 4T distance positions on the running surface is essential and may require slight movement of the search units, i.e., lateral position and/or minor distance corrections.

4.3.2.2 Gain setting (scanning from the running surface). Maximize the signal at the 2T location and adjust the signal amplitude to 80 percent of full screen height. The gain is subsequently increased to 20 decibels (dB) to establish test sensitivity. The instrument is now adjusted to perform this inspection.

4.3.3 Shear wave inspection (scanning from sides of rail-head). Attach a co-axial T-connector to the terminal on the instrument normally used for single search unit operations. Select two of the search units as described in 4.2.2.2 and attach one to each side of the co-axial T-connector. This arrangement allows both search units to transmit and receive simultaneously.

4.3.3.1 Response adjustment (scanning from sides of rail-head). On a nonwelded portion of the rail, position the two search units on opposite sides of the rail head with their sound beams directed toward each other. The sound exit points shall be separated by a distance equal to the rail head width. With sufficient instrument gain, a through-transmission signal will appear on the viewing screen. Position this signal at the 40 percent (W) viewing screen horizontal baseline location. Reposition the two search units so they are facing each other on the same side of the rail head, with the sound exit points spaced at two rail head widths (2W) apart. Maximize this signal and position it on the viewing screen at the 80 percent horizontal baseline scale position. Repeat this procedure using the range and delay controls to ensure the W and 2W signals are properly alined at these locations (see figure 3).

Obtaining maximum signal amplitudes at established W and 2W distance positions on the sides of the rail head is essential and may require slight movement of the search units, i.e., lateral position and/or minor distance corrections.

4.3.3.2 Gain setting (scanning from sides of rail-head). Reposition the search units at the W location as described in 4.3.3.1. Maximize the signal obtained and adjust its amplitude to 80 percent of full screen height. The gain is subsequently increased 20 dB to establish test sensitivity. The instrument is now adjusted to perform this inspection.

5. DETAILED REQUIREMENTS

5.1 Procedure. Using certified inspectors (see 4.1.8) and equipment adjusted in accordance with 4.3, perform the visual and ultrasonic inspections specified herein.

5.1.1 Longitudinal wave inspection. Adjust the instrument in accordance with 4.3.1 and perform a 100 percent inspection of the zone, shown in figure 1, from the rail running surface. Search the inspection zone, using the continuous scan method. If an indication is noted from a discontinuity, the sound beam shall be directed to maximize the indication.

5.1.1.1 Location of discontinuities. The depth, length, and position within the inspection zone shall be determined and recorded for discontinuities yielding amplitudes equal to or greater than the back reflection, or discontinuities causing a complete loss of back reflection. Weld areas having a loss of back reflection unaccompanied by a flaw indication shall be recorded as such and further evaluated using the shear wave inspection techniques.

5.1.1.2 Length of discontinuities. Position the search unit to the point of maximum signal amplitude. Determine the extremities of the discontinuity by moving the search unit parallel to the axis of the discontinuity in each direction. The extremities of the discontinuity, using the center line of the transducer as an index, shall be defined as the point where the signal amplitude falls to one half that of the maximum amplitude and continues to fall toward the baseline when the search unit is moved further away from the point of maximum signal. For discontinuities yielding signal amplitudes exceeding full screen height, this half amplitude index shall be considered to be at 50 percent of full screen height.

5.1.2 Shear wave inspection (scanning from the running surface). Adjust the instrument using the dual search unit technique of 4.3.2.

5.1.2.1 Surface inspection. Using a single search unit, inspect the top and bottom rail weld surfaces.

5.1.2.1.1 Bottom surface. Position the search unit on the running surface and direct the sound beam toward the weld. The search unit exit point shall be a distance equal to T from the weld center line. Inspect the bottom base

surface of the weld by moving the search unit sufficiently to inspect the weld surface (approximately 1.0 inch to and away from the weld). Repeat this inspection from the opposite side of the weld (see figure 4).

5.1.2.1.2 Top surface. Position the search unit on the running surface and direct the sound beam toward the weld. The search unit exit point shall be at a distance equal to 2T from the weld center line. Inspect the weld surface (approximately 1.0 inch to and away from the weld). Repeat this inspection from the opposite side of the weld (see figure 4).

5.1.2.2 Internal inspection. To inspect the weld internal volume using two search units, position the rear search unit on the running surface and direct the sound beam toward the weld. The search unit exit point shall be a distance equal to 2T from the weld center line. Position the front search unit on the running surface at the weld center line location and direct the sound beam in the same direction as the rear search unit. Perform a scan by moving the rear search unit to and away from the weld joint (approximately 1 inch) from its starting 2T position to maximize any reflected signal. Inspect the remainder of the weld volume by moving the rear search unit toward the weld, as the front search unit is moved simultaneously away from the weld an equal distance. This technique is continued until the two search units are making contact with each other at a distance equal to the height of the rail from the weld center line. Repeat this inspection from the opposite side of the weld (see figure 5).

