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MECHANICAL PROPERTIES, INCLUDING FRACTURE TOUGHNESS AND FATIGUE, AND RESISTANCE TO STRESS-CORROSION CRACKING OF STRESS-RELIEVED STRETCHED ALUMINUM ALLOY EXTRUSIONS

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ABSTRACT

The tensile and compressive, shear, bearing, fatigue and fracture-toughness properties of a total of 153 samples of 2014, 2024, 6061, 7075, 7079 and 7178 aluminum alloy extrusions in the TX51X and "heat-treated-by-user" tempers have been determined. The extrusions ranged in thickness from 0.050 to 6.500 in. Ratios among the tensile, compressive, shear and bearing properties have also been computed.

Stress-corrosion tests of 43 samples of extrusions have been made.

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FIFTH QUARTERLY REPORT

MECHANICAL PROPERTIES, INCLUDING FRACTURE TOUGHNESS AND FATIGUE, AND RESISTANCE TO STRESS-CORROSION CRACKING OF STRESS-RELIEVED STRETCHED ALUMINUM ALLOY EXTRUSIONS

I. Introduction.

The tests being made under this contract are for use in establishing design mechanical properties in MIL-HDBK-5A, including stress-strain and tangent-modulus curves, for 2014, 2024, 6061, 7075, 7079 and 7178 aluminum alloy extrusions in the TX51X tempers. For comparison, a limited number of similar tests are being made of extrusions in the "heat-treated-by-user" temper. Also, some fracture-toughness, axial-stress fatigue and stress-corrosion tests are being made.

This Fifth Quarterly Report summarizes the results of tensile, compressive, shear, bearing, fatigue, fracture-toughness and stress-corrosion tests made to date on 125 samples in the TX51X temper and on 28 samples in the "heat-treated-by-user" tempers. The samples ranged in thickness from 0.050 to 6.500 in.

II. Material.

A total of 138 samples of commercially-produced extrusions in the TX51X temper and 23 samples in the O temper have been received from two producers. The section thickness and identification of each sample is shown in Table I. Eighteen of the as-received samples in the O temper have been heat treated, or heat treated and aged, in accordance with applicable conditions in MIL-H-6088D. Five samples of 2024-O and 7075-O

were tested in two "heat-treated-by-user" tempers, so that the total number of samples tested in those tempers is 28.

III. Procedure.

Mechanical Properties

The specimens and procedures used were generally in accordance with ASTM methods, and essentially in agreement with Federal Test Method 151a.

All tests were made in testing machines that meet ASTM and Government requirements for accuracy.

All tensile tests were made in accordance with ASTM Methods of Tension Testing of Metallic Materials (E8-66). The size and type of the tensile specimens are as shown in Fig. 1. Longitudinal and long-transverse specimens were taken from the following locations:

Thickness, in.	Location of Axis of Specimen with Respect to Thickness (T) and Width (W) of Predominant Section		
	Thickness	Width	
		≤ 1.500 in.	> 1.500 in.
< 0.500	T/2	---	---
0.500 to 1.500 incl.	T/2, D*/2	W/2, D*/2	W/4
> 1.500	T/4, D*/4	---	W/4, D*/4

* For round extrusions: D-diameter.

Also, for section thicknesses ≥ 0.500 and widths > 1.500 in., longitudinal and long-transverse specimens were taken at the T/2, W/2 location. For round sections > 1.500 in. in diam, specimens were also taken at the D/2 location. For sections ≥ 2.000 in. in thickness, short-transverse specimens were taken from the T/2, W/2 location.

Whenever possible, the tensile specimens from extrusions 0.499 in. or less in thickness were full-thickness sheet-type specimens (Fig. 1). The specimens from thicker shapes were 1/2 in. in diam, except where it was necessary to use subsize round specimens.

All compressive tests were made in accordance with ASTM Methods of Compression Testing of Metallic Materials (E9-67) and were made using a subpress (Fig. 3 of E9-67). The specimens from shapes less than 0.500 in. in thickness were full-thickness (Fig. 2, top). These specimens were laterally supported by a Montgomery-Templin Fixture (Fig. 4a of E9-67). The specimens from thicker shapes were cylindrical (Fig. 2, center). The compressive specimens were taken from the same locations as the tensile specimens.

Tensile and compressive yield stresses of each sample of extrusion were determined from load-strain diagrams obtained autographically.

Tests to determine the ultimate shear stress were made using specimens shown in Fig. 2 (bottom). Whenever possible, these specimens were taken from the same locations as the tensile specimens, except that tests of short-transverse specimens were made only on shapes 3 in., or more, in thickness. The tests were made with an Amsler double-shear tool in which the center 1-in. length was sheared from the 3-in. long specimen, the end thirds being supported throughout the length. In tests of longitudinal and long-transverse specimens, the loads were applied in the direction normal to the major surface of the

shape from which the specimens were taken; in tests of short-transverse specimens the loads were applied in the direction of extrusion, parallel to the major surface of the shape.

Bearing tests were made in accordance with ASTM Method E238-64T using longitudinal and, where possible, long-transverse specimens, of the types shown in Fig. 3. Flatwise and edgewise specimens were tested from shapes of suitable size. Edgewise specimens from shapes less than 1-1/2 in. in thickness, however, were 1 in. wide (Type A, Fig. 3). The bearing ultimate stresses and yield stresses were determined at edge distances of 1.5 and 2.0 times the pin diameter. The yield stress was determined as the stress at a permanent deformation of 2 per cent of the pin diameter, as indicated on autographic load-deformation diagrams. Before making these tests, the test fixtures and specimens were cleaned ultrasonically in suitable nontoxic solvent (Toson 3, Grannini Controls Corp.).

Certain lots were chosen for tensile and compressive modulus and stress-strain tests, fatigue and fracture-toughness tests. Samples from which both longitudinal and long-transverse specimens could be obtained were selected for these tests. In a few instances, however, the geometry of the shapes in certain thickness ranges permitted only longitudinal tests.

The tensile and compressive specimens used for modulus and stress-strain tests are shown in Figs. 4 and 5, respectively. In all modulus tests of longitudinal tensile specimens, and a few long-transverse specimens, strains were measured over a 6-in. gage length with an Amsler-Martens mirror-type extensometer (probably ASTM Class A). In most of the tests of long-transverse

tensile specimens it was necessary to use smaller specimens and measure strains over a 4 or 2-in. gage length with the Amsler-Martens mirror-type extensometer (ASTM Class B-1) or 1-in. gage length with the Tuckerman optical strain gage (ASTM Class A). In tests to determine modulus, the 6- or 4-in. gage length was used and the specimens were stressed up to about the proportional limit; then after removal of the load and starting again at zero stress and strain, strains were measured with the same instrument over a 2-in. gage length until the yield stress was exceeded. When strains were measured over a 2- or 1-in. gage length, tests were continued beyond the proportional limit to obtain the yield stress. In some tests of each alloy and temper, strains were measured beyond the yield stress to the ultimate stress with a 2-in. dial gage (each division = 0.001 in.) or scale and dividers to obtain complete tensile stress-strain curves. In all compressive modulus and stress-strain tests, the Tuckerman optical strain gage was used over a 2 or 1-in. gage length (ASTM Class A). For determination of each modulus value, the data were examined by the strain-deviation procedure in ASTM Method E111-61. Based on the various tests, representative typical and minimum stress-strain and tangent-modulus curves will be developed in accordance with the procedures as outlined in Section 3.2.3, 3.2.5 and 3.2.6 of Technical Report AFML-TR-66-386.*

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* D. P. Moon and W. S. Hyler, "MIL-HDBK-5 Guidelines for Presentation of Data", Technical Report AFML-TR-66-386, February, 1967.

Axial-stress fatigue tests were made using three longitudinal and three long-transverse specimens of the type shown in Fig. 6. They were tested at three stress levels (R=0.0) in Krouse fatigue machines operating at 2400 rpm.

Fracture-toughness tests were made in accordance with the methods described in ASTM STP 411* on fatigue-cracked single-edge-notched tensile specimens from the longitudinal and long-transverse directions. The types of specimens are shown in Fig. 7; the proportions of these specimens are the same as those of specimens used by NASA, Lewis Research Center. The fracture parameters were calculated from relationships developed from the NASA calibration.

Candidate values of the critical plane-strain stress-intensity factor, K_Q, were calculated using two values of load from the fracture-toughness tests. The first value was calculated using the load at the initial burst of unstable crack growth, as indicated by the initial significant deviation from linearity in the load-deformation curve. These values were obtained from load-deformation curves developed with SR-4 electrical-resistance strain-gage units, mounted as shown in Fig. 2 of the First Quarterly Report, dated June 15, 1966. In reporting the data, the degree of clarity of the initial deviation has been indicated by the use of the letter "P" to indicate a clear instability or pop-in, the letter "I" to

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* W. F. Brown and J. E. Srawley, "Plane Strain Fracture Toughness Testing of High Strength Metals", ASTM STP 411, February, 1967.

indicate a less pronounced but yet abrupt initial deviation from linearity which is believed to be a supressed pop-in, and "M" to indicate that the initial deviation was at the maximum or fracture load. The second value was calculated using the load at a 5 per cent secant offset, equivalent to about 2 per cent of crack extension; this was done as a result of recent recommendations of ASTM Committee E-24* that the secant-offset method be considered for establishing K_Q.

Before values of K_Q can be accepted as values of K_{Ic}, they must meet two criteria:

(a) the plastic zone size must be small with respect to the thickness, as indicated by the limitation that the thickness of the test specimen must be equal to or greater than 2.5 times the ratio $(K_Q/\sigma_{YS})^2$, and

(b) any deviation from linearity in the load-deformation curve prior to the load used for the K_Q calculation must primarily represent crack extension, as indicated by the limitation on the load-deformation diagram that the horizontal displacement of the load-deformation curve (from the initial slope) at a load 80 per cent of that at the 5 per cent secant-offset intercept shall not be more than 1/4 of the displacement at the 5 per cent secant-offset intercept.

Values of the ratio $(K_Q/\sigma_{YS})^2$ needed to check the thickness criterion above (a) are reported with the data. Conformance

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* "Draft Recommended Practice for Notch-Bend Fracture-Toughness Testing", ASTM Committee E24, February, 1967.

with the deviation criterion (b) is still being evaluated and will be reported later, along with the final analysis to determine which values of K_Q may be considered acceptable values of K_{Ic}.

Resistance to Stress Corrosion

Stress-corrosion tests have been, or are currently being conducted, with specimens from 31 samples in the TX51X-type temper, and 12 samples in the "heat-treated-by-user" tempers.

Resistance to stress-corrosion cracking is determined with two types of specimens; longitudinal and long-transverse 0.125-inch diam tensile specimens (Fig. 8) are taken at the center line of the section thickness in all instances. For sections 0.750 inches or more in thickness short-transverse C-ring specimens (Fig. 9) are also taken, again on the center line. The tensile specimens are stressed in frames as indicated in Fig. 10 of this report, and Fig. 7 of the First Quarterly Report, dated June 15, 1966, while the C-rings are stressed in bending as shown in Fig. 8 of the First Quarterly Report; the stresses are 75 per cent of the actual tensile yield stress.

The stress-corrosion evaluations are conducted by alternate immersion in a 3.5% (by weight) NaCl solution (Sterling Granulated Salt in New Kensington tap water). The test cycle includes total immersion of the specimens for 10 min. per hour and aeration above the solution for the remaining 50 minutes per hour. The test cycle is repeated 24 times daily for a 12-week period. The test equipment, shown in Fig. 9 of the First

Quarterly Report, consists of large stationary aluminum alloy tanks which contain the salt solution, and a mechanism for raising and lowering the specimens to provide the desired cycle.

Selected tensile specimen failures are examined to verify the cause as stress-corrosion cracking, and all tensile specimens that do not fracture during exposure are tested in tension to determine the loss in tensile strength cause by corrosion.

The criteria for classifying C-ring specimens as failures are as follows:

(a) in susceptible alloy-temper combinations, cracking in C-rings is usually well defined and readily visible at a macroscopic level (magnifications up to 10 diameters). With such alloys and tempers visual examination is sufficient and any crack readily detected at 10X magnification is considered cause for removal from test. For such combinations metallographic examination to verify the cause of failure as stress-corrosion cracking, has therefore been limited to a few representative failures.

(b) In alloy and temper combinations developed to provide a high degree of resistance to stress-corrosion cracking, C-ring failures, when they do occur, usually develop as very fine, short cracks which are not readily detected visually.

Consequently, all C-rings of such alloy and tempers are examined metallographically after completion of the 84-day exposure period. Any evidence of stress-corrosion cracking results in the specimen being classified as a failure.

The stress-corrosion test results will be compared with existing data for aluminum alloy extruded sections to ascertain that performance was typical of that expected for the various alloy systems.

IV. Summary.

The results of tensile, compressive, shear and bearing tests of 125 samples of extrusions in the TX51X temper are shown in Tables II through IX; the corresponding properties for 28 extrusions in the "heat-treated-by-user" tempers are shown in Table X. The tensile properties of all samples exceed the values in applicable Federal Specifications. Specified minimum tensile properties for extrusions are shown in Table XI; the values shown in this table are those published in "Standards for Aluminum Mill Products", The Aluminum Association, 1967. Some of these values, as indicated in the table, are lower than those shown presently in Federal Specifications. It is understood, however, that the values in "SAMP" will be in the next revisions of the Federal Specifications.

The ratios among the tensile, compressive and shear properties of the extrusions in the TX51X tempers are shown in Tables XII through XIX and those for the "heat-treated-by-user"

tempers are shown in Table XX. The ratios among the bearing and tensile properties of the corresponding extrusions are shown in Tables XXI through XXVIII and XXIX, respectively. The ratios among the properties at different locations with regard to width and thickness are shown in Table XXX. The ratios among bearing properties obtained using edgewise specimens to those obtained using flatwise specimens are shown in Table XXXI.

The results of the axial-stress fatigue tests are shown in Figs. 11 through 16, and those of the fracture-toughness tests for the extrusions in the TX51X tempers and "heat-treated-by-user" tempers are shown in Tables XXXII and XXXIII, respectively.

The current status of the stress-corrosion tests is shown in Table XXXIV for the extrusions in the TX51X tempers and Table XXXV for the extrusion in the "heat-treated-by-user" tempers. The tests results continue to indicate typical performances for the various materials.

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V. Tables and Figures.

TABLE I

SAMPLES OF EXTRUSIONS RECEIVED AS OF JUNE 15, 1967
AF33(615)-5580

2014			2024						6061			7075			7079			7178		
Temper	Section Thickness, in.	AML Sample Number	Temper	Section Thickness, in.	AML Sample Number	Temper	Section Thickness, in.	AML Sample Number	Temper	Section Thickness, in.	AML Sample Number	Temper	Section Thickness, in.	AML Sample Number	Temper	Section Thickness, in.	AML Sample Number	Temper	Section Thickness, in.	AML Sample Number
-0	0.188	318131*	-0	0.050	318026*				-0	0.125	340436	-0	0.063	318034*	-0	0.222	340441	-0	0.050	340738
	0.500	317905		0.089	317855					0.246	318090		0.126	317901					0.051	318036*
	0.498	318081		0.450	318156*					1.625	317947		0.350	317995	-T6510	0.080	340405		0.403	340171
	3.250	340488		0.500	340256								1.225	318041*		0.080	340490*			
				1.120	340455				-T6510	0.050	318136*		2.250	317909		0.146	340406	-T6510	0.062	317902
-T6510	0.061	317920		2.982	340457					0.075	317857		2.812	340505		0.161	340452		0.065	340491*
	0.070	318017*								0.090	318087*					0.251	340453		0.068	340423
	0.073	317921	-T3510	0.075	318132*	-T6510	0.075	318022*		0.125	317846					0.500	340424*		0.142	318015
	0.246	318150*		0.094	318019*		0.094	318134*				-T6510	0.065	317899					0.154	318035*
	0.250	340454		0.101	317885		0.101	317887		0.126	317847		0.153	340490					0.180	340429
	0.271	317904								0.180	340482		0.065	318051*					0.182	317906
	0.495	317920		0.106	317904		0.106	317888		0.246	340491*		0.080	317858					0.188	340395
	0.500	340491		0.120	318018*		0.120	318023*		0.250	317848		0.133	318009*					0.261	340427*
	0.688	340486*		0.151	317886		0.151	317889		0.254	340492		0.150	318030*					0.265	317908
	0.750	317928		0.250	317898		0.250	317890		0.310	317905		0.209	340407					0.280	340508
	1.957	318046		0.258	318027		0.258	318082		0.315	317953		0.250	318028*					0.600	317907
	1.758	340457*		0.375	317913		0.375	317891		0.375	317927		0.313	317908					0.780	340254
				0.510	317908		0.510	317892		0.376	318083		0.325	340437					1.200	318150*
				0.524	318020*		0.525	318024*		0.918	317906		0.376	317904					1.498	317957
				0.550	317856		0.550	317992		1.004	340429*		0.498	317909					2.180	318140*
										1.240	317907		0.463	318032*						
				0.642	317845		0.650	317890		1.498	340488*		0.995	340155						
				0.813	340418*		0.815	340419*		1.980	317896		1.025	318031*						
				0.980	317844		0.960	317893		2.000	340220		1.188	317860						
				1.160	318077		1.150	318078		6.500	317897		1.500	317922						
				1.280	317845		1.200	317895					2.000	317861						
				1.498	318021**		1.498	318025**					2.190	318137*						
				1.700	340213		1.700	340159					2.750	340404						
				2.250	318137*		2.500	340420*					2.812	340509						
				2.780	318048		2.780	318079					3.040	318138*						
				4.000	340215		4.000	340225					3.090	340510						
				4.500	340388		4.500	340389					5.000	340500						
												-T73510	0.080	317866						
													0.209	340509						
													0.313	317909						
													0.505	340438						
													0.575	317900						
													0.498	317910						
													0.995	340252						
													1.000	340439						
													1.500	317900						
													2.000	317868						
													2.750	340440						
													3.812	340439						
													3.090	340508						
													5.000	340504						

* Producer B; all others from Producer A
† T3511 temper
‡ T6511 temper

TABLE II

MECHANICAL PROPERTIES OF STRESS-RELIEVED STRETCHED 2014-T6510 ALUMINUM ALLOY EXTRUSIONS
[AF33(615)-3580]

Section Thickness, in.	Sample Cross-Sectional Area, in²	Number	Location*	Direction†	Tensile Ultimate Stress, psi	Tensile Yield Stress,‡ psi	Elongation in 2 in. or 4D, %	Comp. Yield Stress,‡ psi	Shear Ultimate Stress, psi	Bearing** Flatwise Ultimate Stress, psi e/D=1.5	Bearing** Flatwise Ultimate Stress, psi e/D=2.0	Bearing** Flatwise Yield Stress, psi†† e/D=1.5	Bearing** Flatwise Yield Stress, psi†† e/D=2.0	Bearing** Edgewise Ultimate Stress, psi e/D=1.5	Bearing** Edgewise Ultimate Stress, psi e/D=2.0	Bearing** Edgewise Yield Stress, psi†† e/D=1.5	Bearing** Edgewise Yield Stress, psi†† e/D=2.0
0.061	0.30	317950	T/2	L	67 100	62 200	9.0	64 600	--	105 600	138 800	88 200	103 900	--	--	--	--
				LT	74 700	68 600	5.0‡‡	--	--	--	--	--	--	--	--	--	--
0.070	0.24	318017#	T/2	L	64 900	61 900	9.5	62 800	--	104 500	134 900	88 500	103 800	--	--	--	--
0.073	0.16	317951	T/2	L	62 800	59 100	11.5	59 900	--	--	--	--	--	--	--	--	--
0.246	0.45	318130#	T/2	L	64 100	60 400	10.0	61 000	44 300	110 100	136 900	94 300	107 500	--	--	--	--
0.250	3.7	340154	T/2	L	64 900	62 000	12.5	63 800	46 400	109 200	141 300	93 200	113 700	--	--	--	--
				LT	68 800	63 700	5.0‡‡	69 300	45 700	--	--	--	--	--	--	--	--
0.271	0.40	317994	T/2	L	67 500	63 800	13.5	63 400	47 200	106 900	139 500	93 400	108 000	--	--	--	--
				LT	71 700	64 600	6.2	--	--	--	--	--	--	--	--	--	--
0.625	0.50	317952	T/2	L	65 900	61 900	14.3	60 300	44 700	--	--	--	--	--	--	--	--
0.625	0.55	340291	T/2	L	77 500	71 900	10.7	68 000	42 100	--	--	--	--	--	--	--	--
0.750	1.4	317924	T/2	L	76 700	71 100	11.5	73 100	42 800	110 000	142 800	93 600	106 200	--	--	--	--
				LT	70 300	63 500	7.8	68 400	--	--	--	--	--	--	--	--	--
1.657	2.2	318046	D/4	L	72 600	66 100	10.5	67 800	41 500	105 700	135 800	88 000	103 100	--	--	--	--
			D/2	L	73 200	66 500	10.5	68 200	41 500	104 800	132 500	85 700	99 700	--	--	--	--
				LT	67 400	60 200	7.8	--	--	--	--	--	--	--	--	--	--

* T - Thickness; W - Width, D - Diameter
† L - Longitudinal; LT - Long-Transverse;
‡ Offset equals 0.2 per cent
\# Producer B; all others from Producer A

** Specimens and Fixtures cleaned ultrasonically in Tocon 3 solvent
†† Offset equals 2 per cent of pin diameter
‡‡ Sub-size sheet-type specimen; 1/8-in. wide; 1/2-in. gage length

TABLE III

MECHANICAL PROPERTIES OF STRESS-RELIEVED STRETCHED 2024-T3510 ALUMINUM ALLOY EXTRUSIONS
[AF33(615)-3580]

