MIL-W-12332A(MR)
14 DECEMBER 1964

SUPERSEDING
MIL-W-12332(Ord)
12 NOVEMBER 1952

MILITARY SPECIFICATION

WELDING, RESISTANCE, SPOT, SEAM, AND PROJECTION; FOR FABRICATING ASSEMBLIES OF LOW-CARBON STEEL

1. SCOPE

1.1 Type of welding. This specification covers the spot, seam, and projection, resistance welding of low-carbon steel fabricated assemblies (see 4.1 and 8.1).

1.2 Materials. The materials to be welded under this specification include light steel sheets, forgings, castings, or shapes.

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

SPECIFICATIONS

MILITARY

MIL-I-45208 — Inspection Requirements, General Specification for.

STANDARDS

MILITARY

JAN-STD-19 — Welding Symbols.

MIL-STD-20 — Welding Terms and Definitions.

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

2.2 Other publications. The following documents form a part of this specification. Unless otherwise indicated, the issue in effect on date of invitation for bids shall apply.

AMERICAN WELDING SOCIETY

Resistance Welding — Theory and Use.

(Application for copies should be addressed to the American Welding Society, United Engineering Center, 345 East 47th Street, New York, N.Y.)

RESISTANCE WELDER MANUFACTURERS' ASSOCIATION

Resistance Welding Manual.

(Application for copies should be addressed to the Resistance Welder Manufacturer's Association, 1900 Arch Street, Philadelphia, 3, Pa.)

3. PROCEDURE REQUIREMENTS

3.1 Recorded welding procedure. Unless otherwise specified in the contract or order, the contractor, prior to production fabrication of any weldment shall establish or have the manufacturer establish and record the

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cleaning and welding procedures to cover all welding to be performed under this specification. This information shall be prepared in duplicate on an approved form (see appendix) utilizing symbols and terms in accordance with JAN-STD-19, MIL-STD-20, or as specified on the drawing. The cover sheet shall be signed by the manufacturer and the contractor. The recorded welding procedure shall be submitted to the procuring activity with the test records as specified in 6.4. Any changes in any of the factors listed in table I shall require revision of the recorded test procedure.

3.2 Factors. The factors to be included in the welding procedure shall be as shown in table I.

TABLE I. *Factors in the recorded welding procedure and changes requiring quality control tests*

Factors to be included in recorded welding procedure	Procedure changes requiring revised procedures and tests
1. Metal alloy composition	When a change in alloy or alloy composition outside the producer's declared chemical range is made to either of the metals that are to be joined.
2. Thickness range of metal	When the thickness range is changed.
3. Weld time range	When weld cycle range is changed.
4. Metal cleaning	When method of cleaning is changed from the recorded methods in the welding procedure.
5. Welding current range	When current setting changes outside the declared range are made.
6. Electrode force range	When changes outside the declared range are made.
7. Roll spot or seam welding travel speed	When changes outside the declared range are made.

4. MATERIAL REQUIREMENTS

4.1 Carbon content. The maximum carbon content of any material to be welded shall not exceed 0.20 percent (see 8.4).

4.2 Surface preparation. The material surfaces shall be cleaned by a suitable method and shall be free from dirt, oil, and oxides in the weld area. The application of coatings or sealers, when required, shall be included as a part of the recorded welding procedure and shall not be considered foreign matter.

5. WELDING EQUIPMENT REQUIREMENTS

5.1 Welding machine. The welding machine shall consist of a suitable source of electrical energy, suitable electrodes, means of adequately cooling the electrodes, and a means of reliably controlling the magnitude of the current, the welding force, and the time of current flow to fulfill the requirements specified herein. The force and current controls shall operate so that no current flows until the welding force is applied at the welding electrodes. The current shall be cut off before the force is removed.

5.2 Weld timer. The weld timer shall control the following timing functions:

Single impulse welding	*Multiple impulse welding*	*Roll spot or seam welding*
Squeeze time	Squeeze time	Travel speed
Weld time	Heat time	Weld time on
Hold time	Cool time	Weld time off
	Weld interval	
	Pulse frequency	
	Hold time	

5.3 Roll spot or seam welding travel speed. Speed adjustment provided shall have reference scale calibrations to permit determination of speed in inches per minute either directly or by reference to a calibration chart.