5.1.2.3 Viewing screen display. All internal discontinuities in a vertical plane which are detected with dual search units, and discontinuities at the bottom surface of the rail base will appear as indications at the 40 percent viewing screen horizontal baseline position. Internal globular discontinuities, such as shrinkage, porosity, and slag inclusions normally detected by only one of the two search units, will display indications on the viewing screen at various positions between the initial pulse and the 80 percent location. The indication position on the viewing screen will be proportional to their depth within the weld volume. Surface indications at the top of the rail will appear at the 80 percent viewing screen horizontal baseline position. When indications are noted from discontinuities within the inspection zone, the sound beam shall be directed to maximize the indication. The minimum and maximum vertical dimensions (length) within the weld volume shall be determined and recorded for discontinuities yielding a signal amplitude equal to or exceeding the adjustment level. The location and depth of the indications can be determined by measuring the distance from the exit point of the front search unit to the weld center.

5.1.2.4 Vertical length of discontinuity. Maximize the signal from the discontinuity, then, move the front search unit toward the discontinuity while attempting to maintain an optimum signal by simultaneously moving the rear search unit away from the discontinuity until the signal drops abruptly toward the baseline. Measure the distance from the weld center line to the exit

point of the front search unit. Record this measurement as the upper vertical extremity of the discontinuity. Reposition the two search units at the maximized signal positions. Move the front search unit away from the discontinuity while simultaneously moving the rear search unit toward the discontinuity until the signal again abruptly drops toward the baseline. At this position, the distance between the weld center line and the exit point of the front search unit shall be recorded as the lower vertical extremity of the discontinuity. The difference between the upper and lower vertical extremities will be reported as the vertical length of the discontinuity.

5.1.3 Shear wave inspection (scanning from sides of rail-head). Adjust the instrument using the dual search unit technique of 4.3.3.

5.1.3.1 Surface inspection. To inspect the weld surfaces using one search unit, position the search unit on the side of the rail head and direct the sound beam toward the weld. The search unit exit point shall be at a distance equal to the rail head width from the weld center line. Inspect the opposite weld surface by moving the search unit sufficiently to inspect the weld surface (approximately 1.0 inch to and away from the weld). Repeat this inspection from the opposite side of the rail head and also from the opposite side of the weld, i.e., four scans required (see figure 3B).

5.1.3.2 Internal inspection. To inspect the rail head weld internal volume using two search units, position the rear search unit on the rail head side and direct the sound beam toward the weld. The rear search unit exit point shall be a distance equal to the rail head width from the weld center line. Position the front search unit on the opposite rail head side at the near weld fusion line. Direct the sound beam in the same direction as the rear search unit (toward the weld). Perform a scan of the rail surface by moving the rear search unit to and away from the weld joint (approximately 1.0 inch) from its starting position to maximize any reflected signal. Inspect the remainder of the weld volume by moving the rear search unit toward the weld, as the front search unit is simultaneously moved away from the weld an equal distance. This technique is continued until the original front search unit reaches a distance equal to the rail head width from the weld center line and the original rear search unit reaches the near weld fusion line. Repeat this inspection from the opposite side of the weld (see figure 3C).

5.1.3.3 Viewing screen display. All surface discontinuities at the rail head sides will appear at the 80 percent viewing screen horizontal baseline location. Internal discontinuities in a vertical plane, normally detected with dual search units, will appear at the 40 percent viewing screen horizontal baseline location. Internal globular discontinuities, normally detected by only one of the two search units, will display indications on the viewing screen at various positions between the initial pulse and the 80 percent viewing screen horizontal baseline location. The indicated position on the viewing screen will be proportional to their depth within the inspection zone, the sound beam shall be directed to maximize the indication.

The horizontal length within the rail head inspection zone shall be determined and recorded for discontinuities yielding a signal amplitude equal to or exceeding the adjustment level.

5.1.3.4 Length of discontinuities. Maximize the signal from the discontinuity; then move the front search unit toward the discontinuity while attempting to maintain an optimum signal by simultaneously moving the rear search unit away from the discontinuity until the signal drops abruptly toward the baseline. Measure the distance from the weld center line to the exit point of the front search unit. Record this measurement as the near extremity of the discontinuity. Reposition the two search units at the maximized signal positions. Move the front search unit away from the discontinuity while simultaneously moving the rear search unit toward the discontinuity until the signal again abruptly drops toward the baseline. At this position, the distance between the weld center line and the exit point of the original front search unit will be recorded as the far extremity of the discontinuity. The difference between the near and far extremities will be reported as the discontinuity length.