Section Thickness, in.	Sample Cross-Sectional Area, in.²	Number	Location*	Direction†	Tensile Ultimate Stress, psi	Tensile Yield Stress,‡ psi	Elongation in 2 in. or 4D, %	Comp. Yield Stress,‡ psi	Shear Ultimate Stress, psi	Bearing** Flatwise Ultimate Stress, psi e/D=1.5	Bearing** Flatwise Ultimate Stress, psi e/D=2.0	Bearing** Flatwise Yield Stress, psi†† e/D=1.5	Bearing** Flatwise Yield Stress, psi†† e/D=2.0	Bearing** Edgewise Ultimate Stress, psi e/D=1.5	Bearing** Edgewise Ultimate Stress, psi e/D=2.0	Bearing** Edgewise Yield Stress, psi†† e/D=1.5	Bearing** Edgewise Yield Stress, psi†† e/D=2.0
0.075	0.70	318132#	T/2	L	65 900	53 000	18.0	45 200	--	96 800	119 200	78 300	94 300	--	--	--	--
				LT	70 300	48 100	15.0‡‡‡	57 800	--	--	--	--	--	--	--	--	--
[illegible]	0.30	318054#	T/2	L	63 900	52 800	14.5	58 000	--	97 200	127 800	77 900	92 300	--	--	--	--
[illegible]	[illegible]	[illegible]	T/2	L	68 100	53 400	16.5	45 300	--	102 500	126 900	76 200	90 000	--	--	--	--
[illegible]	[illegible]	[illegible]	T/2	L	64 400	51 700	20.5	42 100	--	102 200	125 300	77 200	91 300	--	--	--	--
[illegible]	[illegible]	[illegible]‡‡‡	T/2	L	65 400	54 000	17.5	45 000	--	101 900	129 500	79 900	92 600	--	--	--	--
0.151	[illegible]	[illegible]	T/2	L	69 900	54 400	17.0	45 400	--	108 300	123 600	78 300	91 200	--	--	--	--
				LT	67 700	49 900	11.0‡‡‡	55 200	--	--	--	--	--	--	--	--	--
[illegible]	7.0	317942	T/2	L	79 400	61 800	16.0	58 200	41 200	99 100	124 000	74 700	85 000	--	--	--	--
				LT	76 100	55 400	19.0†††	59 900	41 800	105 300	132 100	81 000	99 400	--	--	--	--
[illegible]	[illegible]	318017	T/2	L	79 800	60 900	15.0	53 100	43 300	106 300	132 300	81 200	97 000	--	--	--	--
				LT	74 900	54 700	20.0†††	58 100	42 200	107 200	134 400	75 900	97 700	--	--	--	--
[illegible]	0.60	317943	T/2	L	61 700	49 300	21.5	37 400##	41 600	106 200	133 400	79 500	101 400	--	--	--	--
				LT	57 600	38 900	6.0	--	--	--	--	--	--	--	--	--	--
[illegible]	4.1	317986	T/2,W/2	L	75 700	57 100	15.0	50 000	40 600	100 600	130 600	77 400	94 800	--	--	--	--
				LT	64 900	43 500	8.0	52 500	39 800	--	--	--	--	--	--	--	--
[illegible]	1.9	[illegible]	T/2,W/4	L	63 000	48 300	21.5	39 200	42 200	--	--	--	--	--	--	--	--
				LT	61 300	42 600	11.0	--	--	--	--	--	--	--	--	--	--
			T/2,W/2	L	62 600	48 500	23.0	40 300	41 200	108 000	118 900	74 400	87 900	--	--	--	--
				LT	63 200	43 500	12.0	47 500	42 200	--	--	--	--	--	--	--	--
0.900	1.9	317856	T/2,W/4	L	76 900	63 600	15.5	54 500	40 800	105 100	130 700	79 500	97 300	--	--	--	--
				LT	71 800	53 200	16.4	58 300	37 800	--	--	--	--	--	--	--	--
[illegible]	5.0	317995	T/2,W/4	L	77 000	60 800	11.6	[illegible]	40 400	100 900	128 100	76 700	92 300	--	--	--	--
				LT	64 300	47 900	8.5	55 300	39 000	100 600	121 600	76 700	91 600	--	--	--	--
[illegible]	3.9	340418‡‡	T/2,W/4	L	80 000	61 100	15.0	57 400	41 600	105 400	130 100	75 600	95 000	--	--	--	--
				LT	80 400	51 000	15.1	54 400	--	--	--	--	--	--	--	--	--
			T/2,W/2	L	78 100	[illegible]	16.0	53 100	41 700	108 800	128 600	75 600	92 100	--	--	--	--
				LT	71 300	51 400	20.0	54 200	38 600	--	--	--	--	--	--	--	--
0.950	4.6	317944	T/2,W/4	L	80 900	60 600	15.0	54 400	39 700	102 400	132 800	73 900	90 500	--	--	--	--
				LT	64 300	50 200	15.6	54 000	--	--	--	--	--	--	--	--	--
1.250	5.6	318077	T/2,W/4	L	78 700	61 300	14.5	55 500	39 600	104 000	127 900	78 000	96 100	95 000	124 800	75 600	94 200
				LT	[illegible]	58 800	10.9	55 300	--	[illegible]	[illegible]	[illegible]	[illegible]	--	--	--	--
			T/2,W/2	L	[illegible]	[illegible]	14.5	[illegible]	40 100	102 900	129 200	75 400	93 800	--	--	--	--
				LT	69 600	50 700	16.4	54 600	38 400	--	--	--	--	--	--	--	--
1.200	3.9	317986	T/2,W/4	L	80 300	63 300	14.5	58 000	39 900	105 500	134 300	75 400	93 600	101 900	130 900	77 900	91 900
				LT	67 200	49 500	14.1	54 800	--	--	--	--	--	--	--	--	--
1.450	7.3	318021#	T/2,W/4	L	80 400	62 300	14.0	58 100	40 000	105 100	132 200	77 400	92 600	101 900	131 100	75 200	90 700
				LT	68 000	47 000	13.5	52 100	--	--	--	--	--	--	--	--	--
			T/2,W/2	L	79 800	60 800	13.5	56 400	39 700	104 200	129 300	76 500	91 200	100 600	127 600	72 600	90 100
				LT	68 800	49 100	14.6	52 600	39 100	--	--	--	--	--	--	--	--
1.705	4.8	340213	T/4,W/4	L	82 500	62 300	25.0	59 400	40 600	110 800	136 800	76 700	95 900	--	--	--	--
				LT	69 800	48 600	14.0	--	--	--	--	--	--	--	--	--	--
			T/2,W/2	L	82 100	61 800	15.0	60 700	39 000	108 600	133 200	76 400	93 000	106 500	131 000	76 000	90 300
				LT	68 900	49 500	12.0	52 600	38 800	--	--	--	--	--	--	--	--
2.500	8.8	318133#	T/4,W/4	L	81 100	61 500	14.0	59 200	39 300	103 500	128 600	76 800	94 300	100 300	128 000	76 400	87 300
				LT	67 000	46 200	14.1	49 800	--	--	--	--	--	--	--	--	--
			T/2,W/2	L	80 900	61 900	14.5	59 400	38 900	104 000	130 700	77 100	95 900	100 900	125 000	74 000	88 800
				LT	67 000	47 000	12.9	50 400	37 600	--	--	--	--	--	--	--	--
				ST	65 900	44 100	12.5	49 200	41 900	--	--	--	--	--	--	--	--
4.000	24.0	340214	T/4,W/4	L	79 800	62 300	14.0	57 700	38 300	102 300	130 800	75 600	91 800	98 000	125 000	74 600	91 600
				LT	64 400	47 700	8.0	51 400	36 700	97 000	128 300	80 700	95 700	86 900	116 000	71 400	88 600
			T/2,W/2	L	78 400	60 400	14.0	56 500	37 800	92 600	129 300	76 700	93 000	90 100	121 500	72 700	91 100
				LT	68 900	47 800	7.5	50 800	36 700	--	--	--	--	--	--	--	--
				ST	[illegible]	42 800	5.7	49 800	39 700	--	--	--	--	--	--	--	--
2.700	29.6	318048	T/4,W/4	L	77 100	58 800	13.5	58 900	40 900	98 000	118 100	73 400	88 200	94 600	122 700	72 900	91 200
				LT	58 800	43 500	5.5	47 900	37 300	92 600	116 500	74 800	90 900	85 200	111 400	71 200	88 000
			T/2,W/2	L	76 800	58 900	13.5	55 000	39 100	96 600	123 500	76 600	93 900	90 900	118 600	74 100	90 400
				LT	60 300	47 000	6.0	49 700	37 700	91 600	115 400	72 900	90 700	--	--	--	--
				ST	[illegible]	42 500	6.0	47 800	39 200	--	--	--	--	--	--	--	--
4.500	30.7	[illegible]	T/4,W/4	L	[illegible]	[illegible]	19.0	57 300	[illegible]	102 300	131 300	71 600	[illegible]	97 700	127 600	70 600	[illegible]
				LT	[illegible]	[illegible]	12.0	47 800	[illegible]	98 900	118 800	71 000	[illegible]	89 800	112 000	67 800	[illegible]
			T/2,W/2	L	78 800	[illegible]	15.5	[illegible]	[illegible]	108 600	130 300	72 100	[illegible]	93 700	119 300	70 300	[illegible]
				LT	[illegible]	[illegible]	10.5	[illegible]	[illegible]	97 500	124 800	71 300	82 000	91 900	125 800	65 800	81 400
				ST	[illegible]	80 500	7.5	47 900	39 700	--	--	--	--	--	--	--	--

* T - Thickness; W - Width

‡ Offset equals 0.2 per cent

\# Producer B; all others from Producer A

** Specimens and Fixtures cleaned ultrasonically in Toxon 3 solvent.

†† Offset equals 2 per cent of pin diameter.

\#\# Average of two tests; all others, single tests.

††† Sub-size sheet-type specimen; 1/8-in. wide; 1-in. gage length.

‡‡‡ Sub-size sheet-type specimen; 1/8-in. wide; 1/2-in. gage length.

‡‡ Samples were in the T3511 temper.

TABLE IV

MECHANICAL PROPERTIES OF STRESS-RELIEVED STRETCHED 2024-T8510 ALUMINUM ALLOY EXTRUSIONS
[AF33(615)-3500]

Section Thickness, in.	Sample Cross-Sectional Area, in.²	Sample Number	Location*	Direction†	Tensile Ultimate Stress, psi	Tensile Yield Stress,‡ psi	Elongation in 2 in. or 4D, %	Comp. Yield Stress,‡ psi	Shear Ultimate Stress, psi	Bearing** Flatwise Ultimate Stress, psi, e/D=1.5	Bearing** Flatwise Ultimate Stress, psi, e/D=2.0	Bearing** Flatwise Yield Stress, psi††, e/D=1.5	Bearing** Flatwise Yield Stress, psi††, e/D=2.0	Bearing** Edgewise Ultimate Stress, psi, e/D=1.5	Bearing** Edgewise Ultimate Stress, psi, e/D=2.0	Bearing** Edgewise Yield Stress, psi††, e/D=1.5	Bearing** Edgewise Yield Stress, psi††, e/D=2.0
0.075	0.70	318024#	T/2	L	72 400	68 400	6.0	70 000	--	110 200	141 400	98 900	118 600	--	--	--	--
				LT	77 300	69 600	3.0‡‡‡	73 300	--	--	--	--	--	--	--	--	--
0.094	0.30	318134#	T/2	L	76 900	69 200	7.0	65 700	--	103 000	139 500	100 000	118 000	--	--	--	--
0.101	0.33	317887	T/2	L	73 200	70 800	6.0	71 800	--	106 800	141 300	95 700	122 400	--	--	--	--
0.108	0.31	317888	T/2	L	70 200	68 200	6.0	66 800	--	107 600	141 300	95 500	117 600	--	--	--	--
0.120	0.27	318021#	T/2	L	71 300	67 700	8.5	67 800	--	105 600	141 300	97 000	110 300	--	--	--	--
0.151	0.82	317889	T/2	L	71 400	67 600	6.5	70 400	--	112 400	144 400	101 200	117 800	--	--	--	--
				LT	75 200	70 300	8.0‡‡‡	69 600	--	--	--	--	--	--	--	--	--
0.295	2.8	317890	T/2	L	77 600	70 000	8.5	75 500	44 200	113 100	146 600	99 400	117 800	--	--	--	--
				LT	76 600	72 200	10.0†††	73 900	42 900	114 000	145 800	99 900	119 400	--	--	--	--
0.298	4.2	318082	T/2	L	75 400	68 400	7.5	73 100	43 600	118 000	143 800	101 000	115 300	--	--	--	--
				LT	74 800	70 000	9.5†††	71 800	42 800	109 700	141 400	96 700	108 100	--	--	--	--
0.375	0.62	317891	T/2	L	70 100	66 500	7.5	64 800	43 400	107 100	136 800	98 200	107 800	--	--	--	--
				LT	67 700	63 400	4.6	--	--	--	--	--	--	--	--	--	--
0.510	10.1	317892	T/2,W/2	L	73 600	68 700	9.5	70 300	41 600	108 200	139 600	96 000	107 400	--	--	--	--
				LT	71 700	56 900	4.6	69 800	41 500	--	--	--	--	--	--	--	--
0.525	1.9	318024#	T/2,W/4	L	72 200	65 600	10.0	67 500	41 400	--	--	--	--	--	--	--	--
				LT	71 000	65 200	5.0	--	--	--	--	--	--	--	--	--	--
			T/2,W/2	L	71 400	64 100	10.5	67 000	40 900	104 500	135 300	91 600	106 800	--	--	--	--
				LT	70 700	65 000	8.0	64 200	40 600	--	--	--	--	--	--	--	--
0.550	1.9	317922	T/2,W/4	L	74 100	67 800	8.0	70 200	41 300	106 600	139 600	94 800	112 400	--	--	--	--
				LT	72 000	67 200	5.9	69 700	41 200	--	--	--	--	--	--	--	--
0.682	5.8	317894	T/2,W/4	L	75 300	69 000	7.9	70 300	41 700	105 700	135 800	96 600	112 900	--	--	--	--
				LT	71 900	67 800	5.6	70 300	40 100	106 200	137 200	94 100	112 200	--	--	--	--
0.815	3.9	340419#	T/2,W/4	L	73 300	66 200	10.0	69 100	40 400	106 900	136 900	92 900	108 000	--	--	--	--
				LT	71 800	66 700	6.2	68 200	--	--	--	--	--	--	--	--	--
			T/2,W/2	L	73 000	65 400	11.0	68 900	40 400	106 200	138 600	93 000	109 300	--	--	--	--
				LT	72 100	67 100	8.0	67 800	39 400	--	--	--	--	--	--	--	--
0.950	4.6	317893	T/2,W/4	L	73 500	68 400	7.5	67 400	41 700	104 000	134 900	96 600	112 200	--	--	--	--
				LT	70 100	64 700	4.1	67 900	--	--	--	--	--	--	--	--	--
1.150	5.6	318078	T/2,W/4	L	73 800	66 200	8.5	68 800	40 900	106 900	136 700	94 600	111 000	92 900	127 400	89 700	107 500
				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	--	[illegible]	[illegible]	[illegible]	[illegible]	--	--	--	--
			T/2,W/2	L	71 800	64 900	8.0	69 000	42 000	105 300	136 500	94 300	111 400	--	--	--	--
				LT	71 300	67 100	6.4	67 800	39 900	--	--	--	--	--	--	--	--
1.200	3.9	317895	T/2,W/4	L	74 600	68 500	8.5	70 700	41 900	106 200	135 200	93 600	110 100	101 300	131 000	94 300	110 400
				LT	71 400	67 200	4.6	70 700	--	--	--	--	--	--	--	--	--
1.450	7.3	318025##	T/2,W/4	L	74 800	69 000	9.0	70 500	42 000	106 600	135 500	95 700	112 900	101 900	130 700	91 200	110 100
				LT	70 300	65 700	4.9	69 300	--	--	--	--	--	--	--	--	--
			T/2,W/2	L	74 900	69 000	8.5	70 100	42 200	105 400	137 800	93 700	113 500	101 300	131 700	91 700	111 200
				LT	71 000	66 700	5.4	69 100	41 300	--	--	--	--	--	--	--	--
1.705	4.8	340169	T/4,W/4	L	71 400	63 200	10.0	65 700	40 000	104 800	133 100	89 500	105 000	--	--	--	--
				LT	71 900	63 400	6.0	--	--	--	--	--	--	--	--	--	--
			T/2,W/2	L	71 600	65 300	10.0	65 600	39 300	105 700	135 800	90 900	108 000	104 300	129 400	90 000	105 700
				LT	69 700	64 300	5.0	66 100	38 300	--	--	--	--	--	--	--	--
2.980	8.8	340480#	T/4,W/4	L	[illegible]	[illegible]	10.5	65 800	[illegible]	104 000	130 200	90 900	103 100	97 700	1[illegible] 400	88 100	105 000
				LT	[illegible]	[illegible]	6.2	66 700	[illegible]	--	--	--	--	--	--	--	--
			T/2,W/2	L	[illegible]	[illegible]	10.0	65 800	[illegible]	99 400	129 900	87 600	103 100	94 900	126 600	87 100	104 300
				LT	[illegible]	[illegible]	5.7	66 100	39 600	--	--	--	--	--	--	--	--
				ST	[illegible]	[illegible]	5.0	67 200	--	--	--	--	--	--	--	--	--
2.780	29.6	318079	T/4,W/4	L	[illegible]	[illegible]	9.0	64 200	40 800	89 200	121 600	***	107 300	98 600	121 900	90 300	105 000
				LT	[illegible]	[illegible]	8.1	[illegible]	39 100	95 100	124 100	90 900	104 600	97 700	120 500	88 900	106 000
			T/2,W/2	L	[illegible]	[illegible]	8.5	63 700	[illegible]	95 700	122 800	89 600	105 400	89 400	116 400	***	108 100
				LT	[illegible]	[illegible]	8.0	[illegible]	41 100	97 000	127 400	87 800	101 700	--	--	--	--
				ST	[illegible]	[illegible]	1.8	[illegible]	[illegible]	--	--	--	--	--	--	--	--
4.000	24.0	340085	T/4,W/4	L	[illegible]	[illegible]	10.0	[illegible]	[illegible]	96 [illegible]	128 100	88 000	104 400	[illegible]	[illegible]	87 600	105 900
				LT	[illegible]	[illegible]	6.0	[illegible]	[illegible]	100 600	131 [illegible]	86 [illegible]	104 300	89 300	[illegible] 900	[illegible] 700	105 700
			T/2,W/2	L	[illegible]	[illegible]	9.5	[illegible]	[illegible]	95 [illegible]	[illegible] 800	85 900	105 [illegible]	87 600	116 900	[illegible] 600	102 400
				LT	[illegible]	[illegible]	5.6	[illegible]	[illegible]	--	--	--	--	--	--	--	--
				ST	[illegible]	[illegible]	4.5	[illegible]	[illegible]	--	--	--	--	--	--	--	--
4.500	30.7	340309	T/4,W/4	L	[illegible]	[illegible]	10.5	[illegible]	[illegible]	[illegible]	125 700	[illegible]	[illegible]	[illegible]	119 700	[illegible]	[illegible]
				LT	[illegible]	[illegible]	5.0	[illegible]	[illegible]	[illegible]	119 [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			T/2,W/2	L	[illegible]	[illegible]	11.0	[illegible]	[illegible]	[illegible]	12[illegible]	[illegible]	[illegible]	[illegible]	114 [illegible]	[illegible]	[illegible]
				LT	[illegible]	[illegible]	5.5	[illegible]	[illegible]	[illegible] 300	12[illegible] 900	78 900	95 600	[illegible]	114 700	77 300	94 [illegible]
				ST	[illegible]	[illegible]	5.0	[illegible]	37 600	--	--	--	--	--	--	--	--

* T - Thickness; W - Width
† L - Longitudinal; LT - Long-Transverse; ST - Short-Transverse
‡ Offset equals 0.2 per cent.
\# Producer B; all others from Producer A
** Specimens and fixtures cleaned ultrasonically in Freon 3 solvent.
†† Offset equals 2 per cent of pin diameter.
*** Bearing specimen failed before reaching yield stress (2 per cent offset).
††† Sub-size sheet-type specimen; 1/4-in. wide; 1-in. gage length.
‡‡‡ Sub-size sheet-type specimen; 1/8-in. wide; 1/2-in. gage length.
\#\# Sample was in the T8511 temper.

TABLE V

MECHANICAL PROPERTIES OF STRESS-RELIEVED STRETCHED 6061-T6510 ALUMINUM ALLOY EXTRUSIONS
[AF33(615)-3580]

Section Thickness, in.	Sample Cross-Sectional Area, in.²	Number	Location*	Direction†	Tensile Ultimate Stress, psi	Tensile Yield Stress,§ psi	Elongation in 2 in. or 4D, %	Comp. Yield Stress,§ psi	Shear Ultimate Stress, psi	Bearing** Flatwise Ultimate Stress, psi e/D=1.5	Bearing** Flatwise Ultimate Stress, psi e/D=2.0	Bearing** Flatwise Yield Stress, psi†† e/D=1.5	Bearing** Flatwise Yield Stress, psi†† e/D=2.0	Bearing** Edgewise Ultimate Stress, psi e/D=1.5	Bearing** Edgewise Ultimate Stress, psi e/D=2.0	Bearing** Edgewise Yield Stress, psi†† e/D=1.5	Bearing** Edgewise Yield Stress, psi†† e/D=2.0
0.050	0.42	318136#	T/2	L	45 000	42 400	11.0	41 500	--	79 400	107 300	66 900	75 800	--	--	--	--
0.075	0.59	317857	T/2	L	45 900	39 300	13.0	40 100	--	74 200	91 700	59 400	66 800	--	--	--	--
				LT	44 800	37 200	15.0†††	38 800	--	89 100	105 200	67 400	77 700	--	--	--	--
0.090	0.27	318027#	T/2	L	44 700	42 100	13.5	41 300	--	77 600	103 500	66 200	75 600	--	--	--	--
0.125	0.61	317846#	T/2	L	43 200	38 700	11.5	38 700	--	70 900	90 700	58 000	64 300	--	--	--	--
				LT	41 900	36 000	15.0†††	38 600	--	--	--	--	--	--	--	--	--
0.126	0.30	317847	T/2	L	43 900	39 700	10.5	39 800	31 400	--	--	--	--	--	--	--	--
0.245	1.1	340421#	T/2	L	43 300	41 600	17.0	40 700	33 200	77 600	103 900	66 300	76 300	--	--	--	--
				LT	43 500	39 900	14.1	44 500	33 800	--	--	--	--	--	--	--	--
0.250	0.36	317848	T/2	L	43 000	38 600	12.0	38 800	30 800	--	--	--	--	--	--	--	--
0.254	0.97	340422#	T/2	L	44 400	42 400	16.5	43 000	32 500	78 600	102 800	67 200	76 700	--	--	--	--
				LT	47 300	42 900	17.2	46 500	31 800	--	--	--	--	--	--	--	--
0.310	6.3	317905	T/2	L	47 700	43 200	16.5	42 300	31 100	79 500	101 700	66 800	73 200	--	--	--	--
				LT	49 100	43 400	16.5	44 800	30 700	80 700	103 400	67 500	79 500	--	--	--	--
0.315	5.8	317953	T/2	L	45 500	40 200	18.5	40 100	34 400	78 000	100 600	65 700	67 100	--	--	--	--
				LT	44 700	38 000	18.5	40 100	33 600	78 400	103 100	65 300	71 000	--	--	--	--
0.375	8.6	317927	T/2	L	45 900	42 000	18.5	41 600	36 500	80 000	101 400	65 700	70 900	--	--	--	--
				LT	45 300	40 000	17.0	42 000	36 100	80 600	103 700	67 400	75 300	--	--	--	--
0.375	7.7	318083	T/2	L	46 600	42 500	16.0	41 800	35 400	79 800	101 100	68 400	72 600	--	--	--	--
				LT	43 700	39 400	22.5†††	42 000	33 800	81 000	103 400	69 900	75 000	--	--	--	--
0.918	1.7	317906	T/2,W/2	L	45 900	41 800	20.0	41 700	33 000	78 000	101 400	68 500	73 200	--	--	--	--
				LT	45 500	40 800	19.5	43 500	--	--	--	--	--	--	--	--	--
1.004	2.0	340423#	T/2,W/4	L	45 600	42 200	19.5	40 500	31 600	75 200		62 400		73 100	96 600	60 600	72 700
			T/2,W/2	L	45 200	41 900	20.0	40 600	31 900	75 300	99 400	61 800	74 900	73 200	95 600	61 100	74 000
				LT	47 000	40 800	10.9	44 300	30 400	--	--	--	--	--	--	--	--
1.240	2.7	317907	T/2,W/4	L	48 100	43 000	18.5	44 800	28 700	--	--	--	--	--	--	--	--
			T/2,W/2	L	48 800	43 500	18.5	44 100	28 400	72 600	94 300	57 900	66 800	71 900	92 100	56 200	66 900
				LT	43 300	37 600	18.0	40 800	--	--	--	--	--	--	--	--	--
1.960	4.4	317896	T/2,W/4	L	51 600	46 800	18.5	46 800	29 600	76 000	96 600	60 000	71 000	--	--	--	--
			T/2,W/2	L	52 000	47 200	18.5	47 800	29 100	75 100	96 300	60 000	68 900	74 700	96 300	59 700	70 600
				LT	45 200	39 300	17.0	43 000	--	--	--	--	--	--	--	--	--
3.000	15.0	340226	T/4,W/4	L	52 900	49 900	16.0	50 100	27 800	76 100	98 600	63 200	73 200	74 900	96 000	62 100	73 400
				LT	47 700	43 100	15.0	46 200	27 500	74 500	95 900	61 800	74 700	72 100	94 400	60 300	73 300
			T/2,W/2	L	52 000	48 700	15.5	48 700	27 800	75 600	97 400	62 500	72 400	74 100	94 300	60 400	70 300
				LT	46 900	43 800	14.0	45 500	26 800	--	--	--	--	--	--	--	--
				ST	47 100	40 800	13.0	44 700	28 700	--	--	--	--	--	--	--	--
6.500	33.2	317897	D/4	L	51 500	46 100	15.5	46 000	27 000	72 600	93 800	57 200	71 000	72 600	92 600	57 200	71 000
				LT	44 600	38 000	12.5	40 700	27 000	69 300	89 500	55 400	68 200	68 500	86 600	54 700	67 500
			D/2	L	51 000	45 700	13.5	45 600	26 800	71 500	91 500	56 500	67 500	--	--	--	--
				LT	44 000	37 000	12.5	39 600	26 600	--	--	--	--	--	--	--	--

* T - Thickness; W - Width; D - Diameter
† L - Longitudinal; LT - Long-Transverse; ST - Short-Transverse
§ Offset equals 0.2 per cent.
# Produced by all others from Purchase [illegible]

** Specimens and Fixtures cleaned ultrasonically in Tocon 3 solvent.
†† Offset equals 2 per cent of pin diameter
††† Subsize sheet-type specimen: 1/4-in. wide; 1-in. gage length

TABLE VI

MECHANICAL PROPERTIES OF STRESS-RELIEVED STRUCTURED 7075-T6510 ALUMINUM ALLOY EXTRUSIONS
[AP33(615)-[illegible]]