5.4 Welding current. Means for controlling the welding current between specified limits shall be provided. This may be accomplished

by use of tapped transformers, phase shifting heat control circuits or both.

6. PREPRODUCTION REQUIREMENTS

6.1 Certification of welding equipment and recorded welding procedures. Prior to welding the first production assembly of each specific design, the contractor or the manufacturer, or both, shall weld and test the welds in one assembly or simulated specimen under Government surveillance. The assembly or specimen shall be welded in accordance with the recorded welding procedure. This certification test shall be carried out on each welding machine that will be used for the production of weldments of each specific design.

6.1.1 *Simulated specimens.* When a simulated specimen is used, the material thickness, composition range, weld edge distance, spot spacing, and the general weld area contour and metal fit shall be the same as the production part. When the application of weld primer or sealer is required by the recorded welding procedures for production assemblies, the simulated specimens shall have these materials applied before welding in the same manner as applied to production parts. When a substantial amount of magnetic material such as the assembly fixture, locators, etc., is inserted in the throat of the welding machine during the welding of a production part, this condition shall be closely duplicated for the simulated specimen.

6.2 Visual examination of welded assembly or simulated specimen. All welds shall be subject to visual examination to determine compliance with 7.3.1.

6.3 Testing. The welded assembly or simulated specimen shall be subjected to the peel tests in accordance with 7.3.3.

6.4 Reporting of results. The manufacturer shall record the results of this certification and shall submit copies of the results together with the recorded welding procedures through the contractor and contracting officer for review by the procuring activity.

6.5 Rejection. Failure of the welded assembly or simulated specimens to meet the requirements for visual examination (see 7.3.1) or the peel test (see 7.3.3) shall result in the rejection of the recorded welding procedure.

7. PRODUCTION REQUIREMENTS

7.1 Quality control. The contractor shall establish or have the manufacturer establish and use the systematic quality control procedure specified in MIL-I-45208.

7.1.1 *Production checking.* Periodically during a production run, a welded assembly or simulated specimen shall be tested as shown in section 6. The frequency of testing shall be as specified in the contract or order.

7.2 Procedure inspection. All welding operations shall be subject to inspection for compliance with the certified welding procedures and quality control procedures of the contractor and manufacturer.

7.3 Weldment inspection.

7.3.1 *Visual examination.* The outer surface of all welds shall be smooth and free of cracks, tip pickup, pits, metal expulsion, and other defects which indicate that the welds were made with contaminated electrodes or with improperly prepared surfaces.

7.3.2 *Tolerances.* Tolerances on spot weld spacing and edge distance shall be as specified in the contract or order or on the drawing.

7.3.3 *Peel tests.* Welded assemblies or simulated specimens shall be tested by the peel tests in accordance with the provisions for such testing established in the quality control procedures.

7.3.3.1 *Test procedure for spot welds.* The weldment or simulated specimen shall be separated by driving a chisel between the welded components in an unwelded area or by peeling one sheet back against the weld until failure occurs around the periphery of

the weld or until the part fails. Failure of the base metal outside the weld area shall be considered evidence that the welds are satisfactory. The minimum button diameter, as measured in two perpendicular directions at the faying surface, shall conform to table II.

TABLE II. *Peel test requirements*

Thickness of thinner part [1]	Minimum button diameter [1]
Inches	Inches
.010	.10
.020	.13
.031	.16
.040	.19
.050	.22
.062	.25
.078	.29
.094	.31
.109	.32
.125	.33

[1] For intermediate thicknesses, direct interpolation may be use

7.3.3.2 *Test procedure for projection welds.* The weldment or simulated specimen shall be separated by driving a chisel between the welded components in an unwelded area or peeling one sheet back against the weld until failure occurs. Failure outside the periphery of the weld area shall be considered evidence that the welds are satisfactory. Lack of fusion under the projection shall be cause for rejection. It is not necessary to pull buttons in this test, provided the entire area of each of at least 3/4 of the projections show significant evidence of fusion.