5.1.4 Discontinuity area evaluation. All recordable discontinuities reported by the longitudinal and shear wave techniques shall be evaluated to determine if the discontinuity has dimensions larger than the sound beam.

5.1.4.1 Discontinuities oriented parallel to the running surface. Determine the search unit position of maximum flaw signal return and the depth of the discontinuity. From the point of maximum signal return, measure down the running surface a distance equal to the depth of the discontinuity and mark the running surface at this location. Using shear wave search units and the instrument adjusted in accordance with 4.3.2, position one of the search units on the running surface directed toward the discontinuity with the exit point on the mark. Position the other search unit on the running surface, facing the first search unit, with its exit point a distance equal to 2T from the first search unit sound exit point. A through transmission signal, if displayed on the viewing screen, will be seen at the 40 percent viewing screen horizontal baseline location. Record the existence, or lack of, a through transmission signal on the inspection report (see figure 6B and figure 7).

5.1.4.2 Discontinuities detected using the shear wave technique (scanning from the running surface). Determine the search units' positions of maximum flaw signal return. Maintain the front search unit on the running surface at this position and reposition the rear search unit on the running surface, on the opposite side of the weld, facing the front search unit. The sound exit point of what was the rear search unit shall be a distance equal to 2T from the front search unit exit point. A through-transmission signal, if displayed on the viewing screen, will be seen at the 40 percent viewing screen horizontal base line location. Record the existence, or lack of, a through-transmission signal on the inspection report (see figure 6A).

5.1.4.3 Discontinuities detected using the shear wave technique (scanning from the rail head sides). Determine the search units' positions of maximum flaw signal return. Maintain the front search unit on the rail head side at this position and reposition the rear search unit on the opposite side of the weld, facing the front search unit. That is, the two search unit sound beams will be directed toward each other diagonally across the rail head and through the weld. The sound exit point of what was the rear search unit shall be a distance equal to the rail head width from the front search unit exit point. A through-transmission signal, if displayed on the viewing screen, will be seen at the 40 percent viewing screen horizontal baseline location. Record the existence, or lack of, a through-transmission signal on the inspection report (see figure 6C).

5.2 Reporting and evaluation. Record all indications equal to, or greater than, instrument adjustment level.

5.2.1 Identification data. All information pertaining to weld identification and weld location, flaw length or vertical dimension, flaw evaluation, through-transmission or not, as well as equipment and inspector identification, shall be recorded in the appropriate blanks of the inspection report (see 6.2). Figure 7 depicts a typical inspection report sheet to be used.

5.2.2 Evaluation. Review the inspection report(s) and evaluate the recordable indications based on the acceptance/rejection criteria stated in 5.3. Indications less than the adjustment level shall not be recorded.

5.2.3 Marking of defects. Rejectable weld sites shall be marked on the rail or on the surface next to the rail weld site using paint or other suitable marks.

5.2.4 Reports. When specified in the contract or order, inspection and test reports shall be prepared (see 6.2), and shall include the information called for on the example report form shown in figure 7.

5.3 Acceptance/rejection criteria. Any weld joint with a recordable discontinuity within the weld zone which is greater than the acceptance standards shown in figure 8 shall be cause for rejection of the weld joint. Any discontinuity that prevents a through-transmission signal shall also be cause for rejection of the weld joint.

6. NOTES

6.1 Intended use. This standard contains the procedural requirements for nondestructive testing of butt welds in crane and railroad rails by ultrasonic means.

6.2 Data requirements list and cross reference. When this standard is used in an acquisition which incorporates a DD Form 1423, Contract Data Requirements List (CDRL), 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 CDRL incorporated into the contract. When the provisions of the DoD FAR clause on data requirements (currently DoD FAR Supplement 27.410-6) 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 standard is cited in the following paragraphs.

Task Paragraph	Data Requirements	Applicable DID	Options
5.2.4	Reports, Test	DI-T-2072	None

(Data item descriptions related to this standard, and identified in section 6 will be approved and listed as such in DoD 5000.19-1., Vol. II, 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.)

6.3 Subject term (key word) listing.

Inspection zone
Nondestructive testing
Pulse-echo
Search unit

6.4 Changes from previous issue. Asterisks or vertical lines 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 - YD

(Project NDTI-N046)