Section Thickness, in.	Sample Cross-Sectional Area, in.	Number	Location*	Direction†	Tensile Ultimate Stress, psi	Tensile Yield Stress,§ psi	Elongation in 2 in. or 4D, %	Comp. Yield Stress,§ psi	Shear Ultimate Stress, psi	Bearing** Plastic Ultimate Stress, psi e/D=1.5	Bearing** Plastic Yield Stress,†† psi e/D=1.5	Bearing** Plastic Yield Stress,†† psi e/D=2.0	Bearing** Elastic Ultimate Stress, psi e/D=1.5	Bearing** Elastic Ultimate Stress, psi e/D=2.0	Bearing** Elastic Yield Stress,†† psi e/D=1.5	Bearing** Elastic Yield Stress,†† psi e/D=2.0
0.065	0.18	317899	T/2	L	87 000	79 200	11.0	75 400	--	126 600	158 400	106 200	123 100	--	--	--	--
0.065	0.27	318051#	T/2	L	84 200	77 700	10.5	77 300	--	125 900	158 700	102 400	125 400	--	--	--	--
				LT	83 000	74 600	15.0###	77 400	--	--	--	--	--	--	--	--	--
0.080	0.18	317868	T/2	L	86 200	81 700	12.0	80 500	--	125 500	157 900	109 600	124 900	--	--	--	--
0.193	0.97	318029#	T/2	L	84 200	75 800	9.0	76 600	--	124 600	156 200	107 000	123 900	--	--	--	--
				LT	82 800	72 600	15.0###	77 900	--	--	--	--	--	--	--	--	--
0.160	0.26	318030#	T/2	L	87 500	79 900	12.0	82 900	--	126 500	160 100	108 600	128 600	--	--	--	--
0.209	1.2	340403	T/2	L	90 700	82 700	11.0	88 200	51 100	125 400	158 500	110 500	134 500	--	--	--	--
				LT	89 300	80 200	12.0 ###	90 800	48 400	131 800	160 900	106 800	124 800	--	--	--	--
0.260	1.2	318028#	T/2	L	88 500	77 900	11.5	78 800	48 500	126 100	158 000	104 800	123 400	--	--	--	--
				LT	84 100	74 400	15.0###	--	--	--	--	--	--	--	--	--	--
0.313	0.51	317908	T/2	L	89 400	82 700	11.0	85 300	49 800	--	--	--	--	--	--	--	--
0.525	2.4	340437	T/2	L	86 000	77 300	12.0	77 100	46 800	122 900	156 200	103 100	119 400	123 700	151 700	103 100	126 400
				LT	86 000	76 200	13.5	81 200	45 700	--	--	--	--	--	--	--	--
0.375	8.2	317954	T/2	L	88 000	80 900	11.0	79 200	48 000	125 000	160 600	104 400	128 600	--	--	--	--
				LT	83 500	74 800	13.0	82 100	47 100	--	--	--	--	--	--	--	--
0.438	7.2	317899	T/2	L	87 600	80 300	12.0	80 400	49 900	129 100	160 200	113 000	128 500	--	--	--	--
				LT	86 100	77 700	11.5	85 700	48 100	131 000	163 100	112 200	134 200	--	--	--	--
0.463	1.9	318033#	T/2	L	89 800	76 200	12.0	78 900	48 600	121 900	155 400	99 400	119 600	--	--	--	--
				LT	78 700	70 800	10.0	78 400	45 200	--	--	--	--	--	--	--	--
0.935	7.2	340155	T/2,W/4	L	88 300	81 700	11.5	80 800	47 500	127 600	161 700	109 500	127 200	--	--	--	--
				LT	83 500	76 100	12.0	81 100	46 100	129 800	157 600	107 600	131 600	--	--	--	--
			T/2,W/2	L	86 500	79 600	12.0	77 600	47 000	125 900	157 400	105 000	124 300	--	--	--	--
				LT	82 900	75 300	12.0	79 400	45 600	--	--	--	--	--	--	--	--
1.023	1.8	318034#	T/2,W/4	L	88 800	82 500	9.0	84 200	47 100	121 000	156 100	100 000	123 100	--	--	--	--
1.188	27.1	317860	T/2,W/4	L	84 600	77 800	11.0	79 500	51 100	126 900	159 400	108 600	123 400	108 800	148 100	98 100	117 200
				LT	84 300	76 300	13.0	81 000	47 900	129 000	158 500	111 500	128 600	112 000	142 900	99 700	120 200
			T/2,W/2	L	85 600	78 000	12.0	77 100	48 200	126 500	159 600	107 400	119 400	110 800	147 100	100 000	119 700
				LT	83 000	74 500	13.0	80 000	47 500	126 000	159 900	110 800	127 600	115 800	148 400	97 500	117 300
1.500	1.8	317995	D/2	L	95 600	86 700	9.5	88 000	48 200	122 400	156 500	109 300	121 400	--	--	--	--
				LT	77 600	67 700	6.2	--	--	--	--	--	--	--	--	--	--
2.000	3.1	317861	D/4	L	99 600	86 700	11.0	86 400	49 200	127 300	164 500	108 000	126 400	--	--	--	--
			D/2	L	91 100	84 100	10.0	84 900	47 700	120 700	155 700	102 300	122 900	--	--	--	--
				LT	79 100	68 700	8.6	75 100	--	--	--	--	--	--	--	--	--
2.190	17.0	318137#	T/4,W/4	L	93 800	78 800	10.0	75 300	46 300	120 600	151 400	105 000	125 000	103 200	139 200	99 800	121 700
				LT	75 000	69 300	6.0	76 400	45 200	119 900	149 200	104 600	124 300	99 800	131 000	95 800	119 600
			T/2,W/2	L	81 700	73 500	10.0	72 400	44 500	117 900	149 100	100 400	120 700	101 700	136 600	98 700	120 000
				LT	77 400	68 800	9.0	73 000	43 100	120 300	152 200	103 800	121 500	101 900	135 300	94 400	115 600
				ST	70 200	61 500	5.9	72 000	--	--	--	--	--	--	--	--	--
2.750	8.2	340404	T/4,W/4	L	93 000	83 000	11.0	84 600	48 400	122 900	158 200	103 100	122 900	123 900	155 100	105 100	122 900
				LT	80 200	69 700	9.5	77 200	47 100	--	--	--	--	--	--	--	--
			T/2,W/2	L	89 300	81 100	11.0	82 900	47 200	121 800	157 100	100 300	120 000	120 700	151 200	102 300	118 600
				LT	78 800	68 800	9.0	75 500	46 800	--	--	--	--	--	--	--	--
				ST	74 [illegible]	67 [illegible]	8.0	74 800	46 800	--	--	--	--	--	--	--	--
3.040	13.8	318138#	T/4,W/4	L	86 700	79 100	10.0	80 700	46 700	120 100	152 000	104 500	124 300	115 200	146 [illegible]	103 400	122 900
				LT	76 800	67 300	7.0	73 900	--	118 500	149 300	106 400	126 300	115 300	146 100	100 600	125 000
			T/2,W/2	L	84 600	76 700	10.5	77 800	45 400	118 300	151 400	101 800	121 400	115 900	145 800	101 600	118 700
				LT	75 400	66 700	8.2	72 800	43 700	--	--	--	--	--	--	--	--
				ST	73 400	63 200	6.0	70 400	43 600	--	--	--	--	--	--	--	--
5.090	24.3	340391	T/4,W/4	L	87 600	78 200	11.5	78 000	47 000	125 100	159 400	102 900	120 700	111 600	148 000	98 000	120 000
				LT	81 200	71 500	10.0	76 600	44 000	124 600	151 800	103 600	118 600	111 700	141 200	96 400	118 600
			T/2,W/2	L	84 200	74 600	11.5	74 200	44 700	117 400	152 800	97 100	116 500	108 600	138 700	94 300	113 700
				LT	77 600	68 000	8.5	73 500	43 500	118 000	151 200	95 700	113 100	104 700	135 600	91 500	112 500
				ST	75 000	66 600	6.0	71 800	44 500	--	--	--	--	--	--	--	--

* T - Thickness; W - Width; D - Diameter
† L - Longitudinal; LT - Long-Transverse; ST - Short-Transverse
§ Offset equals 0.2 per cent.
\# Producer B; all others from Producer A

** Specimens and fixtures cleaned ultrasonically in Tocon 3 solvent.
†† Offset equals 2 per cent of pin diameter.
Subsize sheet-type specimen; 1/2-in. wide, 1/2-in. gage length.
Subsize sheet-type specimen; 1/4-in. wide; 1-in. gage length.

TABLE VII

MECHANICAL PROPERTIES OF STRESS-RELIEVED STRETCHED 7075-T73510 ALUMINUM ALLOY EXTRUSIONS

AF33(615)-3580

Section Thickness, in.	Sample Cross-Sectional Area, sq in.	Number	Location*	Direction†	Tensile Ultimate Stress, psi	Tensile Yield Stress,‡ psi	Elongation in 2 in. or 4D, %	Comp. Yield Stress,‡ psi	Shear Ultimate Stress, psi	Bearing** Flatwise Ultimate Stress, psi e/D=1.5	Bearing** Flatwise Ultimate Stress, psi e/D=2.0	Bearing** Flatwise Yield Stress, psi†† e/D=1.5	Bearing** Flatwise Yield Stress, psi†† e/D=2.0	Bearing** Edgewise Ultimate Stress, psi e/D=1.5	Bearing** Edgewise Ultimate Stress, psi e/D=2.0	Bearing** Edgewise Yield Stress, psi†† e/D=1.5	Bearing** Edgewise Yield Stress, psi†† e/D=2.0
0.063	0.18	317862	T/2	L	79 400	71 100	9.0	71 300	--	120 600	153 800	103 200	120 500	--	--	--	--
0.249	1.2	340393	T/2	L	75 300	64 100	12.0	66 900	42 500	109 400	139 200	89 100	107 500	--	--	--	--
				LT	75 200	62 500	12.0##	66 000	41 000	111 900	148 100	87 500	107 600	--	--	--	--
0.313	0.51	317909	T/2	L	76 100	66 200	11.5	69 400	44 200	--	--	--	--	--	--	--	--
0.325	1.4	340438	T/2	L	73 600	61 300	12.0	61 800	41 200	109 300	141 800	88 300	104 400	--	--	--	--
				LT	74 700	62 700	11.5	65 200	39 400	109 100	141 200	88 600	106 500	--	--	--	--
0.375	2.2	317900	T/2	L	74 900	64 300	11.5	65 800	44 300	113 400	146 300	92 300	109 400	--	--	--	--
				LT	72 600	62 300	11.0	66 600	42 800	--	--	--	--	--	--	--	--
0.438	7.2	317910	T/2	L	77 200	67 500	12.0	69 800	45 100	118 100	152 800	98 900	117 200	--	--	--	--
				LT	76 600	67 600	10.0	71 800	44 100	118 800	152 600	97 600	120 000	--	--	--	--
0.935	7.2	340292	T/2,W/4	L	79 200	70 300	12.5	70 600	44 600	116 300	149 400	96 400	114 300	--	--	--	--
				LT	76 600	67 700	12.5	71 400	43 300	115 100	144 000	97 300	113 600	--	--	--	--
			T/2,W/2	L	77 700	68 700	13.0	68 800	43 800	116 600	149 100	96 400	113 600	--	--	--	--
				LT	76 000	66 900	12.0	69 800	42 900	--	--	--	--	--	--	--	--
1.000	5.7	340439	T/2,W/4	L	76 700	66 900	13.0	66 900	44 200	112 200	146 300	90 900	107 300	105 900	134 500	87 600	103 800
				LT	73 500	63 400	12.0	66 100	42 500	114 300	147 500	91 900	111 100	103 500	136 600	86 000	105 100
			T/2,W/2	L	74 500	64 300	12.5	64 600	43 300	110 200	143 500	88 100	103 900	107 500	139 700	90 100	106 200
				LT	72 700	62 500	11.0	64 600	41 700	--	--	--	--	--	--	--	--
1.500	1.9	317956	D/2	L	79 700	72 100	11.0	73 800	44 700	111 100	145 700	93 800	111 500	--	--	--	--
				LT	71 800	61 600	6.2	--	--	--	--	--	--	--	--	--	--
2.000	3.1	317948	D/4	L	78 800	71 100	11.5	72 800	44 200	111 400	146 000	90 700	109 400	--	--	--	--
			D/2	L	77 800	70 300	12.0	71 400	43 600	112 200	143 800	92 300	109 400	--	--	--	--
				LT	70 200	60 500	6.2	66 200	--	--	--	--	--	--	--	--	--
2.750	8.2	340440	T/4,W/4	L	77 000	68 500	12.5	69 500	43 900	110 200	144 000	89 300	107 800	109 700	141 200	88 600	105 900
				LT	71 900	61 800	9.4	65 100	41 600	--	--	--	--	--	--	--	--
			T/2,W/2	L	75 000	66 300	12.5	66 900	43 000	107 600	138 900	86 200	103 700	109 600	139 800	88 300	104 400
				LT	69 300	59 000	9.0	62 900	40 900	--	--	--	--	--	--	--	--
				ST	69 400	58 900	8.0	62 800	41 200	--	--	--	--	--	--	--	--

* T - Thickness; W - Width; D - Diameter
† L - Longitudinal; LT - Long-Transverse
‡ Offset equals 0.2 per cent.
** Specimens and Fixtures cleaned ultrasonically in Tocon 3 solvent.
†† Offset equals 2 per cent of pin diameter.
Subsize sheet-type specimen; 1/4-in. wide; 1-in. gage length

TABLE VIII

MECHANICAL PROPERTIES OF STRESS-RELIEVED STRETCHED 7079-T6510 ALUMINUM ALLOY EXTRUSIONS
[AF33(615)-3580]

Section Thickness in.	Sample Cross-Sectional Area, $in.^2$	Number	Location*	Direction†	Tensile Ultimate Stress, psi	Tensile Yield Stress,‡ psi	Elongation in 2 in. or 4D, %	Comp. Yield Stress,‡ psi	Shear Ultimate Stress, psi	Bearing** Flatwise Ultimate Stress, psi e/D=1.5	Bearing** Flatwise Ultimate Stress, psi e/D=2.0	Bearing** Flatwise Yield Stress, psi†† e/D=1.5	Bearing** Flatwise Yield Stress, psi†† e/D=2.0	Bearing** Edgewise Ultimate Stress, psi e/D=1.5	Bearing** Edgewise Ultimate Stress, psi e/D=2.0	Bearing** Edgewise Yield Stress, psi†† e/D=1.5	Bearing** Edgewise Yield Stress, psi†† e/D=2.0
0.080	0.15	340405	T/2	L	84 200	77 600	10.5	76 600	--	123 100	156 200	104 400	119 400	--	--	--	--
0.146	1.1	340406	T/2	L	85 200	77 700	10.0	76 600	--	124 600	156 100	109 300	124 100	--	--	--	--
				LT	84 800	75 700	12.0###	82 100	--	128 000	157 400	106 800	125 900	--	--	--	--
0.161	0.72	340252	T/2	L	86 400	79 300	10.5	78 400	--	124 400	156 500	106 300	123 300	--	--	--	--
				LT	84 100	75 100	16.0###	84 100	--	--	--	--	--	--	--	--	--
0.251	0.82	340253	T/2	L	85 700	78 900	12.0	79 700	48 400	125 100	156 100	105 200	118 600	--	--	--	--
				LT	81 000	72 600	14.1	79 600	47 500	--	--	--	--	--	--	--	--
0.500	4.2	340424#	T/2,W/4	L	83 200	75 600	13.0	75 700	45 000	118 800	150 600	97 300	113 700	--	--	--	--
				LT	79 500	71 000	15.0	78 300	44 000	118 900	151 100	97 500	118 600	--	--	--	--
			T/2,W/2	L	82 400	74 500	14.0	75 100	45 200	118 800	148 900	97 300	111 600	--	--	--	--
				LT	80 700	71 300	19.0###	77 400	44 500	--	--	--	--	--	--	--	--

* T - Thickness; W - Width
† L - Longitudinal; LT - Long-Transverse
‡ Offset equals 0.2 per cent.
# Producer B; all others from Producer A

** Specimens and Fixtures cleaned ultrasonically in Tosco 3 solvent.
†† Offset equals 2 per cent of pin diameter.
‡‡‡ Subsize sheet-type specimen; 1/8-in. wide; 1/2-in. gage length
Subsize sheet-type specimen; 1/4-in. wide; 1-in. gage length

TABLE IX

MECHANICAL PROPERTIES OF STRESS-RELIEVED STRETCHED 7178-T6510 ALUMINUM ALLOY EXTRUSIONS
[AF33(615)-3580]

Section Thickness in.	Sample Cross-Sectional Area, $in.^2$	Number	Location*	Direction†	Tensile Ultimate Stress, psi	Tensile Yield Stress,‡ psi	Elongation in 2 in. or 4D, %	Comp. Yield Stress,‡ psi	Shear Ultimate Stress, psi	Bearing** Flatwise Ultimate Stress, psi e/D=1.5	Bearing** Flatwise Ultimate Stress, psi e/D=2.0	Bearing** Flatwise Yield Stress, psi†† e/D=1.5	Bearing** Flatwise Yield Stress, psi†† e/D=2.0	Bearing** Edgewise Ultimate Stress, psi e/D=1.5	Bearing** Edgewise Ultimate Stress, psi e/D=2.0	Bearing** Edgewise Yield Stress, psi†† e/D=1.5	Bearing** Edgewise Yield Stress, psi†† e/D=2.0
0.063	0.37	317902	T/2	L	95 400	89 900	9.5	90 400	—	133 500	168 900	117 400	138 900	—	—	—	—
				LT	94 200	87 500	10.0###	93 800	--	--	--	--	--	--	--	--	--
0.066	0.35	340426#	T/2	L	90 700	82 000	9.0	82 400	--	135 800	174 100	111 500	136 400	--	--	--	--
				LT	90 800	80 900	12.0###	88 700	—	--	--	--	--	--	--	--	--
0.142	1.0	318016	T/2	L	93 300	86 900	9.5	84 300	--	131 600	166 700	114 900	137 300	--	--	--	--
				LT	92 000	83 400	14.0###	92 300	--	--	--	--	--	--	--	--	--
0.154	0.42	318035#	T/2	L	92 200	85 800	9.5	90 800	—	138 300	172 600	120 300	138 500	--	--	--	--
0.162	0.49	317903	T/2	L	91 900	85 400	10.5	84 000	—	132 600	164 400	114 300	129 800	--	--	--	--
0.162	1.1	340425#	T/2	L	91 500	83 200	9.5	78 800	--	130 000	161 400	110 200	126 700	--	--	--	--
				LT	86 500	78 300	9.0###	84 700	—	--	--	--	--	--	--	--	--
0.180	4.6	340395	T/2	L	92 700	85 800	10.0	85 000	--	131 800	166 500	118 300	139 000	--	--	--	--
				LT	94 400	87 500	8.0		--	140 700	164 600	122 000	145 600	--	--	--	--
0.261	0.60	340427#	T/2	L	92 700	86 200	10.0	88 700	52 200	135 100	170 900	110 600	129 400	--	--	--	--
				LT	86 700	79 400	12.0	--	--	--	--	--	--	--	--	--	--
0.265	0.88	317996	T/2	L	95 400	89 400	10.0	89 200	51 800	132 600	166 600	112 700	125 600	--	--	--	--
0.625	6.9	317997	T/2,W/4	L	93 600	86 900	10.7	85 500	51 800	133 400	164 800	114 300	134 900	--	--	--	--
				LT	91 100	81 500	10.2	88 200	50 000	132 400	158 200	113 600	134 200	--	--	--	--
			T/2,W/2	L	92 600	85 900	10.7	83 900	51 800	131 000	166 500	113 600	129 300	--	--	--	--
				LT	89 400	80 700	7.4	87 500	50 200	--	--	--	--	--	--	--	--
0.780	1.7	340254	T/2,W/2	L	99 200	93 400	10.0	94 300	50 600	137 200	171 500	110 800	133 100	--	--	--	--
				LT	88 900	79 900	8.0	--	--	--	--	--	--	--	--	--	--
1.200	3.9	318139#	T/2,W/4	L	94 900	89 300	9.5	91 000	50 200	132 300	166 700	113 900	137 700	122 400	151 500	116 000	136 900
				LT	86 300	79 600	6.3	--	--	--	--	--	--	--	--	--	--
			T/2,W/2	L	93 200	87 500	9.5	88 900	50 700	132 200	166 300	111 400	139 300	122 400	159 200	114 700	136 900
				LT	85 400	78 900	7.5	86 400	49 500	--	--	--	--	--	--	--	--
1.438	6.4	317957	T/2	L	101 300	95 500	8.5	97 200	52 500	133 100	167 600	115 700	137 100	--	--	--	--
				LT	85 400	76 900	4.7	--	--	--	--	--	--	--	--	--	--
2.180	15.5	318140#	T/4,W/4	L	91 100	83 300	8.0	83 700	49 100	124 400	161 700	113 600	134 300	112 700	145 000	110 800	130 000
				LT	82 600	75 000	5.0	82 600	46 600	128 400	155 400	114 300	134 900	108 800	148 100	105 600	131 900
			T/2,W/2	L	88 600	79 500	9.0	80 100	48 500	122 600	159 100	110 700	129 300	108 800	144 600	105 800	130 700
				LT	82 400	73 500	6.5	79 200	46 000	123 800	157 600	108 100	128 500	102 800	140 600	101 200	125 000
				ST	76 600	66 600	2.6	77 300	--	--	--	--	--	--	--	--	--

* T - Thickness; W - Width
† L - Longitudinal; LT - Long-Transverse; ST - Short-Transverse
‡ Offset equals 0.2 per cent.
\# Producer B; all others from Producer A

** Specimens and Figures cleaned ultrasonically in Tosco 3 solvent.
†† Offset equals 2 per cent of pin diameter.
Subsize sheet-type specimen; 1/8-in. wide; 1/2-in. gage length

TABLE X

MECHANICAL PROPERTIES OF EXTRUSIONS IN THE "HEAT-TREATED-BY USER" TEMPER
AF33(615)-3580

Alloy and Temper	Sample: Section Thickness in.	Sample: Cross-Sectional Area, in.²	Number	Location*	Direction†	Tensile Ultimate Stress, psi	Tensile Yield Stress,‡ psi	Elongation in 2 in. or 4D, %	Comp. Yield Stress,‡ psi	Shear Ultimate Stress, psi	Bearing**: Flatwise: Ultimate Stress psi: e/D=1.5	Bearing**: Flatwise: Ultimate Stress psi: e/D=2.0	Bearing**: Flatwise: Yield Stress,†† psi: e/D=1.5	Bearing**: Flatwise: Yield Stress,†† psi: e/D=2.0	Bearing**: Edgewise: Ultimate Stress, psi: e/D=1.5	Bearing**: Edgewise: Ultimate Stress, psi: e/D=2.0	Bearing**: Edgewise: Yield Stress,†† psi: e/D=1.5	Bearing**: Edgewise: Yield Stress,†† psi: e/D=2.0
2014-T62	0.185	1.0	340240§	T/2	L	68 500	62 800	11.5	67 900	--	109 200	141 200	94 400	112 000	--	--	--	--
					LT	71 700	63 900	11.0‡‡	68 700	--	--	--	--	--	--	--	--	--
	0.300	5.3	318084	T/2	L	74 200	67 200	9.5	70 100	43 100	112 200	144 600	97 300	115 100	--	--	--	--
					LT	74 700	63 400	12.5	72 600	41 400	112 500	143 500	96 600	115 800	--	--	--	--
	0.499	1.4	318085	T/2	L	71 700	65 100	13.0	69 100	41 300	110 200	141 800	93 000	110 100	--	--	--	--
					LT	70 300	63 800	10.2	67 300	--	--	--	--	--	--	--	--	--
2024-T42	0.064	0.27	318088§	T/2	L	65 000	44 500	20.5	44 800	--	103 800	123 100	75 300	86 900	--	--	--	--
					LT	69 100	43 500	18.0‡‡	47 500	--	--	--	--	--	--	--	--	--
	0.083	0.27	318086	T/2	L	66 100	41 600	21.0	44 000	--	98 400	121 200	74 000	87 600	--	--	--	--
					LT	67 100	42 400	18.0‡‡	43 900	--	--	--	--	--	--	--	--	--
	0.430	2.1	340241§	T/2	L	72 400	48 200	18.5	49 400	38 800	100 800	125 000	70 600	86 600	--	--	--	--
					LT	72 100	47 700	21.0	50 600	38 000	--	--	--	--	--	--	--	--
	0.500	0.64	340243	T/2	L	79 800	54 800	17.5	55 200	39 400	107 500	128 800	73 800	90 200	--	--	--	--
					LT	71 600	47 800	18.0	--	--	--	--	--	--	--	--	--	--
	2.562	6.4	340245	T/4,W/4	L	82 100	58 500	15.5	58 700	40 900	106 800	134 500	76 000	91 800	104 300	130 300	72 800	89 800
					LT	69 700	47 400	14.1	50 000	--	--	--	--	--	--	--	--	--
				T/2,W/2	L	80 900	56 500	15.5	57 100	39 100	104 300	130 500	73 200	86 900	98 300	126 300	72 700	84 700
					LT	61 300	45 300	6.5	47 600	38 500	--	--	--	--	--	--	--	--
					ST	64 000	44 000	8.5	47 300	41 700	--	--	--	--	--	--	--	--
2024-T62	0.064	0.27	318089§	T/2	L	65 700	54 900	7.5	54 100	--	107 500	132 200	86 900	102 500	--	--	--	--
					LT	69 500	55 200	11.0‡‡	57 900	--	--	--	--	--	--	--	--	--
	0.083	0.27	318087	T/2	L	66 900	55 900	7.0	60 000	--	109 300	135 400	94 100	111 700	--	--	--	--
					LT	68 800	54 600	9.0‡‡	57 500	--	--	--	--	--	--	--	--	--
	0.430	2.1	340242§	T/2	L	68 300	57 700	12.0	62 200	38 700	100 900	130 600	81 700	99 300	--	--	--	--
					LT	67 700	57 700	12.0	61 000	37 600	--	--	--	--	--	--	--	--
	0.500	0.64	340244	T/2	L	71 800	59 300	11.0	61 400	40 000	102 800	134 100	82 300	100 000	--	--	--	--
					LT	68 100	58 000	9.0	--	--	--	--	--	--	--	--	--	--
	2.562	6.4	340246	T/4,W/4	L	71 200	58 100	10.5	59 500	40 000	101 400	131 900	82 900	101 700	96 800	127 400	81 500	100 600
					LT	66 100	55 300	7.0	58 400	--	--	--	--	--	--	--	--	--
				T/2,W/2	L	67 800	53 600	10.5	56 200	38 300	95 800	125 000	80 500	99 400	96 900	120 200	82 200	95 500
					LT	62 000	51 500	6.5	53 700	36 500	--	--	--	--	--	--	--	--
					ST	63 000	52 700	6.0	55 600	38 400	--	--	--	--	--	--	--	--

* T - Thickness; W - Width
† L - Longitudinal; LT - Long-Transverse; ST - Short-Transverse
‡ Offset equals 0.2 per cent
§ Producer B; all others from Producer A
**Specimens and Fixtures cleaned ultrasonically in Toson 3 solvent
††Offset equals 2 per cent of pin diameter
‡‡Subsize sheet-type specimen; 1/8-in. wide; 1/2-in. gage length

Continued

TABLE X

TABLE X (Concluded)