7.3.3.3 *Test procedure for seam welds.*

7.3.3.3.1 *Macroscopic examination.* The weldment or simulated specimen shall be cross-sectioned and etched. The nugget penetration shall be 30 percent to 80 percent of the sheet thicknesses involved. The width of the seam weld shall conform to table III.

7.3.3.3.2 *Shear peel test.* The shear peel test can be conducted on a sample weldment or a simulated specimen. A suitable specimen size containing a seam weld 3 inches long shall be prepared from a sample weldment or simulated specimen. The sheets shall be separated to permit holding one sheet (the heavier thickness if unequal thicknesses are involved) in a vise. The thinner sheet shall be pulled back against the weld until it shears off. The process shall be repeated on the other side of the specimen, leaving only the thicker sheet and the weld fusion zone. Before the fusion zone width is measured for conformance to table III, the specimen shall be flattened without causing metal flow.

TABLE III. *Shear peel test requirements*

Thickness of thinner part [1]	Minimum fusion zone width [1]
.010	.08
.020	.11
.031	.14
.040	.16
.050	.18
.062	.20
.078	.22
.094	.25
.109	.26
.125	.28

[1] For intermediate thicknesses, direct interpolation may be used

7.3.4 *Rejected welds.* If unsatisfactory welds are found during a production quality control inspection, the production run shall be stopped and necessary corrections made to the equipment or procedure. After correction, a weldment or simulated specimen shall be welded and shall conform to the inspection requirements in 7.3.1 and 7.3.3 before resuming production. The series of weldments in the period subsequent to the last acceptable quality control inspection shall be rejected or may be rewelded in accordance with 7.3.5.

7.3.5 *Rewelding or rejected weldments.* A weldment from each rejected series may be rewelded in accordance with the new procedure. The repaired weldment shall meet the inspection requirements of this specification. If the weldment passes the inspections, the rejected weldments may be rewelded using the new procedure. A simulated specimen shall not be used for determining weld quality of repair welding.

8. NOTES

8.1 Intended use. Resistance welding under

this specification covers only spot, seam, and projection welds.

8.2 **Certification testing.** The certification test is intended to ascertain that the specific welding unit being used has the electrical and mechanical capacity to satisfactorily produce a particular weldment. This test need not be repeated so long as the design and materials of the part being welded remain unchanged, except as may be required by 7.1.

8.3 **Definitions.**

8.3.1 *Contractor.* As used in this specification, the term "contractor" is defined as the organization having a direct contract with the Government activity.

8.3.2 *Manufacturer.* The term "manufacturer" is defined as the organization actually performing the operations covered by this specification.

8.4 It is recommended that the maximum manganese content not exceed 0.60 percent.

Custodian:	Preparing activity:
Army—MR	Army—MR
Other interest:	Project No. MI07-A018
Review:	
MO	
MU	
MR	
User:	
WC	
MI	

Note. Review User information is current as of the date of this document; draft circulation should be based on the information in the current DODISS.

APPENDIX

10. SCOPE

10.1 This appendix contains a suggested form for the submittal of the recorded joint welding procedures and the instructions for completing the forms.

20. INSTRUCTIONS

20.1 The recorded procedure consists of four sheets of an approved form. In completing the information required for a weldment, it may be necessary to use two or more pages of any one or all of the last three sheets of the illustrated form. This use is shown in the illustration, where sheets 4 and 5 are of the same form but represent different weldments.

20.1.1 Sheet one

(a) Record number.- Number selected by the contractor or manufacturer to designate a particular procedure.

(b) Part name, drawing number and revision date.- Name and number appearing on the print for the weldment.

(c) Manufactured by.- Name of the company actually performing the welding.

(d) Location.- Full address of the manufacturer including street and zone number.

(e) Approved by the manufacturer.- Signature of responsible employee of company performing the welding.

(f) Approved by the contractor.- Signature of responsible employee of the company holding the Government contract.

20.1.2 Sheet two.- This sheet should contain an isometric or perspective drawing or sketch showing all the resistance welded parts of the weldment. Additional sheets may be used if additional views are required. Dimensions are not required, but the drawing or sketch should indicate the relationship of parts and weld locations. All weld joints or parts should bear a reference letter.