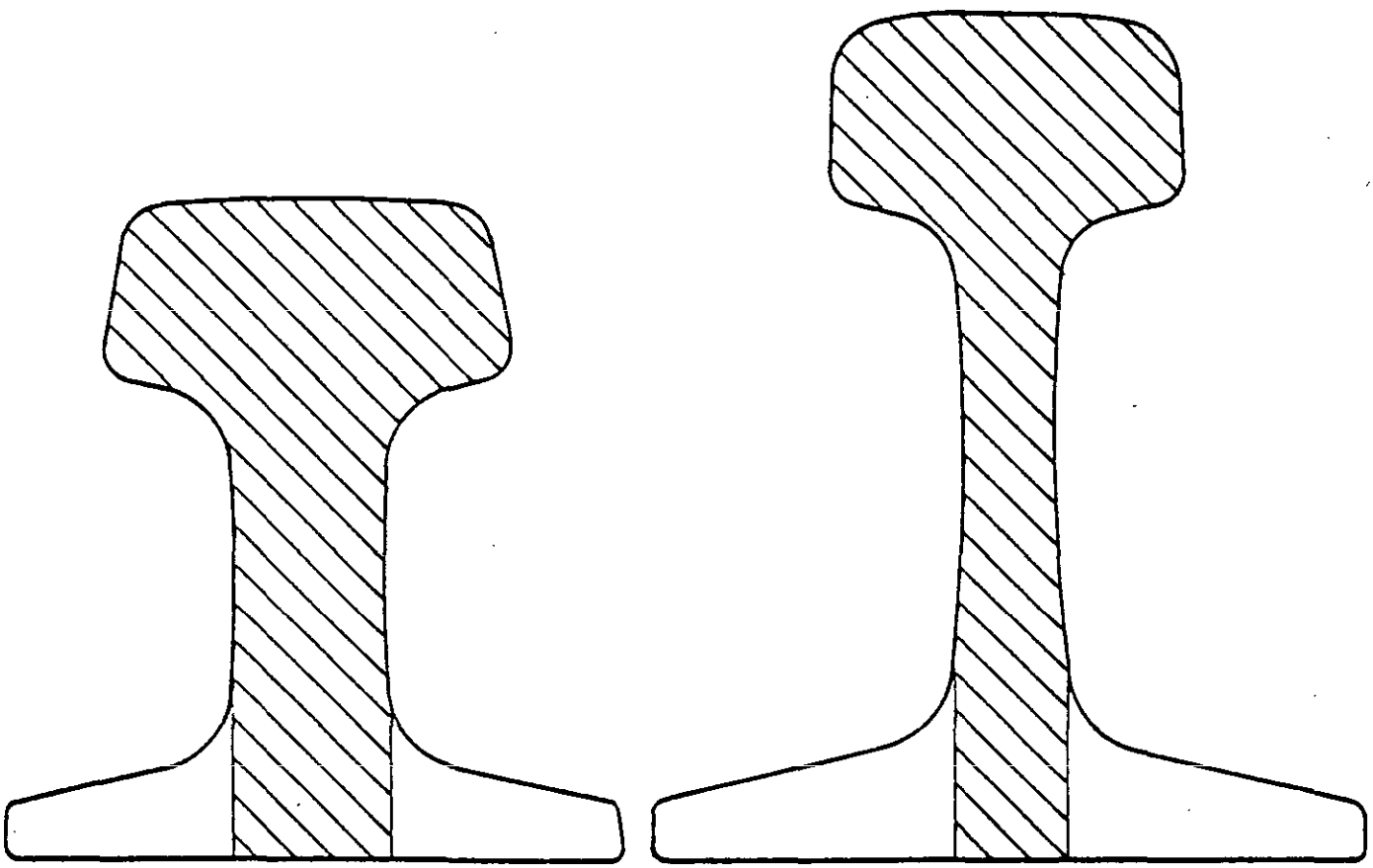


FIGURE 1. Inspection zone for ultrasonic evaluation.