MECHANICAL PROPERTIES OF EXTRUSIONS IN THE "HEAT-TREATED-BY USER" TEMPER
AF33(615)-3580

Alloy and Temper	Sample: Section Thickness, in.	Sample: Cross-Sectional Area, in.²	Number	Location*	Direction†	Tensile Ultimate Stress, psi	Tensile Yield Stress,‡ psi	Elongation in 2 in. or 4D, %	Comp. Yield Stress,‡ psi	Shear Ultimate Stress psi	Bearing**: Flatwise: Ultimate Stress psi e/D=1.5	Bearing**: Flatwise: Ultimate Stress psi e/D=2.0	Bearing**: Flatwise: Yield Stress,†† psi e/D=1.5	Bearing**: Flatwise: Yield Stress,†† psi e/D=2.0	Bearing**: Edgewise: Ultimate Stress, psi e/D=1.5	Bearing**: Edgewise: Ultimate Stress, psi e/D=2.0	Bearing**: Edgewise: Yield Stress,†† psi e/D=1.5	Bearing**: Edgewise: Yield Stress,†† psi e/D=2.0
6061-T62	0.246	4.6	318090	T/2	L	48 000	43 800	15.5	45 100	35 300	80 200	104 000	69 400	80 500	--	--	--	--
					LT	46 100	41 500	18.5	44 000	35 200	82 400	105 200	73 800	85 400	--	--	--	--
	1.625	3.9	418091	T/4,W/4	L	46 100	41 200	18.0	42 500	32 200	75 900	98 000	67 500	77 700	--	--	--	--
					LT	45 000	39 400	14.0	--	--	--	--	--	--	--	--	--	--
				T/2,W/2	L	45 900	41 500	19.0	42 700	32 700	76 300	96 300	69 200	76 700	74 600	95 500	67 800	75 300
					LT	45 600	40 300	15.0	43 200	31 200	--	--	--	--	--	--	--	--
7075-T62	0.063	0.34	318094§	T/2	L	80 700	70 500	11.0	74 900	--	118 000	152 200	96 900	118 600	--	--	--	--
					LT	79 200	70 000	13.0‡‡	76 700	--	--	--	--	--	--	--	--	--
	0.126	0.17	318092	T/2	L	91 300	83 200	10.0	88 400	--	--	--	--	--	--	--	--	--
	0.300	1.7	318096	T/2	L	91 000	81 500	13.0	85 900	48 700	124 000	158 500	106 600	125 700	--	--	--	--
					LT	84 800	76 000	9.4	83 900	47 600	--	--	--	--	--	--	--	--
	1.225	21.2	318098§	T/2,W/4	L	87 100	78 000	10.5	81 800	48 200	124 900	153 200	110 200	124 000	109 600	144 300	105 700	127 200
					LT	81 000	72 400	7.0	79 300	46 500	--	--	--	--	--	--	--	--
				T/2,W/2	L	84 600	75 100	11.5	78 500	47 500	124 000	156 800	107 900	125 000	111 800	144 900	107 000	127 200
					LT	80 000	71 400	8.0	77 000	46 100	123 200	151 100	107 300	127 800	107 600	137 000	101 300	126 600
	2.250	4.1	318100	D/4	L	92 700	85 100	10.5	86 000	48 800	122 200	152 800	106 500	125 000	125 000	154 400	106 300	127 200
				D/2	L	89 300	81 900	9.5	83 600	47 100	120 300	149 100	103 800	122 200	--	--	--	--
					LT	76 700	66 100	7.8	72 400	46 300	--	--	--	--	--	--	--	--
7075-T73X	0.063	0.34	318095§	T/2	L	71 300	61 300	10.5	63 100	--	106 800	139 100	87 000	106 800	--	--	--	--
					LT	70 500	59 000	11.0‡‡	64 800	--	--	--	--	--	--	--	--	--
	0.126	0.17	318093	T/2	L	87 800	78 600	10.0	76 000	--	--	--	--	--	--	--	--	--
	0.300	1.7	318097	T/2	L	76 800	67 000	12.0	71 800	43 700	122 700	145 500	93 200	113 100	--	--	--	--
					LT	74 300	64 300	11.7	68 300	42 200	--	--	--	--	--	--	--	--
	1.225	21.2	318099§	T/2,W/4	L	78 400	69 600	10.0	73 500	44 700	113 100	148 000	98 900	119 300	97 500	138 800	94 900	115 000
					LT	73 600	65 800	7.5	70 900	43 300	--	--	--	--	--	--	--	--
				T/2,W/2	L	76 200	66 700	10.5	70 200	43 800	114 200	144 900	98 000	117 200	100 600	131 600	97 500	115 800
					LT	73 100	64 900	9.0	68 900	42 400	114 100	144 900	95 300	115 100	101 900	132 200	94 400	114 400
	2.250	4.1	318101	D/4	L	79 800	72 700	11.5	73 800	45 300	118 800	150 600	98 000	118 000	115 200	145 900	96 800	116 500
				D/2	L	75 100	67 300	11.0	69 500	42 100	119 900	142 400	93 800	110 900	--	--	--	--
					LT	69 800	59 900	8.6	63 400	42 900	--	--	--	--	--	--	--	--
7178-T62	0.050	0.15	340247	T/2	L	96 700	88 600	11.5	91 200	--	135 400	166 100	117 300	133 900	--	--	--	--
					LT	95 800	88 100	10.0‡‡	--	--	--	--	--	--	--	--	--	--
	0.051	0.20	318102§	T/2	L	96 400	89 700	7.5	97 700	--	138 400	167 900	125 900	147 000	--	--	--	--
	0.403	3.0	340249	T/2	L	98 200	89 900	10.5	92 800	51 900	134 100	167 900	116 500	136 400	--	--	--	--
					LT	93 900	83 100	14.0‡‡‡	93 800	50 300	141 500	164 800	120 800	149 900	--	--	--	--

* T - Thickness; W - Width , D - Diameter
† L - Longitudinal; LT - Long-Transverse; ST - Short-Transverse
‡ Offset equals 0.2 per cent
§ Producer B; all others from Producer A
**Specimens and Fixtures cleaned ultrasonically in Tosco 3 solvent
††Offset equals 2 per cent of pin diameter
‡‡Subsize sheet-type specimen; 1/2-in. wide; 1/2-in. gage length
‡‡‡Subsize sheet-type specimen; 1/4-in. wide; 1-in. gage length

(Concluded)

TABLE X (Concluded)

TABLE XI

SPECIFIED MINIMUM VALUES* FOR ALUMINUM ALLOY EXTRUSIONS
[AF33(615)-3580]

Alloy and Temper	Thickness, in.	Area, sq. in.	Tensile Ultimate Stress, psi	Tensile Yield Stress,† psi	Tensile Elongation 2 in. or 4D, %	Federal Specification
2014-T62	≤0.749	All	60 000	53 000	7	QQ-A-200/2b
-T6510	≤0.499	All	60 000	53 000	7	
	0.500-0.749	All	64 000	58 000	7	
	≥0.750	≤25	68 000	60 000	7	
2024-T3510, -T3511	≤0.249	All	57 000	42 000	12	QQ-A-200/3b
	0.250-0.749	All	60 000	44 000	12	
	0.750-1.499	All	65 000	46 000	10	
	≥1.500	≤25	70 000	52 000	10	
	≥1.500	>25, ≤32	68 000	48 000	8	
-T42	≤0.749	All	57 000	38 000	12	
	≥1.500	≤25	57 000	38 000	10	
-T6510, -T6511	0.050-0.249	All	64 000	56 000	4	
	0.250-1.499	All	66 000	58 000	5	
	≥1.500	≤32	66 000	58 000	5	
-T62	≤0.749	-	--	--	-	None
	≥1.500	-	--	--	-	
6061-T62♦, -T6510	≤0.249	All	38 000	35 000	8**	QQ-A-200/8b
	≥0.250	All	38 000	35 000	10	
7075-T62♦, -T6510	≤0.249	All	78 000	70 000	7	QQ-A-200/11b
	0.250-0.499	All	81 000	73 000	7	
	0.500-2.999	All	81 000	72 000	7	
	3.000-4.499	≤20	81 000	71 000	7	
	3.000-4.499	>20, 32	78 000	70 000	6	
	4.500-5.000	≤32	78 000	68 000	6	
-T73X,†† -T73510	≤0.249	-	--	--	-	None
	0.250-0.499	-	--	--	-	
	0.500-1.499	-	--	--	-	
	1.500-2.999	-	--	--	-	
	3.000-4.499	-	--	--	-	
	4.500-5.000	-	--	--	-	
7079-T62,♦ -T6510	≤0.249	≤20	75 000	67 000	7	QQ-A-200/12b
	0.250-0.499	≤20	77 000	68 000	7	
	0.500-1.499	≤20	78 000	70 000	7	
7178-T62♦	≤0.061	≤20	79 000**	73 000**	5	QQ-A-200/13
	0.250-1.499	≤20	82 000**	74 000**	5	
-T6510	0.062-0.249	≤20	84 000**	76 000**	5	
	0.250-1.499	≤25	87 000**	78 000**	5	
	1.500-2.499	≤25	86 000	77 000**	5	

* All values are as shown in the Aluminum Association Booklet, "Standards for Aluminum Mill Products," 1967.

† Offset equals 0.2 per cent.

♦ In QQ-A-200/8b, 11b, 12b and 13, values for T6 temper apply also for extrusions heat treated and aged by user (T62 temper).

** Lower than in Federal specifications.

†† "T73X" signifies T73-type temper for 7075 when heat treated and aged by user. Standard designation not yet assigned.

TABLE XII

RATIOS AMONG THE TENSILE, COMPRESSIVE AND SHEAR PROPERTIES
OF STRESS-RELIEVED STRETCHED 2014-T6510 ALUMINUM ALLOY EXTRUSIONS
[AF33(615)-3580]

Section Thickness, in.	Sample Cross-Sectional Area, in.^{2}	Number	Location*	TUS(LT)/TUS(L)	TUS(ST)/TUS(L)	TYS(LT)/TYS(L)	TYS(ST)/TYS(L)	CYS(L)/TYS(L)	CYS(LT)/TYS(L)	CYS(ST)/TYS(L)	SU(L)/TUS(L)	SU(LT)/TUS(L)	SU(ST)/TUS(L)
0.061	0.30	317950	T/2	1.11	--	1.10	--	1.04	--	--	--	--	--
0.070	0.24	318017†	T/2	--	--	--	--	1.01	--	--	--	--	--
0.077	0.16	317951	T/2	--	--	--	--	1.01	--	--	--	--	--
0.245	0.45	318130†	T/2	--	--	--	--	1.01	--	--	--	--	--
0.250	3.7	340154	T/2	1.06	--	1.03	--	1.03	1.12	--	0.69	--	--
0.271	0.40	317994	T/2	1.06	--	1.01	--	0.99	--	--	0.71	0.70	--
											0.70	--	--
0.625	0.50	317952	T/2	--	--	--	--	0.97	--	--	0.68	--	--
0.625	0.55	340291	T/2	--	--	--	--	0.95	--	--	0.54	--	--
0.750	1.4	317924	T/2	0.92	--	0.89	--	1.03	0.96	--	0.56	--	--
1.657	2.2	318046	D/4	--	--	--	--	1.03	--	--	0.57	--	--
			D/2	0.92	--	0.91	--	1.03	--	--	0.57	--	--

* T - Thickness; W - Width; D - Diameter

† Producer B; all others from Producer A

TABLE XIII

RATIOS AMONG THE TENSILE, COMPRESSIVE AND SHEAR PROPERTIES OF STRESS-RELIEVED STRETCHED 2024-T3510 ALUMINUM ALLOY EXTRUSIONS

[AF33(615)-3580]

Section Thickness, in.	Sample Cross-Sectional Area, in.²	Number	Location*	TUS(LT)/TUS(L)	TUS(ST)/TUS(L)	TYS(LT)/TYS(L)	TYS(ST)/TYS(L)	CYS(L)/TYS(L)	CYS(LT)/TYS(L)	CYS(ST)/TYS(L)	SU(L)/TUS(L)	SU(LT)/TUS(L)	SU(ST)/TUS(L)
0.075	0.70	318132†	T/2	1.07	--	0.91	--	0.85	1.09	--	--	--	--
0.094	0.30	318019†	T/2	--	--	--	--	1.10	--	--	--	--	--
0.101	0.33	317885	T/2	--	--	--	--	0.85		--	--	--	--
0.106	0.31	317904	T/2	--	--	--	--	0.81	--	--	--	--	--
0.120	0.27	318018†◊	T/2	--	--	--	--	0.83	--	--	--	--	--
0.151	0.82	317886	T/2	0.97	--	0.92	--	0.83	1.01	--	--	--	--
0.255	2.8	317942	T/2	0.96	--	0.90	--	0.84	0.97	--	0.54	0.53	--
0.258	4.2	318047	T/2	0.94	--	0.89	--	0.87	0.95	--	0.54	0.53	--
0.375	0.62	317943	T/2	0.90	--	0.79	--	0.76	--	--	0.65	--	--
0.510	10.1	317926	T/2,W/2	0.86	--	0.85	--	0.88	0.92	--	0.54	0.53	--
0.525	1.9	318020†	T/2,W/4	0.98	--	0.88	--	0.81	--	--	0.67	--	--
			T/2,W/2	1.01	--	0.90	--	0.83	0.98	--	0.66	0.67	--
0.560	1.9	317856	T/2,W/4	0.91	--	0.85	--	0.87	0.93	--	0.52	0.50	--
0.642	5.8	317945	T/2,W/4	0.84	--	0.79	--	0.85	0.92	--	0.52	0.51	--
0.815	3.9	340418†	T/2,W/4	0.87	--	0.83	--	0.94	0.89	--	0.52	--	--
			T/2,W/2	0.91	--	0.87	--	0.89	0.91	--	0.53	0.49	--
0.950	4.6	317944	T/2,W/4	0.86	--	0.83	--	0.90	0.89	--	0.49	--	--
1.150	5.6	318077	T/2,W/4	0.87	--	0.85	--	0.90	0.90	--	0.50	--	--
			T/2,W/2	0.91	--	0.86	--	0.88	0.92	--	0.53	0.50	--
1.200	3.9	317946	T/2,W/2	0.84	--	0.78	--	0.91	0.86	--	0.50	--	--
1.450	7.3	318021†◊	T/2,W/4	0.85	--	0.79	--	0.93	0.84	--	0.50	--	--
			T/2,W/2	0.86	--	0.81	--	0.93	0.87	--	0.50	0.49	--
1.705	4.8	340213	T/4,W/4	0.85	--	0.78	--	0.95	--	--	0.49	--	--
			T/2,W/2	0.84	--	0.80	--	0.98	0.85	--	0.48	0.47	--
2.520	8.8	318135†	T/4,W/4	0.83	--	0.75	--	0.96	0.81	--	0.48	--	--
			T/2,W/2	0.83	0.81	0.76	0.71	0.96	0.81	0.79	0.48	0.47	0.52
4.000	24.0	340214	T/4,W/4	0.81	--	0.77	--	0.93	0.83	--	0.48	0.46	--
			T/2,W/2	0.80	0.77	0.79	0.71	0.94	0.84	0.82	0.48	0.47	0.51
2.760	29.6	318046	T/4,W/4	0.76	--	0.74	--	0.93	0.81	--	0.53	0.48	--
			T/2,W/2	0.79	0.77	0.80	0.72	0.93	0.84	0.81	0.51	0.49	0.51
4.500	30.7	340388	T/4,W/4	0.81	--	0.75	--	0.97	0.81	--	0.49	0.47	--
			T/2,W/2	0.83	0.78	0.82	0.71	0.95	0.85	0.83	0.50	0.47	0.51

* T - Thickness; W - Width
† Producer B; all others from Producer A
◊ Samples were in the T3511 temper

TABLE XIV

RATIOS AMONG THE TENSILE, COMPRESSIVE AND SHEAR PROPERTIES
OF STRESS-RELIEVED STRETCHED 2024-T8510 ALUMINUM ALLOY EXTRUSIONS

[AF33(615)-3580]

Section Thickness, in.	Sample Cross-Sectional Area, in.²	Number	Location*	TUS(LT)/TUS(L)	TUS(ST)/TUS(L)	TYS(LT)/TYS(L)	TYS(ST)/TYS(L)	CYS(L)/TYS(L)	CYS(LT)/TYS(L)	CYS(ST)/TYS(L)	SU(L)/TUS(L)	SU(LT)/TUS(L)	SU(ST)/TUS(L)
0.075	0.70	318022†	T/2	1.07	--	1.02	--	1.02	1.07	--	--	--	--
0.094	0.30	318134†	T/2	--	--	--	--	0.95	--	--	--	--	--
0.101	0.33	317887	T/2	--	--	--	--	1.02	--	--	--	--	--
0.106	0.31	317883	T/2	--	--	--	--	1.01	--	--	--	--	--
0.120	0.27	318023†	T/2	--	--	--	--	1.00	--	--	--	--	--
0.151	0.82	317889	T/2	1.05	--	1.05	--	1.05	1.04	--	--	--	--
0.255	2.8	317880	T/2	0.99	--	1.02	--	1.06	1.04	--	0.57	0.55	--
0.258	4.2	318082	T/2	0.99	--	1.02	--	1.07	1.05	--	0.58	0.57	--
0.375	0.62	317891	T/2	0.97	--	0.95	--	0.97	--	--	0.62	--	--
0.510	10.1	317892	T/2,W/2	0.97	--	1.00	--	1.06	1.05	--	0.57	0.56	--
0.585	1.9	318024†	T/2,W/4	0.98	--	0.99	--	1.03	--	--	0.63	--	--
			T/2,W/2	0.99	--	1.01	--	1.05	1.00	--	0.57	0.57	--
0.650	1.9	317922	T/2,W/4	0.97	--	0.98	--	1.04	1.03	--	0.56	0.56	--
0.642	5.8	317894	T/2,W/4	0.95	--	0.98	--	1.02	1.02	--	0.55	0.53	--
0.815	3.9	340419†	T/2,W/4	0.98	--	1.01	--	1.04	1.03	--	0.55	--	--
			T/2,W/2	0.99	--	1.03	--	1.05	1.04	--	0.55	0.54	--
0.950	4.6	317893	T/2,W/4	0.95	--	0.96	--	0.98	0.99	--	0.57	--	--
1.150	5.6	318078	T/2,W/4	0.97	--	1.02	--	1.04	1.05	--	0.56	--	--
			T/2,W/2	0.99	--	1.03	--	1.06	1.04	--	0.57	0.56	--
1.200	3.9	317895	T/2,W/4	0.96	--	0.98	--	1.03	1.03	--	0.56	--	--
1.450	7.3	318025†§	T/2,W/4	0.94	--	0.98	--	1.02	1.00	--	0.56	--	--
			T/2,W/2	0.96	--	0.97	--	1.02	1.00	--	0.56	0.55	--
1.700	4.8	340169	T/4,W/4	0.99	--	1.00	--	1.04	--	--	0.56	--	--
			T/2,W/2	0.97	--	0.98	--	1.00	1.01	--	0.54	0.53	--
2.520	8.3	340420†	T/4,W/4	0.99	--	1.03	--	1.04	1.05	--	0.56	0.54	--
			T/2,W/2	0.97	0.97	1.01	0.99	1.04	1.04	1.05	0.55	0.56	--
2.760	29.6	318079	T/4,W/4	0.92	--	0.96	--	1.02	1.02	--	0.58	0.56	--
			T/2,W/2	0.94	0.91	0.98	0.94	1.01	1.01	1.02	0.58	0.59	0.56
4.000	24.0	340225	T/4,W/4	0.97	--	1.00	--	1.02	1.02	--	0.56	0.53	--
			T/2,W/2	0.97	0.93	1.00	0.96	1.01	1.01	1.03	0.56	0.53	0.54
4.500	30.7	340389	T/4,W/4	0.97	--	0.99	--	1.02	1.02	--	0.57	0.54	--
			T/2,W/2	0.99	0.97	1.03	0.99	1.01	1.02	1.05	0.57	0.56	0.57

* T - Thickness; W - Width
† Producer B; all others from Producer A
§ Sample was in the T8511 temper

TABLE XV

RATIOS AMONG THE TENSILE, COMPRESSIVE AND SHEAR PROPERTIES OF STRESS-RELIEVED STRETCHED 6061-T6510 ALUMINUM ALLOY EXTRUSIONS

AF33(615)-3580

Section Thickness, in.	Sample Cross-Sectional Area, in.²	Number	Location*	TYS(LT)/TYS(L)	TYS(ST)/TYS(L)	TYS(LT)/TYS(L)	TYS(ST)/TYS(L)	CYS(L)/TYS(L)	CYS(LT)/TYS(L)	CYS(ST)/TYS(L)	SU(L)/TYS(L)	SU(LT)/TYS(L)	SU(ST)/TYS(L)
0.050	0.42	318136†	T/2	--	--	--	--	0.98	--	--	--	--	--
0.075	0.59	317857	T/2	0.98	--	0.95	--	1.02	0.99	--	--	--	--
0.090	0.27	318027†	T/2	--	--	--	--	0.98	--	--	--	--	--
0.125	0.61	317846	T/2	0.97	--	0.93	--	1.00	1.00	--	--	--	--
0.126	0.30	317847	T/2	--	--	--	--	1.00	--	--	0.72	--	--
0.245	1.1	340421†	T/2	1.00	--	0.96	--	0.98	1.07	--	0.77	0.78	--
0.250	0.36	317848	T/2	--	--	--	--	1.01	--	--	0.72	--	--
0.254	0.97	340422†	T/2	1.07	--	1.01	--	1.01	1.10	--	0.73	0.72	--
0.310	6.3	317905	T/2	1.03	--	1.00	--	0.98	1.04	--	0.65	0.64	--
0.315	5.8	317953	T/2	0.98	--	0.95	--	1.00	1.00	--	0.76	0.74	--
0.375	8.6	317927	T/2	0.99	--	0.95	--	0.99	1.00	--	0.80	0.79	--
0.375	7.7	318083	T/2	0.94	--	0.93	--	0.98	0.99	--	0.76	0.73	--
0.918	1.3	317906	T/2,W/2	0.99	--	0.98	--	1.00	1.04	--	0.72	--	--
1.004	2.0	340423†	T/2,W/4	--	--	--	--	0.95	--	--	0.69	--	--
			T/2,W/2	1.04	--	0.97	--	0.97	1.06	--	0.71	0.67	--
1.240	2.7	317907	T/2,W/4	--	--	--	--	1.04	--	--	0.60	--	--
			T/2,W/2	0.89	--	0.86	--	1.01	0.94	--	0.58	--	--
1.960	4.4	317896	T/2,W/4	--	--	--	--	1.00	--	--	0.57	--	--
			T/2,W/2	0.87	--	0.83	--	1.01	0.91	--	0.56	--	--
3.000	15.0	340226	T/4,W/4	0.90	--	0.86	--	1.00	0.93	--	0.53	0.52	--
			T/2,W/2	0.90	0.91	0.90	0.84	1.00	0.93	0.92	0.53	0.52	0.55
6.500	33.2	317897	D/4	0.87	--	0.82	--	1.00	0.88	--	0.52	0.52	--
			D/2	0.86	--	0.81	--	1.00	0.87	--	0.53	0.52	--

* T - Thickness; W - Width; D - Diameter
† Producer B; all others from Producer A

TABLE XVI

RATIOS AMONG THE TENSILE, COMPRESSIVE AND SHEAR PROPERTIES OF STRESS-RELIEVED STRETCHED 7075-T6510 ALUMINUM ALLOY EXTRUSIONS

(AF33(615)-3580)

Thickness, in.	Sample Cross-Sectional Area, in.²	Number	Location*	$\frac{TCS(L)}{TUS(L)}$	$\frac{TCS(ST)}{TUS(L)}$	$\frac{TYS(L)}{TYS(L)}$	$\frac{TYS(ST)}{TYS(L)}$	$\frac{CYS(L)}{TYS(L)}$	$\frac{CYS(ST)}{TYS(L)}$	$\frac{CYS(ST)}{TYS(L)}$	$\frac{SU(L)}{TUS(L)}$	$\frac{SU(L)}{TUS(L)}$	$\frac{SU(ST)}{TUS(L)}$
0.065	0.18	317889	T/2	--	--	--	--	0.95	--	--	--	--	--
0.065	0.27	318031†	T/2	0.97	--	0.96	--	0.99	1.00	--	--	--	--
0.080	0.18	317858	T/2	--	--	--	--	0.98	--	--	--	--	--
0.133	0.97	318029†	T/2	0.98	--	0.96	--	1.01	1.03	--	--	--	--
0.160	0.26	318030†	T/2	--	--	--	--	1.04	--	--	--	--	--
0.209	1.2	340403	T/2	0.98	--	0.97	--	1.07	1.10	--	0.56	0.53	--
0.260	1.2	318028†	T/2	0.98	--	0.96	--	1.01	--	--	0.57	--	--
0.313	0.51	317908	T/2	--	--	--	--	1.03	--	--	0.55	--	--
0.325	2.4	340437	T/2	1.01	--	0.99	--	1.00	1.05	--	0.54	0.53	--
0.375	2.2	317954	T/2	0.95	--	0.92	--	0.98	1.01	--	0.55	0.54	--
0.438	7.2	317859	T/2	0.93	--	0.97	--	1.00	1.07	--	0.57	0.55	--
0.463	1.9	318032†	T/2	0.94	--	0.93	--	1.02	1.02	--	0.56	0.54	--
0.935	7.2	340155	T/2,W/4	0.93	--	0.93	--	0.98	0.99	--	0.54	0.52	--
			T/2,W/2	0.96	--	0.95	--	0.97	1.00	--	0.54	0.53	--
1.023	1.8	318033†	T/2,W/4	--	--	--	--	1.02	--	--	0.53	--	--
1.188	27.1	317860	T/2,W/4	0.97	--	0.96	--	1.00	1.02	--	0.59	0.56	--
			T/2,W/2	0.96	--	0.96	--	0.99	1.03	--	0.57	0.56	--
1.500	1.8	317955	D/2	0.83	--	0.78	--	1.01	--	--	0.51	--	--
2.000	3.1	317861	D/4	--	--	--	--	1.00	--	--	0.53	--	--
			D/2	0.85	--	0.82	--	1.01	0.89	--	0.52	--	--
2.190	17.0	318137†	T/4,W/4	0.89	--	0.91	--	1.00	1.01	--	0.55	0.54	--
			T/2,W/2	0.93	0.86	0.94	0.84	0.99	1.00	0.98	0.53	0.51	--
2.750	8.2	340404	T/4,W/4	0.88	--	0.84	--	1.02	0.93	--	0.53	0.52	--
			T/2,W/2	0.88	0.88	0.85	0.83	1.02	0.93	0.92	0.53	0.52	0.55
3.040	13.8	318138†	T/4,W/4	0.88	--	0.85	--	1.02	0.93	--	0.53	--	--
			T/2,W/2	0.89	0.87	0.87	0.82	1.01	0.95	0.92	0.54	0.52	0.52
3.090	24.3	340391	T/4,W/4	0.93	--	0.91	--	1.00	0.98	--	0.54	0.51	--
			T/2,W/2	0.92	0.89	0.91	0.84	0.99	0.98	0.96	0.53	0.52	0.53