20.1.3 Sheet three

(a) Joint reference.- The letter identifying the joint on sheet 2.

(b) Welding procedure record number.- Reference number from sheet 1 and carried on each additional sheet for identification.

(c) Material reference.- Designation number for the grade of steel. The number will generally be an AISI or SAE designation number.

(d) Machine make, type and size.- Data on the welding machine available from the name plate on the machine.

20.1.4 Sheets four and five.- One sheet should be prepared for each weld joint in the weldment or each joint requiring a different weld schedule or use of electrodes.

(a) Joint reference.- Identification letter assigned to the joint on sheet 2.

(b) Processed condition of material at welding.- Statement of any treatment such as wiping, working, plating, etc., given to the material prior to welding.

(c) Welding sequence timing schedule.- Tabulation of the time factors in the welding sequence: If means of measuring time values are not available, record dial settings or cam openings (inches and degrees). If squeeze time is determined by a pressure switch or a two stage foot switch, a notation should be made to that effect.

(d) Welding current.- Measured current values should be shown. If phase-shift control is used, the transformer-tap setting should be given.

(e) Electrode force.- Applied force as measured by a force gage, if possible. If not available, the pressure and cylinder cross-sectional area that applies the welding force should be stated.

(f) Electrodes.- The R.W.M.A. class number or commercial name should be recorded. Taper size should be recorded. A sketch showing the welding-face shape should be used if necessary.

APPENDIX A
SHEET 1 of 5

RECORDED JOINT WELDING PROCEDURE
FOR
RESISTANCE, SPOT, SEAM, AND PROJECTION WELDING

In accordance with MIL-W-12332A(MR)

Drawing Number and Revision Date: D3747 Nov. 28, 1963

RECORD NUMBER: R - 16

PART NAME: STORAGE SHELF

Drawing NUMBER: 268 - L - 13

Contract Number: S143007

CONTENTS:

TITLE SHEET ---------- Sheet 1
DRAWING SHOWING LOCATION OF JOINTS--- Sheet 2
SUMMARY SHEET---------- Sheet 3
RECORDED WELDING PROCEDURE---------- Sheets 4, 5

MANUFACTURED BY:

JONES MFG. CO.

LOCATED AT:

APPROVED BY MANUFACTURER

APPROVED BY CONTRACTOR

DATE OF SUBMITTAL:

APPENDIX A
SHEET 2 of 5

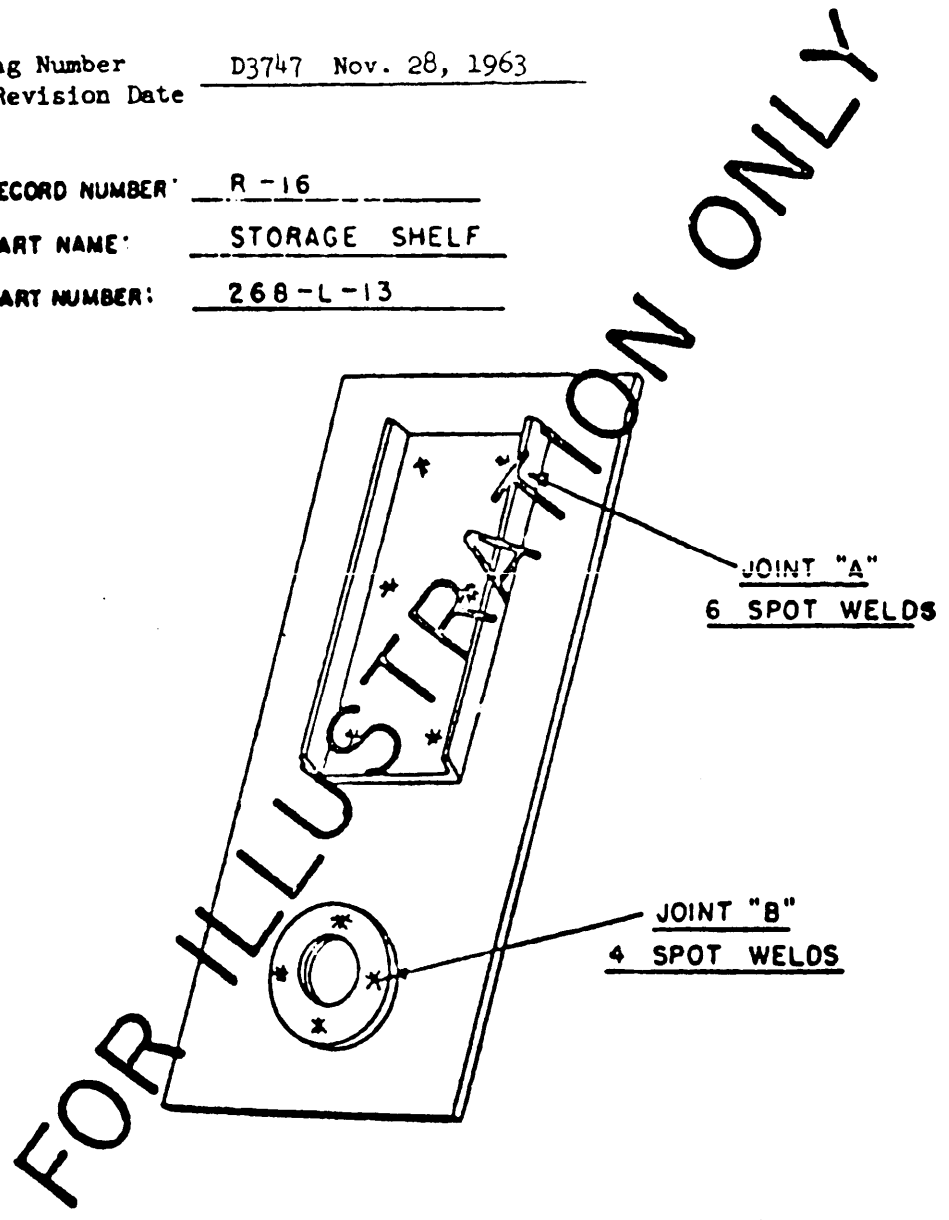
LOCATION DRAWING

Drawing Number and Revision Date: D3747 Nov. 28, 1963

RECORD NUMBER: R-16

PART NAME: STORAGE SHELF

PART NUMBER: 268-L-13



NOTE: MAKE ISOMETRIC OR PERSPECTIVE SKETCH OF ASSEMBLY DESIGNATING JOINT IDENTIFICATIONS, NUMBER OF WELDS AND TYPE OF WELDING OF ALL RESISTANCE-WELDED JOINTS IN THE ASSEMBLY

APPENDIX A
SHEET 3 of 5

SUMMARY SHEET

Drawing Number and Revision Date: D3747 Nov. 28, 1963

RECORD NUMBER: R-16

PART NAME: STORAGE SHELF

PART NUMBER: 268-L-13

A. SUMMARY OF WELDING PROCEDURE:

JOINT REFERENCE	MATERIAL REFERENCE	MACHINE MAKE	MACHINE TYPE	MACHINE SIZE
A	SAE-1010 SAE-1020	BAILEY	PRESS	# 2
B	SAE-1010 SAE-1020	BAILEY	PRESS	# 3