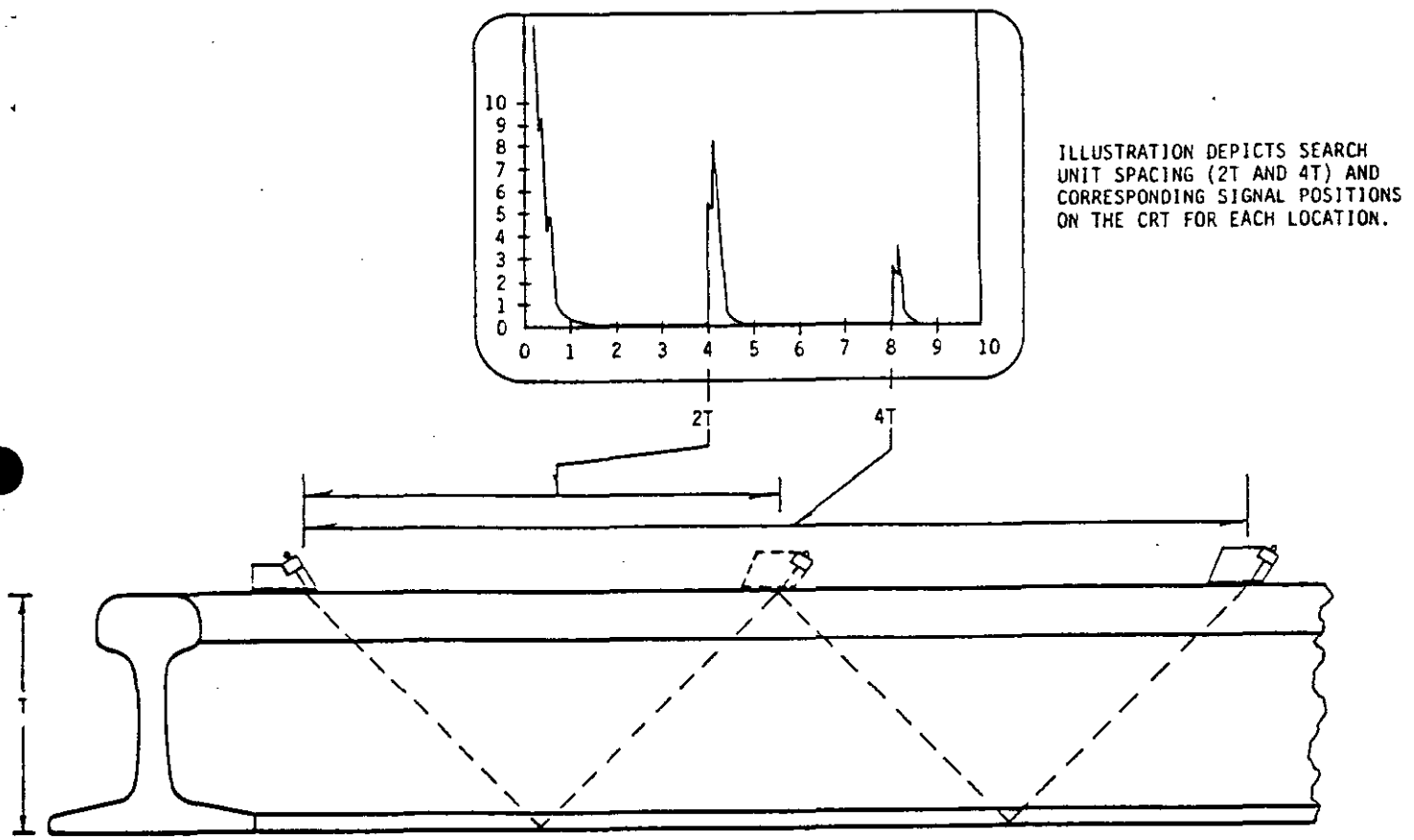
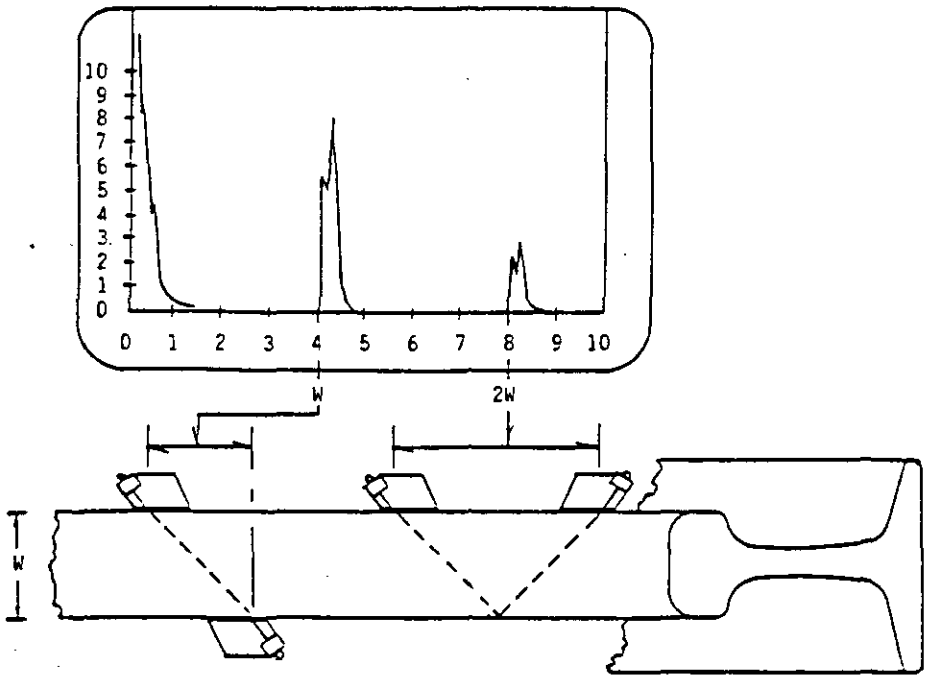
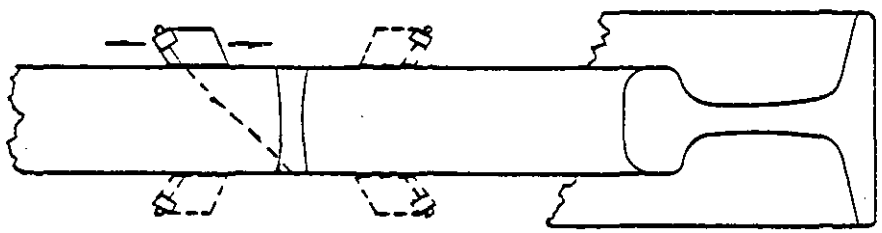


