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PROPERTIES OF 321 STAINLESS STEEL JOINTS AT ROOM TEMPERATURE AND -423°F

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Sample, NAS 3-3232

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PROPERTIES OF 321 STAINLESS STEEL JOINTS AT ROOM TEMPERATURE AND -423°F

OBJECTIVE:

The purpose of this investigation was to determine the static strengths of joints in 321 annealed stainless steel at room temperature and -423°F.

CONCLUSIONS:

The ultimate strengths of each type joint was determined and the average values are shown in the following table.

	AVERAGE ULTIMATE STRENGTH (KSI)		
	Resistance Lapweld	Heliarc, Burn-Down Flange Joint	Heliarc, Fillet With Splitter, Joint
R.T.	90.6	90.1	87.2
-423°F	175.3	131.8	157.8

The resistance lapweld was found to have the highest joint strength.

The strength of each type joint was much higher at -423°F than at room temperature

SPECIMEN:

Specimens were nine inch standard tensile test coupons of 321 annealed stainless steel with welds located in test section of the coupon. The joints were of three types: (1) resistance lapweld, (2) heliarc fillet with splitter, and (3) heliarc burn-down flange.

The resistance lapweld joints were made with 0.0134 inch thick material.

The heliarc fillet with splitter joints were made with 0.0166 inch thick material.

The heliarc burn-down flange joints were made with 0.0136 inch material.

PROCEDURE:

Room temperature testing was done with a Tinius Olsen 200,000 lb. test machine.

Testing at -423°F was accomplished with facilities at the Liquid Hydrogen Test Area. The equipment consisted of a cryostat, a hydraulic ram, and an extensometer. The output of the extensometer was connected to an X-Y recorder which also received an input from a load cell.

Specimens were immersed in liquid hydrogen before any load was applied to the specimen. When the cryostat was completely full, the hydraulic ram was activated and the X-Y recorder turned on to record the load-strain curve of the specimen. The specimen was loaded until failure occurred and the ultimate load was determined from the load-strain curve.

RESULTS:

The ultimate strengths for each joint type are presented in Figure 1.

NOTE:

The test data from which this report was prepared are recorded in MLRs 343, 344 and 1719.

	Resistance Lapweld Joint: Specimen Number	Resistance Lapweld Joint: Ultimate Stress (ksi)	Heliarc, Burn-Down Flange Joint: Specimen Number	Heliarc, Burn-Down Flange Joint: Ultimate Stress (ksi)	Heliarc Fillet with Splitter Joint: Specimen Number	Heliarc Fillet with Splitter Joint: Ultimate Stress (ksi)
Room Temperature	1-1	90.6	2-1	90.2	3-1	86.5
	1-2	90.6	2-2	89.9	3-2	87.9
	1-3	90.2	2-3	89.6	—	—
	1-4	90.5	2-4	90.4	—	—
	1-5	91.2	2-5	90.6	—	—
-423 °F	1-6	--	2-6	117.2	3-3	155.1
	1-7	185.1	2-7	124.9	3-4	246.0
	1-8	218.3	2-8	136.2	3-5	123.0
	1-9	205.8	2-9	135.6	3-6	165.0
	1-10	229.2	2-10	138.5	3-7	156.5
	1-11	210.9	2-11	128.8	3-8	191.4
	1-12	207.3	2-12	122.6	3-9	148.3
	1-13	166.6	2-13	154.1	3-10	177.6
	1-14	198.2	2-14	129.1	—	—
	1-15	131.1	2-15	131.2	—	—

FIGURE 1

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