B. MATERIAL COMPOSITION

REFERENCE DESIGNATION	C	Mn	Si	S	P	Cr	Ni	Mo
SAE-1010	.09	.45		.03	.01			
SAE-1020	.20	.40		.07	.01			

FOR ILLUSTRATION ONLY

APPENDIX A
SHEET 1 of 5

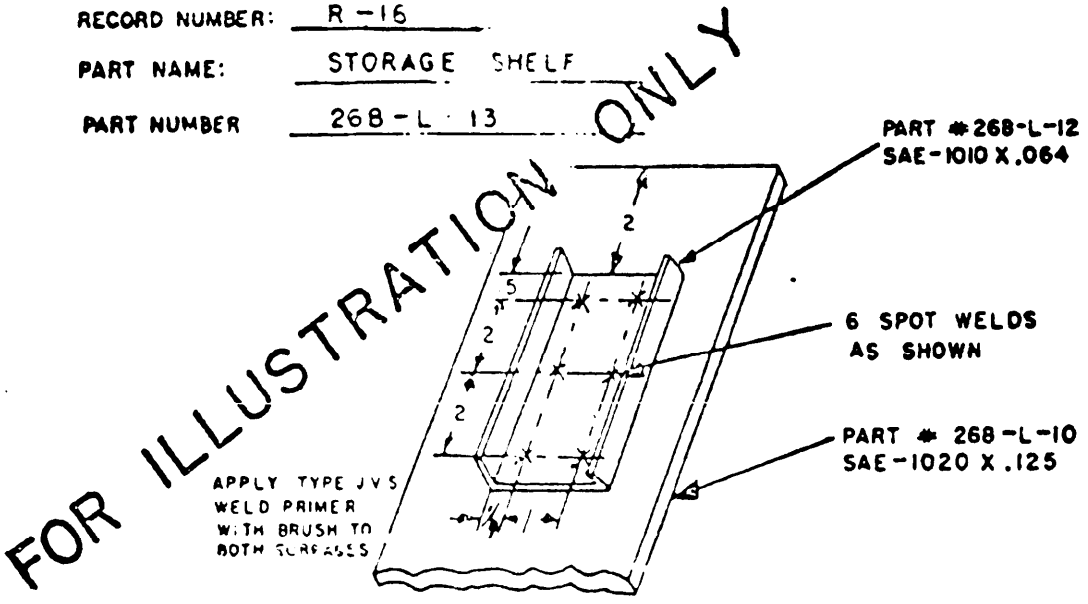
WELDING PROCEDURE, JOINT A

Drawing Number and Revision Date: D3747 Nov. 28, 1963

RECORD NUMBER: R-16

PART NAME: STORAGE SHELF

PART NUMBER: 268-L-13



SKETCH OF JOINT

(SPECIFY PART No.S., MATERIAL & THICKNESS, No. OF WELDS, AND WELD LOCATIONS. INDICATE WELD PRIMER OR SEALER MATERIAL & APPLICATION IF REQUIRED)

1. JOINT REFERENCE: A
2. MATERIAL REFERENCE: See above sketch.
3. PROCESSED CONDITION OF MATERIAL AT WELDING: Wiped clean
4. MATERIAL THICKNESS: See above sketch
5. WELDING SEQUENCE TIMING SCHEDULE:

SINGLE IMPULSE	Multiple Impulse
SQUEEZE TIME – 10 CYCLES	SQUEEZE TIME –
WELD TIME – – 20 CYCLES	HEAT TIME –
HOLD TIME – – 10 CYCLES	COOL TIME –
	NO. OF PULSES –
	HOLD TIME –

6. WELDING CURRENT: TRANSFORMER TAP – # 3
   PHASE SHIFT – 68%
   SECONDARY CURRENT – 21,000 AMPS
7. ELECTRODE FORCE: GAGE PRESSURE – 60 PSI
   CYLINDER AREA – 20 Ins.²
   APPLIED FORCE – 1200 Lbs.
8. ELECTRODES:

	MATERIAL	SIZE	WELDING-FACE SHAPE
UPPER	RWMA CLASS I	# 2 MORSE	3" SPHERICAL RADIUS
LOWER	RWMA CLASS II	# 2 MORSE	.62 DIAMETER FLAT