ILLUSTRATION DEPICTS SEARCH UNIT SPACING (2T AND 4T) AND CORRESPONDING SIGNAL POSITIONS ON THE CRT FOR EACH LOCATION.

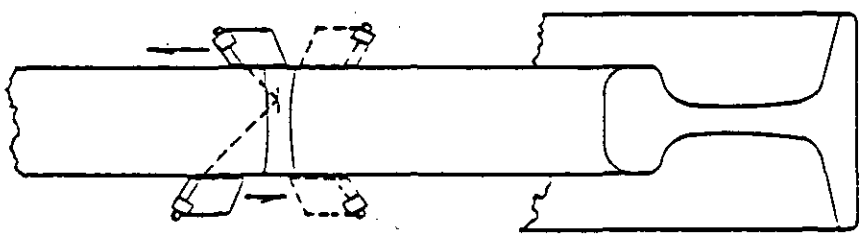
FIGURE 2. Search unit positioning for instrument adjustment for shear wave inspection scanning from the running surface.



3-A Search unit positioning for instrument adjustment for shear wave inspection. Illustration depicts search unit spacing (W & 2W) and corresponding signal positions on the CRT for each location.



3-B Single search unit, shear wave inspection for the detection of surface discontinuities. Four scans required: from each side of the rail head and from each side of the weld.



3-C Dual search unit, shear wave inspection for the detection of internal discontinuities. Two scans required: one from each side of the weld

FIGURE 3. Shear wave inspection for detection of discontinuities scanning from the sides of the rail head.

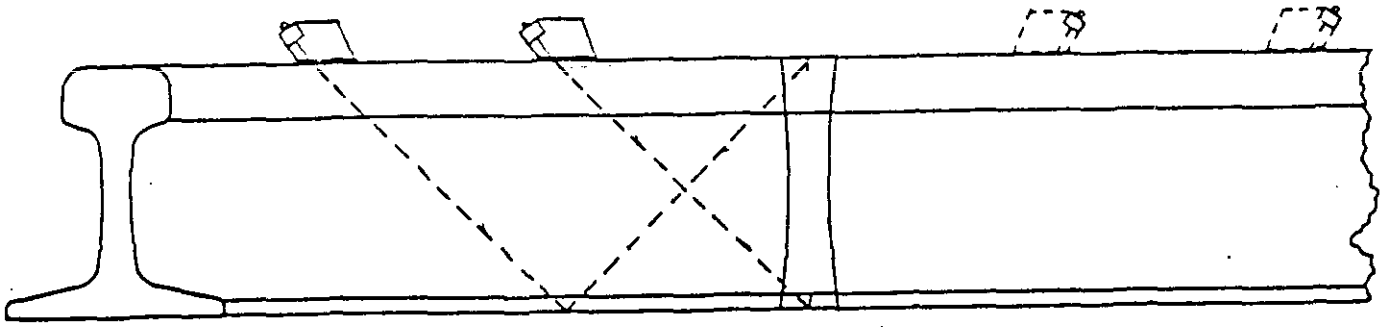


FIGURE 4. Single search unit shear wave inspection for detection of top and bottom surface discontinuities scanning from the running surface.