* T - Thickness; W - Width, D - Diameter

† Producer B; all others from Producer A

TABLE XVII

RATIOS AMONG THE TENSILE, COMPRESSIVE AND SHEAR PROPERTIES OF STRESS-RELIEVED STRETCHED 7075-T73510 ALUMINUM ALLOY EXTRUSIONS

[AF33(615)-3580]

Thickness, in.	Sample Cross-Sectional Area, in.²	Number	Location*	TYS(LT)/TUS(L)	TYS(ST)/TUS(L)	TYS(LT)/TYS(L)	TYS(ST)/TYS(L)	CYS(L)/TYS(L)	CYS(LT)/TYS(L)	CYS(ST)/TYS(L)	SU(L)/TYS(L)	SU(LT)/TUS(L)	SU(ST)/TUS(L)
0.080	0.18	317862	T/2	--	--	--	--	1.00	--	--	--	--	--
0.209		340393	T/2	0.97	--	0.98	--	1.04	1.03	--	0.56	0.54	--
0.313	0.51	317909	T/2	--	--	--	--	1.05	--	--	0.67	--	--
0.325	2.4	340438	T/2	1.01	--	1.02	--	1.01	1.06	--	0.56	0.54	--
0.375	2.2	317900	T/2	0.97	--	0.97	--	1.02	1.04	--	0.59	0.57	--
0.438	7.2	317910	T/2	0.99	--	1.00	--	1.03	1.06	--	0.58	0.57	--
0.935	7.2	340292	T/2,W/4	0.97	--	0.96	--	1.00	1.02	--	0.56	0.56	--
			T/2,W/2	0.98	--	0.97	--	1.00	1.02	--	0.56	0.55	--
1.000	5.1	340439	T/2,W/4	0.96	--	0.94	--	1.00	0.99	--	0.58	0.56	--
			T/2,W/2	0.98	--	0.97	--	1.00	1.00	--	0.58	0.56	--
.500	1.8	317956	D/2	0.90	--	0.85	--	1.02	--	--	0.56	--	--
1.000	3.1	317948	D/4	--	--	--	--	1.02	--	--	0.56	--	--
			D/2	0.90	--	0.86	--	1.02	0.93	--	0.56	--	--
2.750	8.2	340440	T/4,W/4	0.93	--	0.90	--	1.01	0.95	--	0.57	0.54	--
			T/2,W/2	0.92	0.97	0.89	0.89	1.01	0.95	0.95	0.57	0.55	0.55

* T - Thickness; W - Width, D - Diameter

TABLE XVIII

RATIOS AMONG THE TENSILE, COMPRESSIVE AND SHEAR PROPERTIES OF STRESS-RELIEVED STRETCHED 7079-T6510 ALUMINUM ALLOY EXTRUSIONS

[AF33(615)-3580]

Section Thickness, in.	Sample Cross-Sectional Area, in.²	Number	Location*	TYS(LT)/TUS(L)	TUS(ST)/TUS(L)	TYS(LT)/TYS(L)	TYS(ST)/TYS(L)	CYS(L)/TYS(L)	CYS(LT)/TYS(L)	CYS(ST)/TYS(L)	SU(L)/TUS(L)	SU(LT)/TUS(L)	SU(ST)/TUS(L)
0.080	0.15	340405	T/2	--	--	--	--	0.99	--	--	--	--	--
0.146	1.1	340406	T/2	1.00	--	0.97	--	0.99	1.06	--	--	--	--
0.161	0.72	340252	T/2	0.97	--	0.95	--	0.99	1.06	--	--	--	--
0.251	0.82	340253	T/2	0.95	--	0.92	--	1.01	1.01	--	0.56	0.55	--
0.500	4.2	340424†	T/2,W/4	0.96	--	0.94	--	1.00	1.04	--	0.54	0.53	--
			T/2,W/2	0.98	--	0.96	--	1.01	1.02	--	0.55	0.54	--

* T - Thickness, W - Width

† Producer B; all others f. - Producer A

TABLE XIX

RATIOS AMONG THE TENSILE, COMPRESSIVE AND SHEAR PROPERTIES OF STRESS-RELIEVED STRETCHED 7178-T6510 ALUMINUM ALLOY EXTRUSIONS

[AF33(615)-3580]

Section Thickness, in.	Sample Cross-Sectional Area, $in.^2$	Number	Location*	TYS(LT)/TYS(L)	TYS(ST)/TYS(L)	TYS(LT)/TYS(L)	TYS(ST)/TYS(L)	CYS(L)/TYS(L)	CYS(LT)/TYS(L)	CYS(ST)/TYS(L)	SU(L)/TYS(L)	SU(LT)/TYS(L)	SU(ST)/TYS(L)
0.063	0.37	317902	T/2	0.99	--	0.97	--	1.01	1.04	--	--	--	--
0.066	0.35	340426†	T/2	1.00	--	0.99	--	1.00	1.08	--	--	--	--
0.142	1.0	318016	T/2	0.99	--	0.96	--	0.97	1.06	--	--	--	--
0.154	0.42	318035†	T/2	--	--	--	--	1.06	--	--	--	--	--
0.162	0.49	317905	T/2	--	--	--	--	0.98	--	--	--	--	--
0.162	1.1	340425†	T/2	0.95	--	0.94	--	0.95	1.02	--	--	--	--
0.180	4.6	340395	T/2	1.02	--	1.02	--	0.99		--	--	--	--
0.261	0.60	340427†	T/2	0.94	--	0.92	--	1.03	--	--	0.56	--	--
0.265	0.88	317996	T/2	--	--	--	--	1.00	--	--	0.54	--	--
0.625	6.9	317997	T/2,W/4	0.97	--	0.94	--	0.98	1.01	--	0.55	0.53	--
			T/2,W/2	0.97	--	0.94	--	0.98	1.02	--	0.56	0.54	--
0.780	1.7	340254	T/2,W/2	0.90	--	0.86	--	1.01	--	--	0.51	--	--
1.200	3.9	318139†	T/2,W/4	0.91	--	0.89	--	1.02	--	--	0.53	--	--
			T/2,W/2	0.92	--	0.90	--	1.02	0.99	--	0.54	0.53	--
1.438	6.4	317957	T/2	0.84	--	0.81	--	1.02	--	--	0.55	--	--
2.180	15.5	318140†	T/4,W/4	0.91	--	0.90	--	1.00	0.99	--	0.54	0.51	--
			T/2,W/2	0.93	0.86	0.92	0.84	1.01	1.00	0.97	0.53	0.50	--

* T - Thickness; W - Width

† Producer B; all others from Producer A

TABLE XX

RATIOS AMONG THE TENSILE, COMPRESSIVE AND SHEAR PROPERTIES OF ALUMINUM ALLOY EXTRUSIONS IN THE "HEAT-TREATED-BY-USER" TEMPERS

[AF33(615)-3580]

Alloy and Temper	Sample Section Thickness, in.	Sample Cross-Sectional Area, in.²	Number	Location*	TYS(LT)/TYS(L)	TYS(ST)/TYS(L)	TYS(-)/TYS(L)	TYS(ST)/TYS(L)	CYS(L)/TYS(L)	CYS(LT)/TYS(L)	CYS(ST)/TYS(L)	SU(L)/TUS(L)	SU(LT)/TUS(L)	SU(ST)/TUS(L)
2014-T62	0.300	6.3	318084	T/2	1.01	—	0.94	—	1.04	1.08	—	0.56	0.56	--
	0.499	1.4	318085	T/2	0.98	—	0.98	—	1.06	1.03	--	0.69	--	--
2024-T42	0.064	0.27	318088†	T/2	1.06	—	0.98	—	1.01	1.07	--	--	--	--
	0.083	0.27	318086	T/2	1.02	—	1.02	—	1.06	1.06	--	--	--	--
	0.430	2.1	340241†	T/2	1.00	—	0.99	—			—	0.54	0.52	—
	0.500	0.64	340243	T/2	0.90	—	0.87	—	1.01	--	--	0.49	--	--
	2.562	6.4	340245	T/4,W/4	0.85	--	0.81	--	1.00	0.85	--	0.50	--	--
				T/2,W/2	0.76	0.79	0.80	0.78	1.01	0.84	0.84	0.48	0.48	0.52
2024-T62	0.064	0.27	318089†	T/2	1.06	—	1.01	—	0.99	1.05	--	--	--	--
	0.083	0.27	318087	T/2	1.03	—	0.98	—	1.07	1.03	--	--	--	--
	0.430	2.1	340242†	T/2	0.96	—	1.00	—			--	0.57	0.56	--
	0.500	0.64	340244	T/2	0.96	--	0.98	—	1.04	--	--	0.56	--	--
	2.562	6.4	340246	T/4,W/4	0.93	--	0.95	—	1.02	1.01	--	0.56	--	--
				T/2,W/2	0.91	0.93	0.96	0.98	1.04	1.00	1.03	0.56	0.54	0.57
6061-T62	0.246	4.6	318090	T/2	0.96	—	0.95	—	1.03	1.00	--	0.74	0.73	--
	1.625	3.9	318091	T/4,W/4	0.98	—	0.96	—	1.03	--	--	0.70	--	--
				T/2,W/2	0.99	—	0.97	—	1.03	1.04	--	0.71	0.68	--
7075-T62	0.063	0.34	318094†	T/2	0.98	--	0.99	--	1.06	1.09	--	--	--	--
	0.126	0.17	318092	T/2	--	--	--	--	1.06	--	--	--	--	--
	0.300	1.7	318096	T/2	0.93	--	0.93	--	1.05	1.03	--	0.54	0.52	--
	1.225	21.2	318098†	T/2,W/4	0.93	--	0.92	--	1.05	1.02	--	0.55	0.53	--
				T/2,W/2	0.95	--	0.95	--	1.05	1.03	--	0.56	0.54	--
	2.250	4.1	318100	D/4	--	--	--	--	1.03	--	--	0.53	--	--
				D/2	0.86	--	0.81	--	1.02	0.88	--	0.53	0.52	--
7075-T73X	0.063	0.34	318095†	T/2	0.99	--	0.96	--	1.03	1.06	--	--	--	--
	0.126	0.17	318093	T/2	--	--	--	--	0.97	--	--	--	--	--
	0.300	1.7	318097	T/2	0.97	--	0.96	--	1.07	1.02	--	0.57	0.55	--
	1.225	21.2	318099†	T/2,W/4	0.94	--	0.95	--	1.06	1.02	--	0.57	0.55	--
				T/2,W/2	0.96	--	0.97	--	1.05	1.03	--	0.57	0.56	--
	2.250	4.1	318101	D/4	--	--	--	--	1.02	--	--	0.57	--	--
				D/2	0.93	--	0.89	--	1.03	0.94	--	0.56	0.57	--
7178-T62	0.050	0.15	340247	T/2	0.99	--	0.99	--	1.05	--	--	--	--	--
	0.051	0.20	318102†	T/2	--	--	--	--	1.09	--	--	--	--	--
	0.403	3.0	340249	T/2	0.96	--	0.92	--	1.03	1.04	--	0.53	0.51	--

* T - Thickness; W - Width, D - Diameter

† Producer B; all others Producer A

TABLE XXI

RATIOS OF BEARING TO TENSILE PROPERTIES OF STRESS-RELIEVED STRETCHED 2014-T6510 ALUMINUM ALLOY EXTRUSIONS

[AFSC(615)-3580]

Sample Section Thickness, in.	Sample Cross-Sectional Area, in.²	Number	Location*	Flatwise								Edgewise							
				BUS(L)/TUS(L)		BYS(L)/TYS(L)		BUS(LT)/TUS(L)		BYS(LT)/TYS(L)		BUS(L)/TUS(L)		BYS(L)/TYS(L)		BUS(LT)/TUS(L)		BYS(LT)/TYS(L)	
				e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0
0.061	0.30	317950	T/2	1.57	2.07	1.42	1.67	--	--	--	--	--	--	--	--	--	--	--	--
0.070	0.24	318011†	T/2	1.61	2.08	1.43	1.68	--	--	--	--	--	--	--	--	--	--	--	--
0.246	0.45	318130	T/2	1.72	2.14	1.56	1.78	--	--	--	--	--	--	--	--	--	--	--	--
0.250	3.7	340154	T/2	1.68	2.18	1.50	1.83	--	--	--	--	--	--	--	--	--	--	--	--
0.271	0.40	317994	T/2	1.58	2.07	1.46	1.69	--	--	--	--	--	--	--	--	--	--	--	--
0.750	1.4	317924	T/2	1.43	1.86	1.32	1.49	--	--	--	--	--	--	--	--	--	--	--	--
1.657	2.2	318046	D/4	1.46	1.87	1.33	1.56	--	--	--	--		--	--	--	--	--	--	--
			D/2	1.45	1.81	1.29	1.50	--	--	--	--		--	--	--	--	--	--	--

* T - Thickness; W - Width; D - Diameter
† Producer B: all others from Producer A
NOTE: L - Longitudinal; LT - Long-Transverse

TABLE XXII

RATIOS OF BEARING TO TENSILE PROPERTIES OF STRESS-RELIEVED STRETCHED 2024-T3510 ALUMINUM ALLOY EXTRUSIONS

[AF33(615)-3580]

Section Thickness, in.	Sample Cross-Sectional Area, in.^{2}	Number	Location*	Flatwise $\frac{BYS(L)}{TYS(L)}$ e/D=1.5	Flatwise $\frac{BYS(L)}{TYS(L)}$ e/D=2.0	Flatwise $\frac{BUS(L)}{TUS(L)}$ e/D=1.5	Flatwise $\frac{BUS(L)}{TUS(L)}$ e/D=2.0	Flatwise $\frac{BYS(LT)}{TYS(LT)}$ e/D=1.5	Flatwise $\frac{BYS(LT)}{TYS(LT)}$ e/D=2.0	Flatwise $\frac{BUS(LT)}{TUS(LT)}$ e/D=1.5	Flatwise $\frac{BUS(LT)}{TUS(LT)}$ e/D=2.0	Edgewise $\frac{BYS(L)}{TYS(L)}$ e/D=1.5	Edgewise $\frac{BYS(L)}{TYS(L)}$ e/D=2.0	Edgewise $\frac{BUS(L)}{TUS(L)}$ e/D=1.5	Edgewise $\frac{BUS(L)}{TUS(L)}$ e/D=2.0	Edgewise $\frac{BYS(LT)}{TYS(LT)}$ e/D=1.5	Edgewise $\frac{BYS(LT)}{TYS(LT)}$ e/D=2.0	Edgewise $\frac{BUS(LT)}{TUS(LT)}$ e/D=1.5	Edgewise $\frac{BUS(LT)}{TUS(LT)}$ e/D=2.0
0.075	0.70	318132†	T/2	1.47	1.81	1.48	1.78	--	--	--	--	--	--	--	--	--	--	--	--
0.094	0.30	318019†	T/2	1.52	2.00	1.48	1.75	--	--	--	--	--	--	--	--	--	--	--	--
0.101	0.33	317885	T/2	1.51	1.86	1.43	1.69	--	--	--	--	--	--	--	--	--	--	--	--
0.106	0.31	317904	T/2	1.59	1.95	1.49	1.76	--	--	--	--	--	--	--	--	--	--	--	--
0.120	0.27	318018†‡	T/2	1.56	1.98	1.48	1.71	--	--	--	--	--	--	--	--	--	--	--	--
0.151	0.82	317886	T/2	1.46	1.77	1.44	1.68	--	--	--	--	--	--	--	--	--	--	--	--
0.255	2.8	317942	T/2	1.35	1.56	1.21	1.38	1.33	1.66	1.31	1.61	--	--	--	--	--	--	--	--
0.258	4.2	318047	T/2	1.33	1.66	1.33	1.59	1.34	1.68	1.25	1.60	--	--	--	--	--	--	--	--
0.375	0.62	317943	T/2	1.67	2.09	1.61	2.06	--	--	--	--	--	--	--	--	--	--	--	--
0.510	10.1	317926	T/2,W/2	1.33	1.73	1.36	1.66	--	--	--	--	--	--	--	--	--	--	--	--
0.525	1.9	318020†	T/2,W/2	1.63	1.90	1.53	1.81	--	--	--	--	--	--	--	--	--	--	--	--
0.550	1.9	317856	T/2,W/4	1.33	1.66	1.27	1.55	--	--	--	--	--	--	--	--	--	--	--	--
0.642	5.8	317945	T/2,W/4	1.31	1.66	1.26	1.52	1.31	1.58	1.26	1.51	--	--	--	--	--	--	--	--
0.815	3.9	340418†	T/2,W/4	1.32	1.63	1.24	1.52	--	--	--	--	--	--	--	--	--	--	--	--
			T/2,W/2	1.34	1.65	1.27	1.55	--	--	--	--	--	--	--	--	--	--	--	--
0.950	4.6	317944	T/2,W/4	1.27	1.63	1.22	1.49	--	--	--	--	--	--	--	--	--	--	--	--
1.150	5.6	318077	T/2,W/4	1.32	1.63	1.27	1.56	1.27	1.60	1.27	1.53	1.21	1.58	1.23	1.53	--	--	--	--
			T/2,W/2	1.35	1.69	1.27	1.58	--	--	--	--	--	--	--	--	--	--	--	--
1.200	3.9	317946	T/2,W/4	1.31	1.67	1.19	1.47	--	--	--	--	1.27	1.63	1.23	1.45	--	--	--	--
1.450	7.3	318021†‡	T/2,W/4	1.31	1.64	1.24	1.49	--	--	--	--	1.27	1.63	1.21	1.46	--	--	--	--
			T/2,W/2	1.31	1.62	1.26	1.50	--	--	--	--	1.26	1.60	1.19	1.48	--	--	--	--
1.705	4.8	340213	T/4,W/4	1.34	1.65	1.23	1.54	--	--	--	--	--	--	--	--	--	--	--	--
			T/2,W/2	1.32	1.62	1.24	1.50	--	--	--	--	1.30	1.60	1.23	1.49	--	--	--	--
2.520	8.8	318133†	T/4,W/4	1.28	1.59	1.25	1.53	--	--	--	--	1.24	1.58	1.24	1.42	--	--	--	--
			T/2,W/2	1.29	1.62	1.25	1.55	--	--	--	--	1.25	1.55	1.20	1.43	--	--	--	--
4.000	24.0	340214	T/2,W/4	1.28	1.64	1.21	1.47	1.22	1.53	1.30	1.54	1.18	1.57	1.20	1.47	1.09	1.45	1.15	1.42
			T/2,W/2	1.18	1.65	1.27	1.54	--	--	--	--	1.15	1.55	1.20	1.51	--	--	--	--
2.760	29.6	318048	T/4,W/4	1.22	1.53	1.25	1.50	1.20	1.51	1.27	1.55	1.23	1.59	1.24	1.55	1.11	1.44	1.21	1.50
			T/2,W/2	1.26	1.61	1.30	1.59	1.19	1.50	1.24	1.54	1.18	1.54	1.26	1.53	--	--	--	--
4.500	30.7	340388	T/4,W/4	1.27	1.63	1.22	1.49	1.18	1.47	1.20	1.46	1.21	1.59	1.19	1.46	1.12	1.39	1.15	1.44
			T/2,W/2	1.31	1.62	1.26	1.51	1.24	1.58	1.25	1.44	1.22	1.52	1.23	1.48	1.17	1.59	1.15	1.42

* T - Thickness; W - Width

† Producer B; all others from Producer A

‡ Samples were in the T3511 temper

NOTE: L - Longitudinal; LT - Long-Transverse

TABLE XXIII

RATIOS OF BEARING TO TENSILE PROPERTIES OF STRESS-RELIEVED STRETCHED 2024-T8510 ALUMINUM ALLOY EXTRUSIONS

[AF33(615)-3580]

Section Thickness, in.	Sample Cross-Sectional Area, in.^{2}	Number	Location*	Flatwise								Edgewise							
				$\frac{BYS(L)}{TYS(L)}$		$\frac{BYS(L)}{TYS(L)}$		$\frac{BYS(LT)}{TYS(L)}$		$\frac{BYS(LT)}{TYS(L)}$		$\frac{BYS(L)}{TYS(L)}$		$\frac{BYS(L)}{TYS(L)}$		$\frac{BYS(LT)}{TYS(L)}$		$\frac{BYS(LT)}{TYS(L)}$	
				e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0
0.075	0.70	318022†	T/2	1.52	1.95	1.45	1.68	--	--	--	--	--	--	--	--	--	--	--	--
0.094	0.30	318134†	T/2	1.50	1.91	1.44	1.71	--	--	--	--	--	--	--	--	--	--	--	--
0.101	0.33	317887	T/2	1.46	1.93	1.37	1.75	--	--	--	--	--	--	--	--	--	--	--	--
0.106	0.31	317888	T/2	1.53	2.04	1.44	1.78	--	--	--	--	--	--	--	--	--	--	--	--
0.120	0.27	318023†	T/2	1.54	2.00	1.44	1.63	--	--	--	--	--	--	--	--	--	--	--	--
0.151	0.82	317889	T/2	1.57	2.03	1.51	1.76	--	--	--	--	--	--	--	--	--	--	--	--
0.256	2.8	317890	T/2	1.46	1.89	1.40	1.66	1.47	1.88	1.41	1.68	--	--	--	--	--	--	--	--
0.258	4.2	318082	T/2	1.48	1.91	1.48	1.69	1.45	1.88	1.44	1.58	--	--	--	--	--	--	--	--
0.375	0.62	317891	T/2	1.53	1.95	1.48	1.62	--	--	--	--	--	--	--	--	--	--	--	--
0.510	10.1	317892	T/2	1.47	1.90	1.47	1.64	--	--	--	--	--	--	--	--	--	--	--	--
0.525	1.9	318024†	T/2,W/4	1.46	1.89	1.43	1.67	--	--	--	--	--	--	--	--	--	--	--	--
0.550	1.9	317922	T/2,W/4	1.47	1.88	1.40	1.66	--	--	--	--	--	--	--	--	--	--	--	--
0.642	5.8	317894	T/2,W/4	1.40	1.80	1.40	1.64	1.41	1.82	1.36	1.63	--	--	--	--	--	--	--	--
0.815	3.9	340419†	T/2,W/4	1.46	1.87	1.40	1.63	--	--	--	--	--	--	--	--	--	--	--	--
			T/2,W/2	1.45	1.90	1.42	1.67	--	--	--	--	--	--	--	--	--	--	--	--
0.950	4.6	317893	T/2,W/4	1.41	1.84	1.41	1.64	--	--	--	--	--	--	--	--	--	--	--	--
1.150	5.6	318078	T/2,W/4	1.46	1.87	1.43	1.68	1.45	1.87	1.45	1.70	1.27	1.74	1.36	1.62	--	--	--	--
			T/2,W/2	1.47	1.90	1.45	1.72	--	--	--	--	--	--	--	--	--	--	--	--
1.200	3.9	317895	T/2,W/4	1.42	1.81	1.37	1.61	--	--	--	--	1.36	1.76	1.38	1.61	--	--	--	--
1.450	7.3	318025†§	T/2,W/4	1.43	1.81	1.38	1.64	--	--	--	--	1.36	1.75	1.32	1.60	--	--	--	--
			T/2,W/2	1.41	1.84	1.36	1.65	--	--	--	--	1.35	1.76	1.33	1.61	--	--	--	--
1.705	4.8	340169	T/4,W/4	1.47	1.86	1.42	1.66	--	--	--	--	--	--	--	--	--	--	--	--
			T/2,W/2	1.48	1.90	1.39	1.65	--	--	--	--	1.46	1.81	1.38	1.62	--	--	--	--
2.520	8.8	340420†	T/4,W/4	1.48	1.85	1.45	1.64	--	--	--	--	1.39	1.81	1.40	1.67	--	--	--	--
			T/2,W/2	1.41	1.84	1.38	1.63	--	--	--	--	1.35	1.80	1.37	1.65	--	--	--	--
2.760	29.6	318079	T/4,W/4	1.27	1.73	**	1.70	1.33	1.76	1.43	1.66	1.36	1.73	1.43	1.66	1.39	1.80	1.41	1.68
			T/2,W/2	1.34	1.75	1.42	1.67	1.38	1.82	1.39	1.61	1.28	1.69	**	1.71	--	--	--	--
4.000	24.0	340225	T/4,W/4	1.39	1.83	1.42	1.69	1.44	1.88	1.40	1.69	1.33	1.75	1.42	1.70	1.28	1.79	1.37	1.71
			T/2,W/2	1.39	1.85	1.41	1.54	--	--	--	--	1.29	1.70	1.38	1.68	--	--	--	--
4.500	30.7	340389	T/4,W/4	1.41	1.83	1.43	1.71	1.44	1.76	1.42	1.69	1.37	1.77	1.40	1.66	1.32	1.88	1.39	1.67
			T/2,W/2	1.38	1.88	1.44	1.71	1.46	1.93	1.38	1.67	1.36	1.73	1.40	1.69	1.31	1.74	1.35	1.65