9. WELDING MACH. IDENTIFICATION: BAILEY # 2 PRESS SERIAL # 2357

APPENDIX A
SHEET 5 of 5

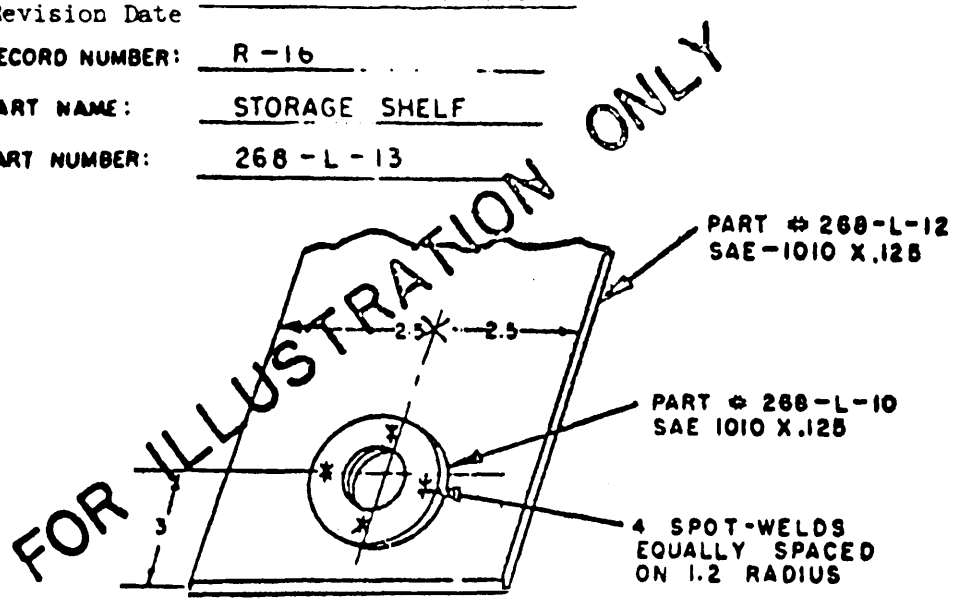
WELDING PROCEDURE, JOINT B

Drawing Number and Revision Date: D3747 Nov. 25, 1963

RECORD NUMBER: R-16

PART NAME: STORAGE SHELF

PART NUMBER: 268-L-13



SKETCH OF JOINT

(SPECIFY PART No's, MATERIAL & THICKNESS, No. OF WELDS, AND WELD LOCATIONS. INDICATE WELD PRIMER OR SEALER, MATERIAL & APPLICATION IF REQUIRED)

1. JOINT REFERENCE: "B"
2. MATERIAL REFERENCE: See above sketch
3. PROCESSED CONDITION OF MATERIAL AT WELDING: Wiped clean
4. MATERIAL THICKNESS: See above sketch
5. WELDING SEQUENCE TIMING SCHEDULE:

SINGLE IMPULSE	Multiple Impulse
SQUEEZE TIME —	SQUEEZE TIME — 20 CYCLES
WELD TIME —	HEAT TIME — — 18 CYCLES
HOLD TIME —	COOL TIME — — 5 CYCLES
	NO. OF PULSES — 3 CYCLES
	HOLD TIME — — 20 CYCLES

6. WELDING CURRENT: TRANSFORMER TAP — ⊕ 3
   PHASE SHIFT — 70%
   SECONDARY CURRENT — 24,000 AMPS
7. ELECTRODE FORCE: GAGE PRESSURE — 70 PSI
   CYLINDER AREA — 34 ins.^{2}
   APPLIED FORCE — 2380 Lbs.
8. ELECTRODES:

	MATERIAL	SIZE	WELDING FACE SHAPE
UPPER:	RWMA CLASS II	⊕ 3 MORSE	.38 DIAMOND FLAT
LOWER:	RWMA CLASS II	⊕ 3 MORSE	.88 DIAMOND FLAT

9. WELDING MACH. IDENTIFICATION: BAILEY ⊕ 3 PRESS TAG ⊕ 341

GPO 873435

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Army Materials & Mechanics Research Center
Attn: AMXMR-MS
Watertown, MA 02172

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SPECIFICATION ANALYSIS SHEET

Form Approved
Budget Bureau No. 119-R004

INSTRUCTIONS

This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity *(as indicated on reverse hereof)*.

SPECIFICATION

ORGANIZATION *(Of submitter)* | CITY AND STATE

CONTRACT NO. | QUANTITY OF ITEMS PROCURED | DOLLAR AMOUNT $

MATERIAL PROCURED UNDER A

☐ DIRECT GOVERNMENT CONTRACT ☐ SUBCONTRACT

1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?

A. GIVE PARAGRAPH NUMBER AND WORDING.

B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES.

2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID

3. IS THE SPECIFICATION RESTRICTIVE?

☐ YES ☐ NO IF "YES", IN WHAT WAY?

4. REMARKS *(Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)*

SUBMITTED BY *(Printed or typed name and activity)* | DATE

DD FORM 1 APR 63 1426 REPLACES NAVSHIPS FORM 4863, WHICH IS OBSOLETE