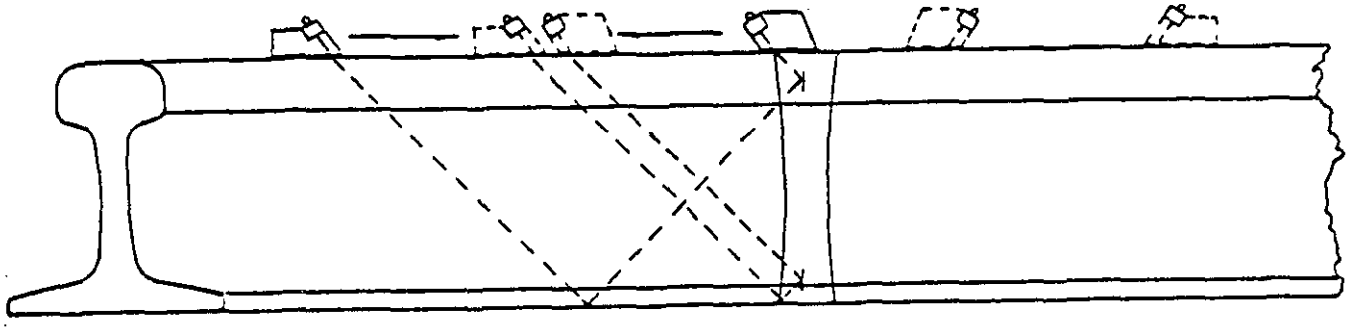
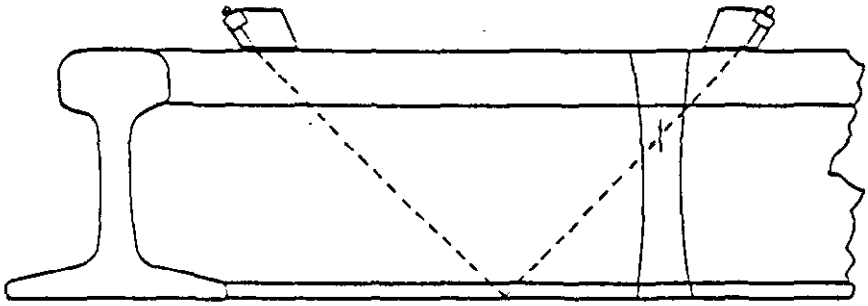
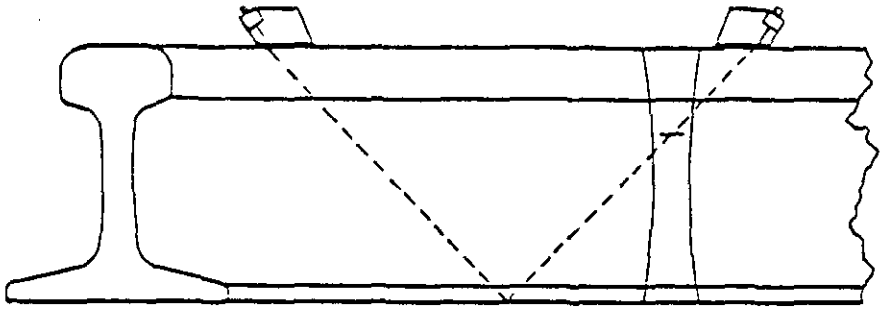


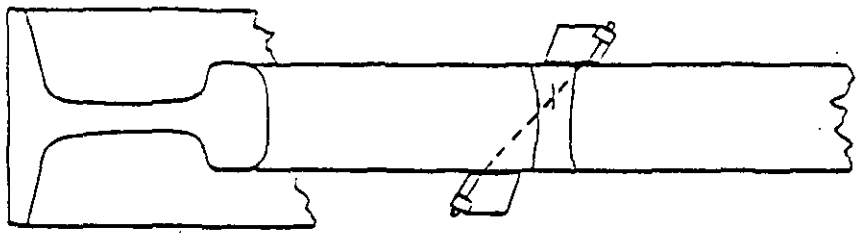
FIGURE 5. Dual search unit shear wave inspection for detection of internal discontinuities scanning from the running surface.



6-A Dual search unit positioning for through-transmission evaluation of discontinuities detected using the shear wave inspection technique while scanning from the running surface.



6-B Dual search unit positioning for through-transmission evaluation of discontinuities oriented parallel to the running surface.



6-C Dual search unit positioning for through-transmission evaluation of discontinuities detected using the shear wave inspection technique while scanning from the rail head sides.

FIGURE 6. Search unit positioning for through transmission evaluation.

Line Number	Station_____ to Station ____	Rail Dimensions (T)_____ (W)____	Weld Process ☐ Thermite ☐ Flash Butt
Inspected by:	Procedure No.	Instrument/Model	Date:

FLAW DATA

Distance from Station	Rail Lft	Rail Rgt	Maximum flaw Dimension	Flaw Depth Min	Flaw Depth Max	Thru Trans Yes	Thru Trans No	Flaw Evaluation Accept	Flaw Evaluation Reject	Remarks

FIGURE 7. Typical inspection report form.