* T - Thickness, W - Width
† Producer B; all others from Producer A
§ Sample was in the T8511 temper
** Bearing specimen failed before reaching yield stress (2 per cent offset).
NOTE: L - Longitudiral; LT - Long-Transverse

TABLE XXIV

RATIOS OF BEARING TO TENSILE PROPERTIES OF STRESS-RELIEVED STRETCHED 6061-T6510 ALUMINUM ALLOY EXTRUSIONS

[AF33(615)-3580]

Sample				Flat-wise								Edge-wise							
Section Thickness, in.	Cross-Sectional Area, in.²	Number	Location*	BYS(L)/TYS(L)		BYS(L)/TYS(L)		BHS(LT)/TYS(L)		BYS(LT)/TYS(L)		BHS(L)/TYS(L)		BYS(L)/TYS(L)		BHS(LT)/TYS(L)		BYS(LT)/TYS(L)	
				e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0
0.050	0.42	318136†	T/2	1.76	2.38	1.58	1.79	--	--	--	--	--	--	--	--	--	--	--	--
0.075	0.59	317857	T/2	1.62	2.00	1.51	1.70	1.94	2.29	1.72	1.98	--	--	--	--	--	--	--	--
0.090	0.27	318027†	T/2	1.74	2.32	1.57	1.80	--	--	--	--	--	--	--	--	--	--	--	--
0.125	0.61	317846	T/2	1.64	2.10	1.50	1.66	--	--	--	--	--	--	--	--	--	--	--	--
0.245	1.1	340421†	T/2	1.79	2.40	1.59	1.83	--	--	--	--	--	--	--	--	--	--	--	--
0.254	0.97	340422†	T/2	1.77	2.32	1.58	1.81	--	--	--	--	--	--	--	--	--	--	--	--
0.310	6.3	317905	T/2	1.67	2.13	1.55	1.69	1.69	2.17	1.56	1.84	--	--	--	--	--	--	--	--
0.315	5.8	317953	T/2	1.71	2.21	1.63	1.67	1.72	2.27	1.62	1.77	--	--	--	--	--	--	--	--
0.375	8.6	317927	T/2	1.74	2.21	1.56	1.69	1.76	2.26	1.60	1.79	--	--	--	--	--	--	--	--
0.375	7.7	318083	T/2	1.71	2.17	1.61	1.71	1.74	2.22	1.64	1.76	--	--	--	--	--	--	--	--
0.918	1.3	317906	T/2,W/2	1.70	2.21	1.64	1.75	--	--	--	--	--	--	--	--	--	--	--	--
1.004	2.0	340423†	T/2,W/4	1.65	2.13	1.48	--	--	--	--	--	1.60	2.12	1.44	1.72	--	--	--	--
			T/2,W/2	1.67	2.20	1.37	1.79	--	--	--	--	1.62	2.12	1.46	1.77	--	--	--	--
1.240	2.7	317907	T/2,W/2	1.49	1.93	1.33	1.54	--	--	--	--	1.47	1.89	1.29	1.54	--	--	--	--
1.960	4.4	317896	T/2,W/4	1.47	1.87	1.26	1.52	--	--	--	--	--	--	--	--	--	--	--	--
			T/2,W/2	1.44	1.85	1.27	1.46	--	--	--	--	1.44	1.85	1.26	1.50	--	--	--	--
3.000	15.0	340226	T/4,W/4	1.44	1.86	1.27	1.47	1.41	1.81	1.24	1.50	1.42	1.81	1.24	1.47	1.36	1.78	1.21	1.47
			T/2,W/2	1.45	1.87	1.28	1.39	--	--	--	--	1.42	1.81	1.24	1.44	--	--	--	--
6.500	33.2	317897	D/4	1.41	1.82	1.24	1.54	1.35	1.74	1.20	1.48	1.41	1.80	1.24	1.54	1.33	1.68	1.19	1.46
			D/2	1.40	1.79	1.24	1.48	--	--	--	--	--	--	--	--	--	--	--	--

* T - Thickness; W - Width; D - Diameter

† Producer B; all others from Producer A

NOTE: L - Longitudinal; LT - Long-Transverse

TABLE XIV

RATIOS OF BEARING TO TENSILE PROPERTIES OF STRESS-RELIEVED STRETCHED 7075-T6510 ALUMINUM ALLOY EXTRUSIONS

[AF33(615)-3580]

Section Thickness, in.	Sample Cross-Sectional Area, in.^{2}	Number	Location*	Flatwise								Edgewise							
				$\frac{BRS(L)}{TYS(L)}$		$\frac{BYS(L)}{TYS(L)}$		$\frac{BRS(LT)}{TYS(L)}$		$\frac{BYS(LT)}{TYS(L)}$		$\frac{BRS(L)}{TYS(L)}$		$\frac{BYS(L)}{TYS(L)}$		$\frac{BRS(LT)}{TYS(L)}$		$\frac{BYS(LT)}{TYS(L)}$	
				e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0
0.065	0.18	317899	T/2	1.46	1.82	1.35	1.55	--	--	--	--	--	--	--	--	--	--	--	--
0.065	0.27	318031†	T/2	1.48	1.86	1.32	1.01	--	--	--	--	--	--	--	--	--	--	--	--
0.080	0.18	317858	T/2	1.42	1.81	1.34	1.53	--	--	--	--	--	--	--	--	--	--	--	--
0.133	0.97	318029†	T/2	1.48	1.86	1.41	1.63	--	--	--	--	--	--	--	--	--	--	--	--
0.160	0.26	318030†	T/2	1.45	1.83	1.37	1.62	--	--	--	--	--	--	--	--	--	--	--	--
0.209	1.2	340403	T/2	1.38	1.75	1.34	1.62	1.45	1.77	1.29	1.51	--	--	--	--	--	--	--	--
0.260	1.23	318028†	T/2	1.47	1.86	1.35	1.58	--	--	--	--	--	--	--	--	--	--	--	--
0.325	2.4	340437	T/2	1.43	1.82	1.33	1.54	1.44	1.76	1.33	1.64	--	--	--	--	--	--	--	--
0.375	2.2	317954	T/2	1.42	1.82	1.29	1.59	--	--	--	--	--	--	--	--	--	--	--	--
0.438	7.2	317859	T/2	1.47	1.83	1.41	1.60	1.50	1.75	1.40	1.67	--	--	--	--	--	--	--	--
0.463	1.9	318032†	T/2	1.45	1.85	1.30	1.56	--	--	--	--	--	--	--	--	--	--	--	--
0.935	7.2	340155	T/2,W/4	1.45	1.83	1.33	1.56	1.47	1.79	1.32	1.61	--	--	--	--	--	--	--	--
			T/2,W/2	1.46	1.82	1.33	1.56	--	--	--	--	--	--	--	--	--	--	--	--
1.023	1.8	318033	T/2,W/4	1.37	1.77	1.21	1.49	--	--	--	--	--	--	--	--	--	--	--	--
1.188	27.1	317860	T/2,W/4	1.47	1.84	1.36	1.52	1.49	1.83	1.40	1.61	1.26	1.71	1.23	1.47	1.29	1.65	1.25	1.51
			T/2,W/2	1.47	1.83	1.38	1.53	1.51	1.88	1.42	1.64	1.30	1.73	1.28	1.53	1.36	1.74	1.25	1.50
1.500	1.8	317955	D/2	1.31	1.67	1.18	1.40	--	--	--	--	--	--	--	--	--	--	--	--
2.000	3.1	317861	D/4	1.36	1.76	1.25	1.46	--	--	--	--	--	--	--	--	--	--	--	--
			D/2	1.32	1.71	1.22	1.46	--	--	--	--	--	--	--	--	--	--	--	--
2.190	17.0	318137†	T/4,W/4	1.44	1.81	1.38	1.64	1.43	1.78	1.37	1.64	1.23	1.66	1.31	1.60	1.19	1.56	1.21	1.57
			T/2,W/2	1.44	1.82	1.38	1.65	1.47	1.86	1.42	1.66	1.24	1.67	1.35	1.64	1.25	1.66	1.29	1.58
2.750	8.2	340404	T/4,W/4	1.35	1.74	1.24	1.48	--	--	--	--	1.36	1.70	1.27	1.48	--	--	--	--
			T/2,W/2	1.36	1.76	1.24	1.48	--	--	--	--	1.35	1.73	1.26	1.46	--	--	--	--
3.040	13.8	318138†	T/4,W/4	1.39	1.75	1.32	1.57	1.37	1.72	1.35	1.60	1.33	1.69	1.31	1.55	1.31	1.69	1.27	1.58
			T/2,W/2	1.40	1.79	1.33	1.58	--	--	--	--	1.35	1.72	1.32	1.55	--	--	--	--
3.090	24.3	340391	T/4,W/4	1.43	1.82	1.32	1.54	1.42	1.73	1.32	1.52	1.27	1.69	1.25	1.53	1.28	1.68	1.23	1.52
			T/2,W/2	1.39	1.81	1.30	1.56	1.40	1.80	1.28	1.52	1.29	1.65	1.26	1.52	1.24	1.61	1.22	1.51

* T - Thickness, W - Width; D - Diameter

† Producer B; all others from Producer A

NOTE: L - Longitudinal; LT - Long-Transverse

TABLE XXVI

RATIOS OF BEARING TO TENSILE PROPERTIES OF STRESS-RELIEVED STRETCHED 7075-T73510 ALUMINUM ALLOY EXTRUSIONS

[AF33(615)-3580]

Section Thickness, in.	Sample Cross-Sectional Area, in.²	Number	Location*	Flatwise								Edgewise							
				$\frac{BRS(L)}{TYS(L)}$		$\frac{BYS(L)}{TYS(L)}$		$\frac{BRS(LT)}{TYS(L)}$		$\frac{BYS(LT)}{TYS(L)}$		$\frac{BRS(L)}{TYS(L)}$		$\frac{BYS(L)}{TYS(L)}$		$\frac{BRS(LT)}{TYS(L)}$		$\frac{BYS(LT)}{TYS(L)}$	
				e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0
0.080	0.18	317862	T/2	1.52	1.94	1.45	1.69	--	--	--	--	--	--	--	--	--	--	--	--
0.209	1.2	340393	T/2	1.45	1.85	1.39	1.67	1.49	1.97	1.37	1.68	--	--	--	--	--	--	--	--
0.325	2.4	340438	T/2	1.49	1.93	1.44	1.70	1.48	1.92	1.45	1.74	--	--	--	--	--	--	--	--
0.375	2.2	317900	T/2	1.51	1.95	1.44	1.70	--	--	--	--	--	--	--	--	--	--	--	--
0.430	7.2	317910	T/2	1.53	1.98	1.47	1.74	1.54	1.98	1.45	1.78	--	--	--	--	--	--	--	--
0.935	7.2	340292	T/2,W/4	1.47	1.89	1.37	1.63	1.45	1.82	1.38	1.62	--	--	--	--	--	--	--	--
			T/2,W/2	1.50	1.92	1.40	1.65	--	--	--	--	--	--	--	--	--	--	--	--
1.000	5.7	340439	T/2,W/4	1.46	1.91	1.39	1.60	1.49	1.92	1.37	1.66	1.38	1.75	1.31	1.55	1.35	1.78	1.29	1.57
			T/2,W/2	1.48	1.92	1.37	1.62	--	--	--	--	1.44	1.88	1.21	1.45	--	--	--	--
1.500	1.8	317956	D/2	1.39	1.83	1.30	1.55	--	--	--	--	--	--	--	--	--	--	--	--
2.000	3.1	317948	D/4	1.41	1.85	1.28	1.54	--	--	--	--	--	--	--	--	--	--	--	--
			D/2	1.44	1.85	1.31	1.56	--	--	--	--	--	--	--	--	--	--	--	--
2.750	8.2	340440	T/4,W/4	1.43	1.87	1.33	1.57	--	--	--	--	1.42	1.83	1.30	1.55	--	--	--	--
			T/2,W/2	1.43	1.85	1.33	1.56	--	--	--	--	1.46	1.86	1.33	1.57	--	--	--	--

* T - Thickness; W - Width; D - Diameter

NOTE: L - Longitudinal; LT - Long-Transverse

TABLE XXVII

RATIOS OF BEARING TO TENSILE PROPERTIES OF STRESS-RELIEVED STRETCHED 70'79-T6510 ALUMINUM ALLOY EXTRUSIONS

[AF33(615)-3580]

Section Thickness, in.	Sample Cross-Sectional Area, in.^{2}	Number	Location*	Flatwise $\frac{BRS(L)}{TYS(L)}$ e/D=1.5	Flatwise $\frac{BRS(L)}{TYS(L)}$ e/D=2.0	Flatwise $\frac{BYS(L)}{TYS(L)}$ e/D=1.5	Flatwise $\frac{BYS(L)}{TYS(L)}$ e/D=2.0	Flatwise $\frac{BRS(LT)}{TYS(L)}$ e/D=1.5	Flatwise $\frac{BRS(LT)}{TYS(L)}$ e/D=2.0	Flatwise $\frac{BYS(LT)}{TYS(L)}$ e/D=1.5	Flatwise $\frac{BYS(LT)}{TYS(L)}$ e/D=2.0	Edgewise $\frac{BRS(L)}{TYS(L)}$ e/D=1.5	Edgewise $\frac{BRS(L)}{TYS(L)}$ e/D=2.0	Edgewise $\frac{BYS(L)}{TYS(L)}$ e/D=1.5	Edgewise $\frac{BYS(L)}{TYS(L)}$ e/D=2.0	Edgewise $\frac{BRS(LT)}{TYS(L)}$ e/D=1.5	Edgewise $\frac{BRS(LT)}{TYS(L)}$ e/D=2.0	Edgewise $\frac{BYS(LT)}{TYS(L)}$ e/D=1.5	Edgewise $\frac{BYS(LT)}{TYS(L)}$ e/D=2.0
0.080	0.15	340405	T/2	1.46	1.86	1.35	1.54	--	--	--	--	--	--	--	--	--	--	--	--
0.146	1.1	340406	T/2	1.46	1.83	1.41	1.60	1.50	1.85	1.37	1.62	--	--	--	--	--	--	--	--
0.161	0.72	340252	T/2	1.44	1.81	1.34	1.55	--	--	--	--	--	--	--	--	--	--	--	--
0.251	0.82	340253	T/2	1.46	1.82	1.33	1.50	--	--	--	--	--	--	--	--	--	--	--	--
0.500	4.2	340424†	T/2,W/4	1.43	1.81	1.28	1.50	1.43	1.82	1.29	1.57	--	--	--	--	--	--	--	--
			T/2,W/2	1.44	1.81	1.31	1.50	--	--	--	--	--	--	--	--	--	--	--	--

* T - Thickness; W - Width

† Producer B; all others from Producer A

NOTE: L - Longitudinal; LT - Long-Transverse

TABLE XXVIII

RATIOS OF BEARING TO TENSILE PROPERTIES OF STRESS-RELIEVED STRETCHED
7178-T6510 ALUMINUM ALLOY EXTRUSIONS
AF33(615)-3580

Section Thickness, in.	Sample Cross-Sectional Area, in.²	Number	Location*	Flatwise								Edgewise							
				$\frac{BRS(L)}{TYS(L)}$		$\frac{BRY(L)}{TYS(L)}$		$\frac{BRS(LT)}{TYS(L)}$		$\frac{BRY(LT)}{TYS(L)}$		$\frac{BRS(L)}{TYS(L)}$		$\frac{BRY(L)}{TYS(L)}$		$\frac{BRS(LT)}{TYS(L)}$		$\frac{BRY(LT)}{TYS(L)}$	
				e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0	e/D=1.5	e/D=2.0
0.063	0.37	317902	T/2	1.40	1.77	1.31	1.55	--	--	--	--	--	--	--	--	--	--	--	--
0.066	0.35	340426†	T/2	1.50	1.92	1.36	1.66	--	--	--	--	--	--	--	--	--	--	--	--
0.142	1.0	318016	T/2	1.41	1.79	1.32	1.58	--	--	--	--	--	--	--	--	--	--	--	--
0.154	0.42	318035†	T/2	1.50	1.87	1.40	1.61	--	--	--	--	--	--	--	--	--	--	--	--
0.162	0.49	317903	T/2	1.44	1.79	1.34	1.52	--	--	--	--	--	--	--	--	--	--	--	--
0.162	1.1	340425†	T/2	1.42	1.76	1.32	1.52	--	--	--	--	--	--	--	--	--	--	--	--
0.180	4.6	340395	T/2	1.42	1.79	1.38	1.62	1.52	1.78	1.42	1.70	--	--	--	--	--	--	--	--
0.261	0.60	340427†	T/2	1.46	1.84	1.28	1.50	--	--	--	--	--	--	--	--	--	--	--	--
0.265	0.88	317996	T/2	1.39	1.75	1.26	1.40	--	--	--	--	--	--	--	--	--	--	--	--
0.625	6.9	317997	T/2,W/4	1.46	1.76	1.32	1.55	1.41	1.69	1.31	1.54	--	--	--	--	--	--	--	--
			T/2,W/2	1.41	1.80	1.32	1.51	--	--	--	--	--	--	--	--	--	--	--	--
0.780	1.7	340254	T/2,W/2	1.38	1.73	1.19	1.47	--	--	--	--	--	--	--	--	--	--	--	--
1.200	3.9	318139†	T/2,W/4	1.39	1.76	1.28	1.54	--	--	--	--	--	--	--	--	--	--	--	--
			T/2,W/2	1.42	1.78	1.27	1.59	--	--	--	--	1.29	1.70	1.30	1.53	--	--	--	--
1.438	6.4	317957	T/2	1.31	1.65	1.21	1.44	--	--	--	--	1.31	1.71	1.31	1.56	--	--	--	--
2.180	15.5	318140†	T/4,W/4	1.37	1.77	1.36	1.61	1.41	1.71	1.37	1.62	--	--	--	--	--	--	--	--
			T/2,W/2	1.38	1.80	1.39	1.63	1.40	1.78	1.36	1.62	1.24	1.59	1.33	1.56	1.19	1.63	1.27	1.58
												1.23	1.63	1.33	1.64	1.16	1.59	1.27	1.57

* T - Thickness, W - Width
† Producer B; all others from Producer A
NOTE: L - Longitudinal; LT - Long-Transverse

TABLE XXXX

RATIOS OF BEARING TO TENSILE PROPERTIES OF ALUMINUM ALLOY EXTRUSIONS IN THE "HEAT-TREATED-BY-USER" TEMPER

[AFSS(615)-3580]

Alloy	Sample: Section Thickness, in.	Sample: Cross-Sectional Area, in.²	Sample: Number	Sample: Location	Flatwise: BES(L)/TUS(L) e/D=1.5	Flatwise: BES(L)/TUS(L) e/D=2.0	Flatwise: BYS(L)/TYS(L) e/D=1.5	Flatwise: BYS(L)/TYS(L) e/D=2.0	Flatwise: BES(LT)/TUS(L) e/D=1.5	Flatwise: BES(LT)/TUS(L) e/D=2.0	Flatwise: BYS(LT)/TYS(L) e/D=1.5	Flatwise: BYS(LT)/TYS(L) e/D=2.0	Edgewise: BES(L)/TUS(L) e/D=1.5	Edgewise: BES(L)/TUS(L) e/D=2.0	Edgewise: BYS(L)/TYS(L) e/D=1.5	Edgewise: BYS(L)/TYS(L) e/D=2.0	Edgewise: BES(LT)/TUS(L) e/D=1.5	Edgewise: BES(LT)/TUS(L) e/D=2.0	Edgewise: BYS(LT)/TYS(L) e/D=1.5	Edgewise: BYS(LT)/TYS(L) e/D=2.0
[illegible]	0.188	1.0	340244*	T/2	1.59	2.06	1.50	1.78	--	--	--	--	--	--	--	--	--	--	--	--
	0.375	6.3	318084	T/2	1.51	1.96	1.35	1.71	1.52	1.99	1.44	1.72	--	--	--	--	--	--	--	--
	0.490	1.4	318085	T/2	1.54	1.99	1.43	1.69	--	--	--	--	--	--	--	--	--	--	--	--
724-T42	0.064	0.27	318088*	T/2	1.60	1.89	1.69	1.95	--	--	--	--	--	--	--	--	--	--	--	--
	0.063	0.27	318066	T/2	1.49	1.83	1.76	2.11	--	--	--	--	--	--	--	--	--	--	--	--
	0.438	2.1	340241*	T/2	1.39	1.73	1.40	1.68	--	--	--	--	--	--	--	--	--	--	--	--
	0.500	0.64	340243	T/2	1.35	1.67	1.38	1.66	--	--	--	--	--	--	--	--	--	--	--	--
	0.562	6.4	340245	T/4,W/4	1.38	1.64	1.36	1.57	--	--	--	--	1.27	1.59	1.24	1.54	--	--	--	--
				T/2,W/2	1.29	1.61	1.30	1.54	--	--	--	--	1.22	1.56	1.29	1.50	--	--	--	--
7050-T73	0.064	0.27	318089*	T/2	1.64	2.01	1.56	1.97	--	--	--	--	--	--	--	--	--	--	--	--
	0.063	0.27	318067	T/2	1.62	2.09	1.54	2.00	--	--	--	--	--	--	--	--	--	--	--	--
	0.438	2.1	340246*	T/2	1.44	1.81	1.45	1.78	--	--	--	--	--	--	--	--	--	--	--	--
	0.500	0.64	340247	T/2	1.43	1.67	1.45	1.73	--	--	--	--	--	--	--	--	--	--	--	--
	0.562	6.4	340248	T/4,W/4	1.40	1.61	1.36	1.63	--	--	--	--	1.36	1.79	1.40	1.73	--	--	--	--
				T/2,W/2	1.41	1.66	1.39	1.70	--	--	--	--	1.43	1.77	1.43	1.76	--	--	--	--
6061-T62	1.045	4.5	318090	T/2	1.67	2.27	1.61	1.94	1.72	2.30	1.66	1.98	--	--	--	--	--	--	--	--
	1.687	3.9	318091	T/4,W/4	1.62	2.17	1.64	1.96	--	--	--	--	--	--	--	--	--	--	--	--
				T/2,W/2	1.66	2.10	1.67	1.95	--	--	--	--	1.63	2.06	1.63	1.81	--	--	--	--
7075-T62	0.063	0.34	318094*	T/2	1.46	1.69	1.47	1.68	--	--	--	--	--	--	--	--	--	--	--	--
	0.250	1.7	318096	T/2	1.36	1.77	1.34	1.64	--	--	--	--	--	--	--	--	--	--	--	--
	1.125	21.0	318099*	T/2,W/4	1.43	1.75	1.41	1.68	--	--	--	--	1.26	1.60	1.36	1.63	--	--	--	--
				T/2,W/2	1.45	1.77	1.44	1.69	1.46	1.80	1.43	1.70	1.32	1.72	1.19	1.69	1.27	1.62	1.25	1.67
	2.050	4.1	318100	IW4	1.32	1.65	1.21	1.47	--	--	--	--	1.35	1.67	1.25	1.48	--	--	--	--
				IW2	1.35	1.67	1.22	1.46	--	--	--	--	--	--	--	--	--	--	--	--
7075-T73	0.063	0.34	318093*	T/2	1.47	1.69	1.46	1.71	--	--	--	--	--	--	--	--	--	--	--	--
	0.250	1.7	318095	T/2	1.41	1.73	1.40	1.65	--	--	--	--	--	--	--	--	--	--	--	--
	1.125	21.0	318098*	T/2,W/4	1.41	1.73	1.41	1.71	--	--	--	--	1.64	1.77	1.56	1.66	--	--	--	--
				T/2,W/2	1.45	1.77	1.44	1.78	1.50	1.80	1.43	1.72	1.52	1.73	1.46	1.74	1.34	1.73	1.43	1.71
	2.050	4.1	318101	IW4	1.32	1.65	1.21	1.52	--	--	--	--	1.44	1.63	1.33	1.60	--	--	--	--
				IW2	1.6	1.95	1.31	1.69	--	--	--	--	--	--	--	--	--	--	--	--
7178-T62	0.050	0.15	340247	T/2	1.48	1.78	1.48	1.81	--	--	--	--	--	--	--	--	--	--	--	--
	0.102	1.4	340252*	T/2	1.44	1.75	1.43	1.76	--	--	--	--	--	--	--	--	--	--	--	--
	0.187	3.1	340253*	T/2	1.37	1.71	1.38	1.72	1.44	1.66	1.34	1.67	--	--	--	--	--	--	--	--

* T - Thickness; W - Width; D - Diameter
* [Produced by] [illegible] [from Product] /

NOTE: L - Longitudinal; LT - [illegible]

TABLE XXX

RATIOS AMONG THE MECHANICAL PROPERTIES AT DIFFERENT LOCATIONS

[AF33(615)-3580]

Alloy and Temper	Sample: Section Thickness, in.	Sample: Cross-Sectional Area, in.²	Number	Direction*	Location†	Tensile Ultimate Stress	Tensile Yield Stress	Compressive Yield Stress	Shear Ultimate Stress	Bearing: Ultimate Stress e/D=1.5	Bearing: Ultimate Stress e/D=2.0	Bearing: Yield Stress e/D=1.5	Bearing: Yield Stress e/D=2.0
					Stress-Relieved Stretched Extrusions								
2014-T6510	1.657	2.8	318146	L	D/2/D/4	1.01	1.01	1.01	1.00	0.99	0.98	0.97	0.97
2024-T3510	0.525	1.9	318020**	L	W/2/W/4	0.99	1.02	1.03	0.98	--	--	--	--
				LT		1.03	1.02	--	--	--	--	--	--
	0.815	3.9	340418**	L	W/2/W/4	0.96	0.97	0.93	1.00	0.99	0.99	1.00	0.99
				LT		1.03	1.02	1.00	--	--	--	--	--
	0.150	5.6	318077	L	W/2/W/4	0.97	0.96	0.94	1.01	0.99	1.01	0.97	0.98
				LT		1.01	0.97	0.99	--	--	--	--	--
	1.450	7.3	318021** ††	L	W/2/W/4	0.99	0.98	0.97	0.99	0.99	0.96	0.99	0.98
				L		--	--	--	--	0.99‡	0.97‡	0.97‡	0.99‡
				LT		1.01	1.00	1.01	--	--	--	--	--
	1.705	4.8	340213	L	TW/2/TW/4	1.00	0.99	1.02	0.96	0.98	0.98	1.00	0.97
				LT		0.99	1.02	--	--	--	--	--	--
	2.520	8.8	318133**	L	TW/2/TW/4	1.00	1.01	1.00	--	1.00	1.02	1.00	1.02
				L		--	--	--	--	1.01	0.98	0.97	1.02
				LT		1.02	1.02	1.01	0.98	--	--	--	--
	4.000	24.0	340214	L	TW/2/TW/4	0.98	0.97	0.98	0.99	0.91	0.99	1.01	1.01
				L		--	--	--	--	0.96‡	0.97‡	0.97‡	0.99‡
				LT		0.98	1.00	0.99	1.00	--	--	--	--
	2.760	29.6	318048	L	TW/2/TW/4	1.00	1.00	1.00	0.96	1.03	1.05	1.04	1.06
				L		--	--	--	--	0.96‡	0.97‡	1.02‡	0.99‡
				LT		1.03	1.06	1.04	1.01	0.99	0.96	0.97	1.00
	4.500	30.7	340388	L	TW/2/TW/4	0.98	0.95	0.95	0.98	1.00	0.98	1.01	0.98
				L		--	--	--	--	0.98‡	0.94‡	1.00‡	0.99‡
				LT		1.00	1.04	1.02	0.96	1.03	1.05	1.00	0.95
				LT		--	--	--	--	1.02‡	1.12‡	0.97‡	0.97‡
2024-T8510	0.525	1.9	318024**	L	W/2/W/4	0.99	0.98	0.99	0.99	--	--	--	--
				LT		1.00	1.00	--	--	--	--	--	--
	0.815	3.9	340419**	L	W/2/W/4	1.00	0.99	1.00	1.00	0.99	1.01	1.00	1.01
				LT		1.01	1.01	0.99	--	--	--	--	--
	1.150	5.6	318078	L	W/2/W/4	0.98	0.98	1.00	1.00	0.99	1.00	0.99	1.00
				LT		1.00	1.00	0.98	--	--	--	--	--
	1.450	7.3	318025** ‡‡	L	W/2/W/4	1.00	1.00	0.99	1.00	0.99	1.02	0.98	1.01
				L		--	--	--	--	0.99‡	1.01‡	1.01‡	1.01‡
				LT		1.01	1.02	1.00	--	--	--	--	--

* L - Longitudinal; LT - Long Transverse

† T - Thickness; W - Width; D - Diameter

‡ Edgewise bearing specimens; others - flatwise specimens

** Producer B; all others from Producer A

†† Sample was in the T3513 temper

‡‡ Sample was in the T8511 temper

TABLE XXX (Continued)

RATIOS AMONG THE MECHANICAL PROPERTIES AT DIFFERENT LOCATIONS

[AF33(615)-3580]

Alloy and Temper	Sample Section Thickness, in.	Sample Cross-Sectional Area, in.²	Number	Direction*	Location†	Tensile Ultimate Stress	Tensile Yield Stress	Compressive Yield Stress	Shear Ultimate Stress	Bearing Ultimate Stress e/D=1.5	Bearing Ultimate Stress e/D=2.0	Bearing Yield Stress e/D=1.5	Bearing Yield Stress e/D=2.0
2024-T4510	1.705	4.8	340169	L	TW/2/TW/4	1.00	1.03	1.00	0.98	1.01	1.02	1.02	1.03
				LT		0.98	1.01	--	--	--	--	--	--
	2.520	8.8	340420**	L	TW/2/TW/4	1.00	1.01	1.00	0.99	0.96	1.00	0.96	1.00
				L‡		--	--	--	--	0.97‡	0.99‡	0.99‡	0.99‡
				LT		0.98	0.98	0.99	1.04	--	--	--	--
	2.760	29.6	318079	L	TW/2/T-/4	1.00	1.00	0.99	1.00	1.05	1.01	***	0.98
				L‡		--	--	--	--	0.94‡	0.97‡	***‡	1.03‡
				LT		1.01	1.02	0.99	1.05	1.02	1.03	0.97	0.97
	4.000	24.0	340225	L	TW/2/TW/4	0.98	0.98	0.98	0.98	0.98	0.99	0.98	1.01
				L‡		--	--	--	--	0.94‡	0.96‡	0.96‡	0.97‡
				LT		0.98	0.98	0.98	0.97	--	--	--	--
	4.500	30.7	340389	L	TW/2/TW/4	0.97	0.98	0.97	0.98	0.96	1.00	0.99	0.98
				L‡		--	--	--	--	0.96‡	0.95‡	0.89‡	1.00‡
				LT		1.00	1.01	0.98	0.99	0.99	1.07	0.95	0.97
				LT‡		--	--	--	--	0.96‡	0.90‡	0.95‡	0.96‡
6061-T6510	1.004	2.0	340423**	L	W/2/W/4	0.99	0.99	1.01	1.01	1.00	1.03	0.99	--
				L‡		--	--	--	--	1.00‡	0.99‡	1.01‡	1.02‡
	1.240	2.7	317907	L	W/2/W/4	1.01	1.01	0.98	0.99	--	--	--	--
	1.960	4.4	317896	L	W/2/W/4	1.01	1.01	1.02	0.98	0.99	1.00	1.00	0.97
	3.000	15.0	340226	L	TW/2/TW/4	0.98	0.98	0.97	1.00	0.99	0.99	0.99	0.99
				L‡		--	--	--	--	0.99‡	0.98‡	0.97‡	0.96‡
				LT		0.98	1.02	0.98	0.97	--	--	--	--
	6.500	33.2	317897	L	D/2/D/4	0.99	0.99	0.99	0.99	0.98	0.98	0.99	0.95
				LT		0.99	0.97	0.97	0.99	--	--	--	--
7075-T6510	0.935	7.2	340155	L	W/2/W/4	0.98	0.97	0.97	0.99	0.99	0.98	0.97	0.98
				LT		0.99	0.99	0.98	0.99	--	--	--	--
	1.188	27.1	317860	L	W/2/W/4	0.98	0.98	0.97	0.94	0.99	0.98	0.99	0.98
				L‡		--	--	--	--	1.02‡	0.99‡	1.02‡	1.02‡
				LT		0.98	0.98	0.99	0.99	1.00	1.01	0.99	0.99
				LT‡		--	--	--	--	1.03‡	1.04‡	0.98‡	0.98‡
	2.000	3.1	317861	L	D/2/D/4	0.98	0.97	0.98	0.97	0.95	0.96	0.95	0.97
	2.190	17.0	318137**	L	TW/2/TW/4	0.97	0.96	0.95	0.96	0.98	0.98	0.96	0.97
				L‡		--	--	--	--	0.99‡	0.98‡	0.99‡	0.99‡
				LT		1.03	0.99	0.96	0.95	1.00	1.01	0.99	0.98
				LT‡		--	--	--	--	1.03‡	1.03‡	0.98‡	0.97‡
	2.750	8.8	340404	L	TW/2/TW/4	0.98	0.98	0.98	0.98	0.99	0.99	0.97	0.98
				L‡		--	--	--	--	0.97‡	0.99‡	0.97‡	0.97‡
				LT		0.98	0.98	0.98	0.99	--	--	--	--
	3.040	13.8	318138**	L	TW/2/T-/4	0.97	0.97	0.96	0.98	0.99	1.00	0.97	0.98
				L‡		--	--	--	--	0.99‡	0.99‡	0.98‡	0.97‡
				LT		0.99	1.00	0.99	--	--	--	--	--

* L - Longitudinal; LT - Long-Transverse

† T - Thickness; W - Width; D - Diameter

‡ Edgewise bearing specimens; others - flatwise specimens

** Producer B; all others from Producer A

TABLE XXX (Concluded)

RATIOS AMONG THE MECHANICAL PROPERTIES AT DIFFERENT LOCATIONS

AF33(615)-3580

Alloy and Temper	Samples: Section Thickness, in.	Samples: Cross-Sectional Area, in.²	Samples: Number	Direction*	Location†	Tensile Ultimate Stress	Tensile Yield Stress	Compressive Yield Stress	Shear Ultimate Stress	Bearing: Ultimate Stress e/D=1.5	Bearing: Ultimate Stress e/D=2.0	Bearing: Yield Stress e/D=1.5	Bearing: Yield Stress e/D=2.0
7075-T6510	3.090	24.3	340391	L	T/2/T/4	0.96	0.95	0.95	0.95	0.94	0.96	0.94	0.97
				L		--	--	--	--	0.97‡	0.94‡	0.96‡	0.95‡
				LT		0.95	0.95	0.96	0.97	0.95	1.00	0.92	0.95
				LT		--	--	--	--	0.94‡	0.92‡	0.95‡	0.95‡
7075-T73510	0.935	7.2	340292	L	W/2/W/4	0.98	0.98	0.97	0.98	1.00	1.00	1.00	0.99
				LT		0.99	0.99	0.98	0.99	--	--	--	--
	1.000	5.7	340439	L	W/2/W/4	0.97	0.96	0.97	0.98	0.96	0.98	0.97	0.97
				L		--	--	--	--				
				LT		0.99	0.99	0.98	0.98	--	--	--	--
	2.000	3.1	317948	L	D/2/D/4	0.99	0.98	0.98	0.99	1.01	0.98	1.02	1.00
	2.750	8.2	340440	L		0.97	0.97	0.96	0.98	0.98	0.97	0.97	0.96
				L		--	--	--	--	1.00‡	0.99‡	0.99‡	0.99‡
				LT		0.96	0.95	0.97	0.98	--	--	--	--
7079-T6510	0.500	4.2	340424**	L	W/2/W/4	0.99	0.99	0.99	1.00	1.00	0.99	1.00	0.98
				LT		1.02	1.00	0.99	1.01	--	--	--	--
7178-T6510	0.625	6.9	317997	L	W/2/W/4	0.99	0.99	0.98	1.00	0.98	1.01	0.99	0.96
				LT		0.98	0.99	0.99	1.00	--	--	--	--
	1.200	3.9	318139**	L	W/2/W/4	0.98	0.98	0.98	1.01	1.00	1.00	0.98	1.01
				L		--	--	--	--	1.00‡	0.99‡	0.99‡	1.00‡
				LT		0.99	0.99	--	--	--	--	--	--
	2.180	15.5	318140**	L	T/2/T/4	0.97	0.95	0.96	0.99	0.99	0.98	0.97	0.96
				L		--	--	--	--	0.97‡	1.00‡	0.95‡	1.01‡
				LT		1.00	0.98	0.96	0.99	0.96	1.01	0.95	0.95
				LT		--	--	--	--	0.94‡	0.95‡	0.96‡	0.95‡
Extrusions in the "Heat-Treated-by-User" Tempers													
2024-T42	2.562	6.4	340245	L	WT/2/WT/4	0.99	0.97	0.97	0.96	0.98	0.97	0.96	0.95
				L		--	--	--	--	0.94‡	0.97‡	1.00‡	0.94‡
				LT		0.88	0.96	0.95	--	--	--	--	--
2024-T62	2.562	6.4	340246	L	WT/2/WT/4	0.95	0.93	0.94	0.96	0.94	0.95	0.97	0.98
				L		--	--	--	--	1.00‡	0.94‡	1.01‡	0.95‡
				LT		0.94	0.93	0.92	--	--	--	--	--
6061-T62	1.605	3.9	318091	L	WT/2/WT/4	1.00	1.01	1.00	1.02	1.01	0.98	1.02	0.99
				LT		1.01	1.02	--	--	--	--	--	--
7075-T62	1.225	21.2	318098	L	W/2/W/4	0.97	0.96	0.96	0.99	0.99	1.02	0.98	1.01
				L		--	--	--	--	1.02‡	1.00‡	1.01‡	1.00‡
				LT		0.99	0.99	0.97	0.99	--	--	--	--
	2.250	4.1	318100	L	D/2/D/4	0.96	0.96	0.95	0.97	0.98	0.98	0.97	0.96
7075-T73	1.225	21.2	318099	L	W/2/W/4	0.97	0.96	0.96	0.98	1.01	0.98	0.99	0.98
				L		--	--	--	--	1.03‡	0.95‡	1.03‡	1.01‡
				LT		0.99	0.99	0.97	0.98	--	--	--	--
	2.250	4.1	318101	L	D/2/D/4	0.94	0.93	0.94	0.93	1.01	0.95	0.96	0.94

* L - Longitudinal; LT - Long-Transverse

† T - Thickness; W - Width; D - Diameter

‡ Edgewise bearing specimens; others - flatwise specimens

** Producer B; all others from Producer A

TABLE XXXI

RATIOS OF BEARING PROPERTIES IN THE EDGEWISE DIRECTION TO THOSE IN THE FLATWISE DIRECTION FOR ALUMINUM ALLOY EXTRUSIONS

[AF33(615)-3580]

Alloy and Temper	Sample: Section Thickness, in.	Sample: Cross-Sectional Area, in.²	Sample: Number	Location*	Direction†	Edgewise/Flatwise: BUS(E)/BUS(F) e/D=1.5	BUS(E)/BUS(F) e/D=2.0	BYS(E)/BYS(F) e/D=1.5	BYS(E)/BYS(F) e/D=2.0
Stress-Relieved Stretched Extrusions									
2024-T3510	1.150	5.6	318077	T/2,W/4	L	0.91	0.97	0.97	0.93
	1.200	5.9	317946	T/2,W/4	L	0.97	0.98	1.03	0.98
††	1.450	7.3	318021‡	T/2,W/4	L	0.97	0.99	0.97	0.98
				T/2,W/2	L	0.97	0.99	0.95	0.99
	1.705	4.8	340213	T/2,W/2	L	0.98	0.98	0.99	0.99
	2.520	8.8	318133‡	T/4,W/4	L	0.97	1.00	0.99	0.93
				T/2,W/2	L	0.97	0.96	0.96	0.93
	4.000	24.0	340214	T/4,W/4	L	0.92	0.88	0.99	1.00
					LT	0.90	0.95	0.88	0.92
				T/2,W/2	L	0.97	0.94	0.95	0.98
	2.760	29.1	318048	T/4,W/4	L	1.01	1.04	0.99	1.03
					LT	0.92	0.96	0.95	0.97
				T/2,W/2	L	0.94	0.96	0.97	0.96
	4.500	30.7	340386	T/4,W/4	L	0.96	0.97	0.99	0.98
					LT	0.95	0.95	0.95	0.98
				T/2,W/2	L	0.93	0.93	0.98	0.98
					LT	0.94	1.01	0.92	0.99
2024-T8510	1.150	5.6	318078	T/2,W/4	L	0.87	0.93	0.95	0.97
	1.200	5.9	317895	T/2,W/4	L	0.95	0.97	1.01	1.00
‡‡	1.450	7.3	318025‡	T/2,W/4	L	0.96	0.96	0.96	0.96
				T/2,W/2	L	0.96	0.96	0.98	0.98
	1.705	4.8	340169	T/2,W/2	L	0.99	0.95	0.99	0.98
	2.520	8.8	340420‡	T/4,W/4	L	0.94	0.98	0.97	1.02
				T/2,W/2	L	0.96	0.97	0.99	1.01
	2.760	29.1	318079	T/4,W/4	L	1.01	1.00	**	0.98
					LT	1.03	1.02	0.98	1.01
				T/2,W/2	L	0.96	0.96	**	1.03
	4.000	24.0	340225	T/4,W/4	L	0.95	0.95	1.00	1.01
					LT	0.[illegible]	0.84	0.98	1.01
				T/2,W/2	L	0.92	0.86	0.98	0.97
	4.500	30.7	340389	T/4,W/4	L	0.[illegible]	0.97	0.97	0.97
					LT	0.92	1.07	0.98	0.99
				T/2,W/2	L	0.88	0.92	0.97	0.99
					LT	0.90	0.90	0.98	0.98
6061-T6510	1.004	2.0	340423‡	T/2,W/4	L	0.95	1.00	0.97	--
				T/2,W/2	L	0.95	0.96	0.99	0.99
	1.240	2.7	317907	T/2,W/2	L	0.98	0.98	0.97	1.00
	1.350	4.4	317896	T/2,W/2	L	0.98	1.00	1.00	1.02
	3.000	15.0	340226	T/4,W/4	L	1.02	0.97	0.98	1.00
					LT	0.97	0.98	0.98	0.98
				T/2,W/2	L	0.98	0.97	0.97	0.97
	6.500	33.2	317897	D/4	L	1.00	0.99	1.00	1.00
					LT	0.99	0.97	0.99	0.99
7075-T6510	1.188	27.1	317860	T/2,W/4	L	0.86	0.93	0.90	0.97
					LT	0.87	0.90	0.89	0.93
				T/2,W/2	L	0.88	0.95	0.93	1.00
					LT	0.90	0.93	0.88	0.92
	2.190	17.0	318137‡	T/4,W/4	L	0.86	0.92	0.90	0.97
					LT	0.83	0.88	0.93	0.96
				T/2,W/2	L	0.86	0.92	0.96	0.99
					LT	0.85	0.89	0.91	0.95
	2.750	8.2	340404	T/4,W/4	L	1.01	0.98	1.02	1.00
				T/2,W/2	L	0.99	0.98	1.02	0.99
	3.040	13.8	318138‡	T/4,W/4	L	0.96	0.96	0.99	0.99
					LT	0.96	0.98	0.94	0.99
				T/2,W/2	L	0.96	0.96	1.00	0.99
	3.090	24.3	340391	T/4,W/4	L	0.89	0.93	0.95	0.99
					LT	0.90	0.97	0.93	1.00
				T/2,W/2	L	0.93	0.91	0.97	0.98
					LT	0.89	0.90	0.95	0.99
7075-T73510	1.000	5.7	340439	T/2,W/4	L	0.94	0.92	0.96	0.97
					LT	0.91	0.93	0.94	0.95
				T/2,W/2	L	0.98	0.97	1.02	1.02
	2.750	8.2	340440	T/4,W/4	L	1.00	0.98	0.99	0.98
				T/2,W/2	L	1.02	1.01	1.02	1.01
7178-T6510	1.200	3.9	318139‡	T/4,W/4	L	0.93	0.97	1.02	0.99
				T/2,W/2	L	0.93	0.96	1.02	0.94
	2.180	15.5	318140‡	T/4,W/4	L	0.90	0.90	0.98	0.98
					LT	0.85	0.95	0.93	0.98
				T/2,W/2	L	0.89	0.91	0.96	1.01
					LT	0.83	0.89	0.94	0.97
Extrusions in the "Heat-Treated-by-User" Tempers									
2024-T42	2.562	6.4	340245	T/4,W/4	L	0.98	0.97	0.96	0.98
				T/2,W/2	L	0.94	0.97	0.99	0.97
2024-T62	2.562	6.4	340246	T/4,W/4	L	0.95	0.97	0.98	0.99
				T/2,W/2	L	1.01	0.96	1.02	0.98
6061-T62	1.625	3.9	318091	T/2,W/2	L	0.98	0.99	0.98	0.98
7075-T62	1.225	21.2	318098	T/2,W/4	L	0.88	0.94	0.96	1.03
				T/2,W/2	L	0.90	0.92	0.99	1.02
					LT	0.87	0.91	0.64	0.99
	2.250	4.1	318100	D/4	L	1.02	1.01	1.00	1.02
7075-T73X	1.225	21.2	318099	T/2,W/4	L	0.86	0.94	0.96	0.96
				T/2,W/2	L	0.88	0.91	0.99	0.99
					LT	0.89	0.91	0.66	0.96
	2.250	4.1	318101	D/4	L	0.97	0.97	0.99	1.00

* T - Thickness; W - Width; D - Diameter
† L - Longitudinal; LT - Long-Transverse
‡ Producer B; all others from Producer A

** Bearing specimen failed before reaching yield stress (2 per cent offset)
†† Sample was in the T3511 temper
‡‡ Sample was in the T8511 temper

TABLE XXXII

RESULTS OF FRACTURE-TOUGHNESS TESTS OF SINGLE-EDGE-NOTCHED SPECIMENS OF STRESS-RELIEVED STRETCHED ALUMINUM ALLOY EXTRUSIONS

[AF53(615)-3580]

Sample			Specimen					At Initial Indication of Crack Growth								At 5 Per Cent Secant Offset							
Section Thickness, in.	Cross-Sectional Area, in.²	Number	Direction* and Number	Type (See Fig. 7)	Width (W), in.	Thickness (B), in.	Original Crack Length (a_o),† in.	Nature of Pop-in Indication*	Load (P), lb	Gross Stress (σ),# psi	Net Stress (σn),** psi	$\frac{\sigma_n}{\sigma_{ys}}$	K_Q,†† psi√in.	$\left(\frac{K_Q}{\sigma_{ys}}\right)^2$, in.	$\frac{B}{\left(\frac{K_Q}{\sigma_{ys}}\right)^2}$	Load (P), lb	Gross Stress (σ),# psi	Net Stress (σn),** psi	$\frac{\sigma_n}{\sigma_{ys}}$	K_Q,†† psi√in.	$\left(\frac{K_Q}{\sigma_{ys}}\right)^2$, in.	$\frac{B}{\left(\frac{K_Q}{\sigma_{ys}}\right)^2}$
													2014-T6510									
0.271	0.80	317994	L	2	1.502	0.271	0.52	I	4 600	11 500	44 700	0.70	27 300	0.18	1.48	5 100	12 500	49 600	0.78	30 800	0.23	1.19
			L	2	1.502	0.271	0.51	P	4 950	12 200	46 900	0.73	28 700	0.20	1.34	5 100	12 500	48 300	0.76	29 600	0.22	1.25
													2024-T3510									
0.255	2.8	317982	L	2	1.502	0.254	0.52	--	--	--	--	--	--	--	--	5 750	16 400	64 800	1.05	42 [illegible]	0.44	0.58
			L	2	1.501	0.254	0.53	--	--	--	--	--	--	--	--	4 900	14 000	55 600	0.92	35 200	0.32	0.79
			T	1	0.998	0.200	0.52	--	--	--	--	--	--	--	--	3 120	15 600	64 300	1.16	42 700	0.57	0.35
			T	1	0.996	0.200	0.55	--	--	--	--	--	--	--	--	2 090	10 800	43 400	0.87	29 300	0.16	1.25
0.510	10.1	317926	L	3	2.250	0.500	0.74	--	--	--	--	--	--	--	--	17 650	15 700	57 700	1.01	44 700	0.61	0.81
			L	3	2.250	0.500	0.74	--	--	--	--	--	--	--	--	16 500	14 700	54 000	0.95	41 500	0.53	0.95
0.642	5.8	317985	L	4	3.000	0.629	1.05	--	--	--	--	--	--	--	--	19 000	10 100	40 500	0.67	34 700	0.33	1.93
			L	4	3.000	0.628	1.05	--	--	--	--	--	--	--	--	18 300	9 700	39 100	0.64	33 500	0.30	2.09
			T	1	0.997	0.251	0.54	--	--	--	--	--	--	--	--	2 625	11 200	47 400	0.99	33 500	0.34	1.88
			T	1	0.997	0.252	0.54	--	--	--	--	--	--	--	--	2 700	11 400	48 400	1.01	35 800	0.35	1.82
1.000	7.3	318021††	L	4	3.000	1.000	1.15	--	--	--	--	--	--	--	--	28 800	9 600	44 600	0.73	37 800	0.39	2.59
			L	4	3.000	1.000	1.15	--	--	--	--	--	--	--	--	26 000	12 000	54 200	0.89	46 [illegible]	0.60	1.70
			T	1	0.997	0.575	0.55	--	--	--	--	--	--	--	--	5 [illegible]	10 800	49 500	0.99	23 500	0.35	1.69
			T	1	0.996	0.575	0.54	--	--	--	--	--	--	--	--	5 850	11 000	46 700	0.95	22 800	0.32	1.94
4.000	29.0	340214	L	6	6.000	1.879	2.06	--	--	--	--	--	--	--	--	120 800	10 714	41 900	0.67	51 000	0.67	2.80
			L	6	6.000	1.877	2.33	--	--	--	--	--	--	--	--	100 000	8 800	41 900	0.67	49 800	0.64	2.93
			T	2	1.501	0.500	0.48	--	--	--	--	--	--	--	--	7 150	9 526	35 800	0.71	20 800	0.19	2.60
			T	2	1.501	0.500	0.51	--	--	--	--	--	--	--	--	7 150	9 526	36 700	0.77	22 600	0.22	2.28
2.760	29.6	318048	L	5	4.500	1.300	1.34	--	--	--	--	--	--	--	--	79 200	13 600	48 000	0.82	51 700	0.71	1.68
			L	5	4.500	1.330	1.41	P	75 000	12 500	43 200	0.74	46 300	0.62	2.14	75 000	12 500	43 200	0.74	46 300	0.62	2.14
			T	1	0.998	0.574	0.54	--	--	--	--	--	--	--	--	5 850	11 000	46 600	1.07	23 100	0.28	1.93
			T	1	0.997	0.574	0.55	--	--	--	--	--	--	--	--	3 400	9 700	41 200	0.99	21 100	0.23	1.59

* L - longitudinal; T - Transverse

† At start of fracture-toughness test, i.e., after fatigue cracking

* Nature of Pop-in Indication: P - Clear Pop-in, below maximum load without significant prior deviation from linearity.
I - Initial significant deviation from linearity
M - Maximum load

\# P/AB

** Combined (P/A + Mc/I) stress at tip of crack

†† $K_Q^2 = \frac{P^2}{B} \left(\frac{1}{W}\right) \left\{7.59 \left(\frac{a}{W}\right) - 32\left(\frac{a}{W}\right)^2 + 117\left(\frac{a}{W}\right)^3\right\}$; ref: ASTM STP 411.