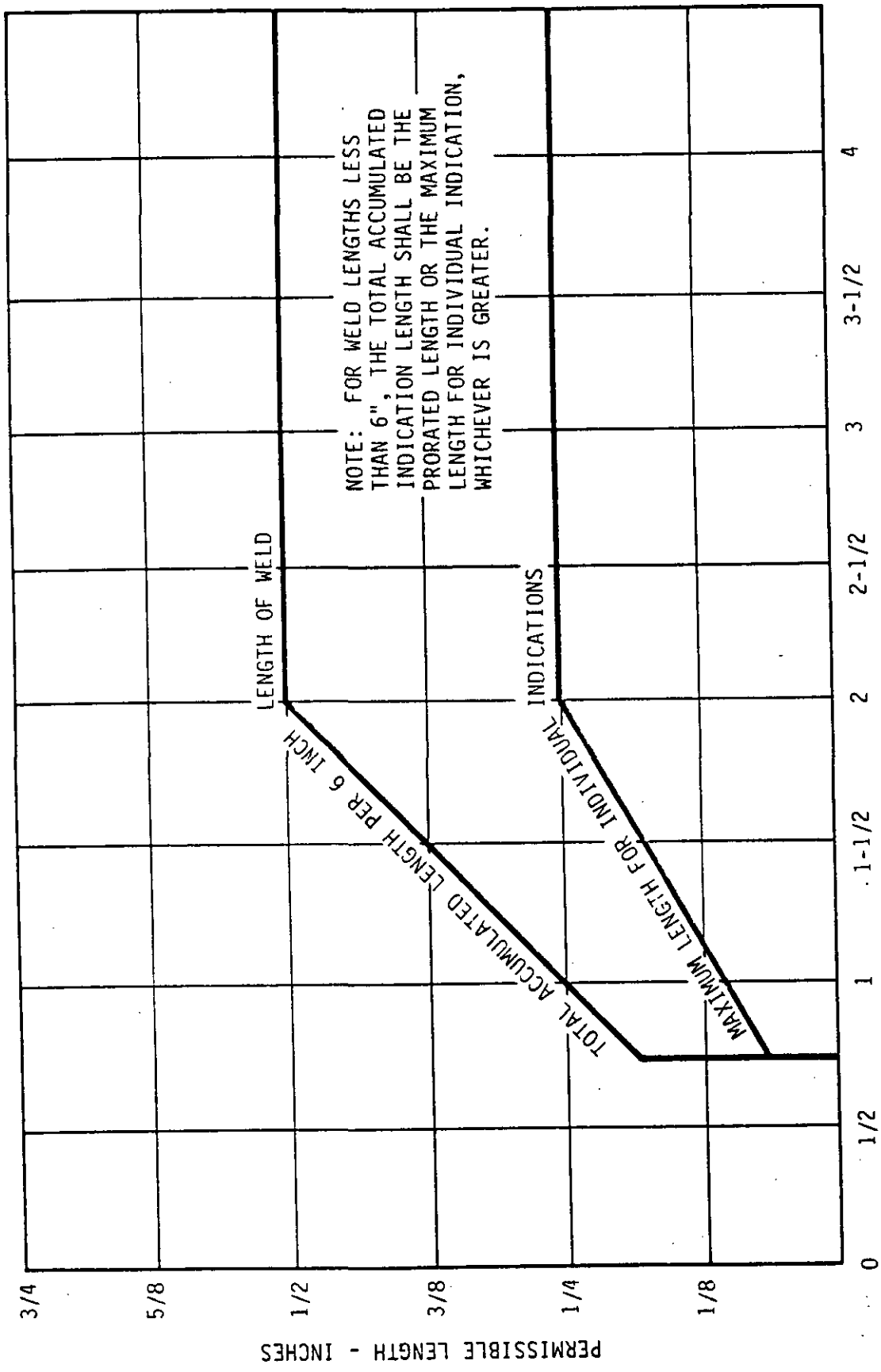


FIGURE 8. Production weld, acceptance standard for incomplete fusion and incomplete penetration indications.

INSTRUCTIONS: In a continuing effort to make our standardization documents better, the DoD provides this form for use in submitting comments and suggestions for improvements. All users of military standardization documents are invited to provide suggestions. This form may be detached, folded along the lines indicated, taped along the loose edge *(DO NOT STAPLE)*, and mailed. In block 5, be as specific as possible about particular problem areas such as wording which required interpretation, was too rigid, restrictive, loose, ambiguous, or was incompatible, and give proposed wording changes which would alleviate the problems. Enter in block 6 any remarks not related to a specific paragraph of the document. If block 7 is filled out, an acknowledgement will be mailed to you within 30 days to let you know that your comments were received and are being considered.

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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions – Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE
MIL-STD-1699A(YD)	NONDESTRUCTIVE EVALUATION OF BUTT WELDS IN CRANE AND RAILROAD

3a. NAME OF SUBMITTING ORGANIZATION	4. TYPE OF ORGANIZATION *(Mark one)*
RAILS	☐ VENDOR ☐ USER ☐ MANUFACTURER ☐ OTHER *(Specify)*:
b. ADDRESS *(Street, City, State, ZIP Code)*	

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

7a. NAME OF SUBMITTER *(Last, First, MI)* – Optional	b. WORK TELEPHONE NUMBER *(Include Area Code)* – Optional
c. MAILING ADDRESS *(Street, City, State, ZIP Code)* – Optional	8. DATE OF SUBMISSION *(YYMMDD)*

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