K_Q = Candidate value of plane-strain stress-intensity factor, psi$\sqrt{\text{in.}}$
P = load, lb, at unstable crack growth
B = thickness, in.
W = Gross width, in.

$a = a_o + \frac{K_Q^2}{6\pi\sigma_{ys}^2}$ = actual crack length, in., plus plastic zone correction factor, in.

σ_{ys} = tensile yield stress, psi

‡‡ Producer B; all others are Producer A

TABLE XXXII (Continued)

RESULTS OF FRACTURE-TOUGHNESS TESTS OF SURFACE-NOTCHED SPECIMENS OF STRESS-RELIEVED STRETCHED ALUMINUM ALLOY EXTRUSIONS

[AF53(615)-2980]

Sample			Specimen					At Initial Indication of Crack Growth								At 5 Per Cent Secant Offset							
Section Thickness, in.	Cross-Sectional Area, in.²	Number	Direction* and Number	Type (See Fig. 7)	Width (W), in.	Thickness (B), in.	Original Crack Length (a_o),† in.	Nature of Pop-in Indication‡	Load (P), lb	Gross Stress (σ),# psi	Net Stress (σ_n),** psi	$\frac{\sigma_n}{\sigma_{ys}}$	K_Q,†† psi$\sqrt{\text{in.}}$	$(\frac{K_Q}{\sigma_{ys}})^2$, in.	$\frac{B}{(\frac{K_Q}{\sigma_{ys}})^2}$	Load (P), lb	Gross Stress (σ),# psi	Net Stress (σ_n),** psi	$\frac{\sigma_n}{\sigma_{ys}}$	K_Q,†† psi$\sqrt{\text{in.}}$	$(\frac{K_Q}{\sigma_{ys}})^2$, in.	$\frac{B}{(\frac{K_Q}{\sigma_{ys}})^2}$
												2024-T6510										
0.255	2.8	317890	L1	2	1.502	0.219	0.52	I	3 600	10 600	43 300	0.61	26 200	0.14	1.60	3 780	11 500	45 500	0.64	27 600	0.15	1.68
			L2	2	1.501	0.219	0.53	I	3 500	10 600	43 400	0.61	26 200	0.14	1.60	3 790	11 500	47 000	0.66	28 500	0.18	1.76
			T1	1	0.937	0.199	0.53	P	2 060	11 000	44 800	0.62	21 400	0.09	2.26	2 060	11 000	44 900	0.62	21 400	0.09	2.26
			T2	1	0.939	0.200	0.55	P	1 920	10 200	45 400	0.63	21 500	0.09	2.26	1 940	10 300	45 800	0.63	21 700	0.09	2.27
0.510	10.1	317892	L1	3	2.250	0.500	0.78	P	10 375	9 200	36 600	0.55	27 000	0.16	3.05	10 100	9 000	35 600	0.53	26 300	0.16	3.24
			L2	3	2.250	0.500	0.78	I	9 750	8 700	34 400	0.52	25 300	0.14	3.46	9 750	8 700	34 400	0.52	25 300	0.14	3.46
0.647	5.8	317894	L1	4	3.000	0.627	1.01	I	12 625	6 700	25 500	0.37	21 700	0.10	6.35	13 125	7 000	26 500	0.38	22 600	0.11	5.87
			L3	4	3.000	0.613	0.99	I	12 375	6 700	24 900	0.36	21 200	0.09	6.50	12 950	7 000	26 000	0.38	22 200	0.10	6.02
			T1	1	0.938	0.217	0.34	F	1 660	8 000	33 800	0.50	15 900	0.06	3.93	1 680	8 300	35 000	0.52	15 500	0.06	3.54
			T2	1				Specimen failed in fatigue														
1.850	7.3	318025**	L1	4	3.000	1.010	1.02	P	27 600	9 100	35 100	0.51	30 000	0.19	5.35	27 600	9 100	35 100	0.51	30 000	0.19	5.35
			L3	4	3.000	1.010	1.01	P	27 200	9 000	34 100	0.49	29 200	0.18	5.65	27 300	9 000	34 300	0.50	29 300	0.18	5.61
			T1	1	0.937	0.373	0.33	M	3 310	9 500	38 500	0.56	18 300	0.08	8.95	3 310	9 500	38 500	0.56	18 300	0.08	8.95
			T2	1	0.935	0.377	0.31	M	3 570	10 100	37 700	0.57	18 100	0.07	5.13	3 570	10 100	37 700	0.57	18 100	0.0	5.13
2.760	20.6	318079	L1	5	4.500	1.282	1.54	--	--	--	--	--	--	--	--	41 600	7 200	28 100	0.44	29 200	0.21	5.80
			L2	5	4.500	1.282	1.55	--	--	--	--	--	--	--	--	42 600	7 400	28 500	0.45	29 100	0.22	5.81
			T1	1				Specimen failed in fatigue														
			T2	1	0.937	0.374	0.32	M	3 125	8 900	34 600	0.57	16 600	0.07	4.99	3 125	8 900	34 600	0.57	16 600	0.0	4.99
4.000	24.0	340225	L1	6	6.000	1.879	2.07	P	38 500	6 966	27 400	0.44	32 900	0.28	6.62	37 200	6 800	26 970	0.44	32 400	0.27	6.66
			L2	6	6.000	1.879	2.05	P	36 200	6 559	26 500	0.42	31 600	0.26	7.21	37 500	6 900	26 700	0.43	32 100	0.2	6.9
			T1	2	1.501	0.500	0.58	P	4 800	6 396	30 100	0.49	17 800	0.08	6.00	4 875	6 500	30 600	0.50	18 000	0.09	5.61
			T2	2	1.501	0.499	0.52	M	5 625	7 510	29 800	0.48	17 900	0.08	5.89	5 500	7 500	29 600	0.48	17 800	0.08	5.95
												6061-T6510										
0.375	8.6	317907	L1	2	1.499	0.380	0.52	--	--	--	--	--	--	--	--	4 900	8 600	34 200	0.81	21 000	0.25	1.52
			L2	2	1.498	0.379	0.51	--	--	--	--	--	--	--	--	5 950	10 500	40 500	0.96	25 300	0.38	1.04
			T1	2	1.499	0.375	0.50	--	--	--	--	--	--	--	--	5 [illegible]00	11 900	46 [illegible]00	1.12	28 600	0.51	0.73
			T2	2	1.499	0.375	0.52	--	--	--	--	--	--	--	--	6 500	11 600	45 300	1.10	29 300	0.54	0.70

* L - Longitudinal; T - Transverse

† At start of fracture-toughness test, i.e., after fatigue cracking

‡ Nature of Pop-in Indication: P - Clear Pop-in, below maximum load without significant prior deviation from linearity
I - Initial significant deviation from linearity
M - Maximum load

P/aB

** Combined (P/A + Mc/I) stress at tip of crack

†† $K_Q = \sigma \sqrt{\frac{a}{Q}} \left[1.99 \frac{a}{W} - 2.2 \left(\frac{a}{W}\right)^2 + 11.7 \left(\frac{a}{W}\right)^3\right]$; ref: ASTM STP 381

K_Q = Candidate value of plane-strain stress-intensity factor, psi$\sqrt{\text{in.}}$

P = load, lb, at unstable crack growth

B = thickness, in.

W = gross width, in.

$a = a_o + \frac{K_Q^2}{2\sigma_{ys}^2}$ = actual crack length, in., plus plastic-zone correction factor, in.

σ_{ys} = tensile yield stress, psi

‡‡ Producer B; all others are Producer A

TABLE XXXII (Concluded)

RESULTS OF FRACTURE-TOUGHNESS TESTS OF SINGLE-EDGE-NOTCHED SPECIMENS OF STRESS-RELIEVED STRETCHED ALUMINUM ALLOY EXTRUSIONS

[AF33(615)-3580]

Sample: Section Thickness, in.	Sample: Cross-Sectional Area, in.²	Sample: Number	Specimen: Direction* and Number	Specimen: Type (See Fig. 7)	Specimen: Width (W), in.	Specimen: Thickness (B), in.	Specimen: Original Crack Length (a_o),† in.	At Initial Indication of Crack Growth: Nature of Pop-in Indications‡	Load (P), lb	Gross Stress (σ),# psi	Net Stress (σ_n),** psi	$\frac{\sigma_n}{\sigma_{ys}}$	K_Q,†† psi $\sqrt{in.}$	$(\frac{K_Q}{\sigma_{ys}})^2$, in.	$\frac{B}{(\frac{K_Q}{\sigma_{ys}})^2}$	At 5 Per Cent Secant Offset: Load (P), lb	Gross Stress (σ),# psi	Net Stress (σ_n),** psi	$\frac{\sigma_n}{\sigma_{ys}}$	K_Q,†† psi $\sqrt{in.}$	$(\frac{K_Q}{\sigma_{ys}})^2$, in.	$\frac{B}{(\frac{K_Q}{\sigma_{ys}})^2}$
6.500	55.2	317897	L1	6	6.000	1.007	2.17	—	—	—	—	—	—	—	—	57 200	9 500	40 000	0.88	45 100	1.15	0.87
			L2	6	6.000	1.003	2.16	—	—	—	—	—	—	—	—	50 600	8 400	35 800	0.77	42 800	0.88	1.14
			T1	2	1.500	0.374	0.57	—	—	—	—	—	—	—	—	5 600	8 900	45 800	1.01	23 200	0.24	0.84
			T2	2	1.499	0.374	0.55	—	—	—	—	—	—	—	—	5 300	9 500	40 900	1.08	23 800	0.25	0.85
								7075-T6510														
0.438	7.2	317859	L1	4	3.000	0.390	1.01	P	9 250	7 900	30 900	0.58	26 200	0.11	3.66	9 350	8 000	31 300	0.59	26 500	0.11	3.98
			L2	4	3.000	0.401	1.06	P	10 150	8 400	34 400	0.65	29 100	0.13	3.05	10 150	8 400	34 400	0.65	29 100	0.13	3.05
			T1	3	2.250	0.390	0.86	P	7 300	6 500	38 500	0.50	27 800	0.13	3.04	7 300	6 500	38 500	0.50	27 800	0.13	3.04
			T2	3	2.250	0.390	0.84	P	7 550	8 600	38 500	0.49	27 800	0.13	3.04	7 550	8 600	38 500	0.49	27 800	0.13	3.04
1.188	27.1	317860	L1	6	6.000	1.120	2.18	P	32 800	4 900	20 800	0.26	28 600	0.10	11.79	32 800	4 900	20 800	0.26	28 600	0.10	11.79
			L2	6	6.000	1.136	2.28	P	31 600	4 600	21 200	0.27	29 900	0.10	11.66	31 600	4 600	21 200	0.27	29 900	0.10	11.66
			T1	5	4.500	1.135	1.53	P	30 800	6 000	23 300	0.31	29 100	0.10	10.89	30 800	6 000	23 300	0.31	29 100	0.10	10.89
			T2	5	4.500	1.135	1.54	P	29 000	5 700	22 100	0.30	28 900	0.08	12.05	30 200	5 900	23 000	0.31	29 800	0.10	11.00
2.190	17.0	318137**	L1	4	3.000	1.010	1.00	I	24 300	8 300	31 300	0.41	26 700	0.12	8.19	26 200	8 600	32 400	0.43	27 100	0.13	7.62
			L2	4	3.000	1.010	1.00	I	25 400	8 400	31 400	0.41	26 800	0.12	8.19	27 200	9 000	33 700	0.44	28 100	0.14	7.00
			T1	2	1.501	1.501	0.51	P	7 450	9 900	38 200	0.56	23 100	0.11	4.44	7 500	10 000	38 500	0.56	23 200	0.11	4.46
			T2	2	1.500	0.500	0.54	M	6 900	9 200	38 600	0.56	23 200	0.11	4.41	6 900	9 200	38 600	0.56	23 200	0.11	4.41
3.500	13.2	318138**	L1	5	4.500	1.446	1.51	P	42 800	6 600	24 900	0.31	25 900	0.11	13.51	42 800	6 600	24 900	0.31	25 200	0.11	13.51
			L2	5	4.500	1.444	1.54	P	52 500	8 100	31 500	0.40	32 700	0.17	8.45	52 500	8 200	32 100	0.41	33 100	0.18	7.50
			T1	1	0.939	0.378	0.32	I	3 750	10 000	40 900	0.61	19 600	0.09	4.46	4 250	12 000	46 800	0.69	21 100	0.11	4.00
			T2	1	0.939	0.376	0.34	I	3 800	10 000	45 600	0.68	21 800	0.11	3.56	3 850	10 000	46 000	0.69	22 000	0.11	3.51
								7075-T7310														
0.438	7.2	317910	L1	4	3.000	0.396	1.01	P	12 750	10 800	42 100	0.69	26 100	0.09	1.98	12 750	10 800	42 100	0.69	26 100	0.09	1.98
			L2	4	3.000	0.400	1.04	P	12 650	10 600	41 800	0.68	25 500	0.08	1.82	12 650	10 600	41 800	0.68	25 500	0.08	1.82
			T1	3	2.250	0.400	0.78	P	9 600	10 700	42 700	0.69	31 400	0.12	1.46	9 600	10 700	42 700	0.69	31 400	0.12	1.46
			T2	3	2.250	0.400	0.76	P	9 750	10 800	43 200	0.69	32 500	0.13	1.39	9 750	10 800	43 200	0.69	32 500	0.13	1.39
								7178-T6510														
0.625	6.0	317907	L1	3	6.250	0.620		P	9 700	7 700	24 500	0.29	18 100	0.04	14.01	9 700	7 700	24 500	0.29	18 100	0.04	14.01
			L2				Specimen failed in fatigue															
			T1				Specimen failed in fatigue															
			T2	2	1.500	0.374		P	5 750	6 700	30 600	0.38	16 000	0.05	7.51	5 750	6 700	30 600	0.38	16 000	0.05	7.51
2.190	15.6	318140**	L1	4	3.000	1.010		P	18 600	6 100	23 300	0.28	19 800	0.05	17.91	18 600	6 100	23 300	0.28	19 800	0.05	17.91
			L2	4	3.000	1.010		I	21 000	6 900	26 300	0.32	22 500	0.07	15.19	21 000	6 900	26 300	0.32	22 500	0.07	15.19
			T1	2	1.500	0.498		M	6 800	7 600	30 000	0.41	18 500	0.06	8.23	6 800	7 600	30 000	0.41	18 500	0.06	8.23
			T2	2	1.500	0.500		P	6 000	8 000	30 900	0.41	18 900	0.06	8.16	5 700	8 400	32 400	0.43	19 500	0.07	7.41

* L - Longitudinal; T - Transverse

† At start of fracture-toughness test, i.e., after fatigue cracking

‡ Nature of Pop-in Indications: P - Clear Pop-in, below maximum load without significant prior deviation from linearity
I - Initial significant deviation from linearity
M - Maximum load

P/aB

** Combined (P/A + Mc/I) stress at tip of crack

†† $K_Q = \frac{P}{BW^{1/2}}\left[29.6\left(\frac{a}{W}\right)^{1/2} - 185\left(\frac{a}{W}\right)^{3/2} + 655\left(\frac{a}{W}\right)^{5/2} - \ldots\right]$, ref: ASTM STP #11

K_Q = candidate value of plane-strain stress-intensity factor, psi $\sqrt{in.}$
P = load, lb, at incipient crack growth
B = thickness, in.
W = Gross width, in.

$a = a_o + \frac{K_Q^2}{6\sigma_{ys}^2}$ = actual crack length, in., plus plastic-zone correction factor, in.

σ_{ys} = tensile yield stress, psi

‡‡ Producer B; all others are Producer A

TABLE XXXIII

RESULTS OF FRACTURE-TOUGHNESS TESTS OF SINGLE-EDGE-NOTCHED SPECIMENS OF ALUMINUM ALLOY EXTRUSIONS IN THE "HEAT-TREATED-ST-USEP" TEMPER

[AF33(615)-3580]

Sample			Specimen					At Initial Indication of Crack Growth								At 4 Per Cent Secant Offset					
Section Thickness, in.	Cross-Sectional Area, in.²	Number	Direction* and Number	Type (See Fig. 7)	Width (W), in.	Thickness (B), in.	Original Crack Length (a_o),† in.	Nature of Pop-in Indication‡	Load (P), lb	Gross Stress (σ),# psi	Net Stress (σ_n),** psi	σ_n/σ_{ys}	K_Q,†† psi$\sqrt{\text{in.}}$	$\left(\frac{K_Q}{\sigma_{ys}}\right)^2$, in.	$\frac{B}{\left(\frac{K_Q}{\sigma_{ys}}\right)^2}$	Load (P), lb	Gross Stress (σ),# psi	Net Stress (σ_n),** psi	σ_n/σ_{ys}	K_Q,†† psi$\sqrt{\text{in.}}$	$\left(\frac{K_Q}{\sigma_{ys}}\right)^2$, in.	$\frac{B}{\left(\frac{K_Q}{\sigma_{ys}}\right)^2}$
													2014-T62								
0.300	6.3	318084	L1	1	0.995	0.296	0.33	I	5 780	13 700	55 600	0.83	26 900	0.16	1.84	4 100	14 800	60 400	0.90	29 400	0.19	1.58
			L2	1	0.998	0.296	0.32	P	5 920	14 100	58 700	0.81	28 700	0.16	1.88	4 600	14 700	56 950	0.85	27 200	0.17	1.72
			T1	1	0.995	0.299	0.32	I	5 550	13 300	52 100	0.82	25 300	0.16	1.69	5 600	14 300	56 000	0.80	27 400	0.19	1.46
			T2	1	0.995	0.298	0.31	P	5 870	15 500	57 800	0.91	28 500	0.20	1.55	5 870	15 500	57 800	0.91	28 500	0.20	1.55
													7075-T62								
1.225	21.2	318098**	L1	5	4.500	1.158	1.41	P	28 400	5 500	18 800	0.25	19 700	0.07	16.84	28 400	5 500	18 800	0.25	19 700	0.0	16.84
			L2	5	4.500	1.158	1.60	--	--	--	--	--	--	--	--	22 200	4 300	17 600	0.29	18 000	0.04	20.06
			T1	5	4.499	0.500	0.52	I	7 000	9 300	37 100	0.52	22 300	0.10	5.12	7 500	10 000	39 700	0.56	24 000	0.11	4.44
			T2	5	4.499	0.500	0.52	I	7 100	9 500	37 600	0.53	22 800	0.10	4.97	7 575	9 800	39 100	0.55	23 500	0.11	4.70
1.225	21.2	318099**	L1	5	4.500	1.158	1.61	--	--	--	--	--	--	--	--	32 000	6 100	25 500	0.32	26 300	0.16	7.42
			L2	5	4.500	1.157	1.45	--	--	--	--	--	--	--	--	32 400	8 100	28 800	0.41	30 100	0.20	5.76
			T1	5	4.499	0.501	0.51	I	6 400	8 500	35 100	0.60	23 200	0.13	3.91	6 700	8 900	40 900	0.63	24 400	0.14	3.67
			T2	5	1.500	0.500	0.50	P	8 125	10 800	40 600	0.63	24 800	0.15	3.44	8 125	10 800	40 600	0.63	24 800	0.15	3.44

* L - Longitudinal, T - Transverse

† At start of fracture-toughness test, i.e., after fatigue cracking

‡ Nature of Pop-in Indication: P - Clear Pop-in, below maximum load without significant prior deviation from linearity
I - Initial significant deviation from linearity

\# P/A

** Combined (P/A + Mc/I) stress at tip of crack

†† $K_Q^2 = \frac{P^2}{B\,a}\left[1.99 \frac{a}{W} - 32\left(\frac{a}{W}\right)^2 + 117\left(\frac{a}{W}\right)^3\right]$; ref: ASTM STP 411

K_Q = Candidate value of plane-strain stress-intensity factor, psi$\sqrt{\text{in.}}$
P = load, lb, at unstable crack growth
B = thickness, in.
W = Gross width, in.

$a = a_o + \frac{K_Q^2}{2\pi\sigma_{ys}^2}$ = actual crack length, in., plus plastic-zone correction factor, in.

σ_{ys} = tensile yield stress, psi

‡‡ Producer B: all stresses are Producer A

TABLE XXXIV

RESISTANCE TO STRESS-CORROSION CRACKING OF STRESS-RELIEVED STRETCHED ALUMINUM ALLOY EXTRUSIONS

[AF33(615)-3580]

Alloy	Section Thickness, in.	Number	Exposure: 3.5% NaCl Solution by Alternate Immersion Stressed - 75% Yield Strength — Longitudinal F/N†	Longitudinal Days††	Longitudinal Per cent Loss in Tensile Strength†††	Long Transverse F/N†	Long Transverse Days††	Long Transverse Per cent Loss in Tensile Strength†††	Short Transverse F/N†	Short Transverse Days††
2014-T6510	0.250	340154	0/2	75	--	2/2	2,2***	--	--	--
	0.628	340486							--	--
	1.755	340487								
2024-T3510	0.255	317942	0/2	84	29	0/2	84	22	--	--
	0.510	317926	0/2	84	34	0/2	84	25	--	--
	0.950	317944*	0/2	84	18	1/2	31 (OK 84)	42	2/2	6,6
	1.200	317946*	0/2	84	14	2/2	7,7	--	2/2	6,6
	2.760	318048	0/2	84	23	2/2	12,26	--	1/2	40 (OK 84)
	4.000	340214**	0/2	75		2/2	2,5	--	2/2	84,84§
2024-T8510	0.255	317890	0/2	84	5	0/2	84	8	--	--
	0.510	317892	0/2	84	8	0/2	84	7	--	--
	0.950	317893*	0/2	84	6	0/2	84	9	0/2	84
	1.200	317895*	0/2	84	6	0/2	84	10	0/2	84
	2.760	318079	0/2	84	9	0/2	84	17	0/2	84
	4.000	340225**	0/2	75		0/2	75		0/2	84
6061-T6510	0.315	317953	0/2	84	0	0/2	84	0	--	--
	0.375	317927	0/2	84	4	0/2	84	1	--	--
	1.240	317907	0/2	84	0	0/2	84	0	--	--
	1.960	317896	0/2	84	0	0/2	84	0	--	--
	3.000	340227	0/2	75		0/2	75		0/2	84
7075-T6510	0.375	317954	0/2	84	3	1/2	17 (OK 84)	7	--	--
	0.438	317859	0/2	84	3	0/2	84	4	--	--
	0.975	340155*	0/2	28		0/2	28			
	1.188	317860*	0/2	84	3	0/2	84	3	2/2	6,6
	2.190	318137	0/2	84	7	1/2	8 (OK 84)	18	2/2	4,4
	3.040	318133	0/2	84	5	2/2	4,4	--	2/2	9,9
7075-T73510	0.375	317900	0/2	84	0	0/2	84	0	--	--
	0.438	317910	0/2	84	2	0/2	84	3	--	--
7075-T73510	0.975	340292*	0/2	28		0/2	28			
	3.090	340392								
7079-T6510	0.251	340253	0/2	28		0/2	28		--	--
									--	--
7178-T6510	0.625	317997	0/2	84	9	1/2	81 (OK 84)	14	--	--
	1.200	318139*	0/2	84	10	2/2	3,7	--	2/2	4,4
	2.190	318140	0/2	84	11	2/2	7,7	--	2/2	4,4

* F/N denotes number of specimens failed over number exposed

†† Tests in progress for periods shown, with maximum duration of 84 days

††† Results are average values for tension tests of specimens which did not fail by stress-corrosion cracking.

* Short transverse yield strengths determined by tests of duplicate 0.050" diameter tension specimens

** The directionality of these sections is being determined metallographically.

*** Failure occurred outside the reduced section beneath the protective coating used to isolate all parts of the stressing frame.

§ Accumulated corrosion products prevented detection of these failures until specimens were chemically cleaned at termination of the exposure period.

TABLE XXXV

RESISTANCE TO STRESS-CORROSION CRACKING OF ALUMINUM ALLOY EXTRUSIONS IN THE "HEAT-TREATED-BY-USER" TEMPER

[AF33(615)-3580]

Alloy	Section Thickness, in.	Number	Exposure: 3.5% NaCl Solution by Alternate Immersion Stressed - 75% Yield Strength							
			Longitudinal			Long Transverse			Short Transverse	
			F/N†	Days††	Per cent Loss in Tensile Strength†††	F/N†	Days††	Per cent Loss in Tensile Strength†††	F/N†	Days††
2014-T62	0.300	318084	1/2	24§(OK 84)	11	1/2	24§(OK 84)	13	--	--
2024-T42	0.430	340241	0/2	28		0/2	28		--	--
	2.562	340245	0/2	28		2/2	28	2,2	2/2	46,46§§
2024-T62	0.430	340242	0/2	28		0/2	28		--	--
	2.562	340246	0/2	28		0/2	28		0/2	46
6061-T62	0.246	318090	0/2	84	0	0/2	84		--	--
	1.625	318091**	0/2	84	2	0/2	84		0/2	84
7075-T6	0.350	318096	0/2	84	6	0/2	84	7	--	--
	1.225	318098**	0/2	84	4	0/2	84	6	2/2	7,7
7075-T73X	0.350	318097	0/2	84	2	0/2	84	4	--	--
	1.225	318098**	0/2	84	1	0/2	84	5	0/2	84
7178-T6	0.403	340249	0/2	28		0/2	28		--	--

** Short transverse yield strengths determined by tests of duplicate 0.050" diameter tension specimens

† F/N denotes number of specimens failed over number exposed.

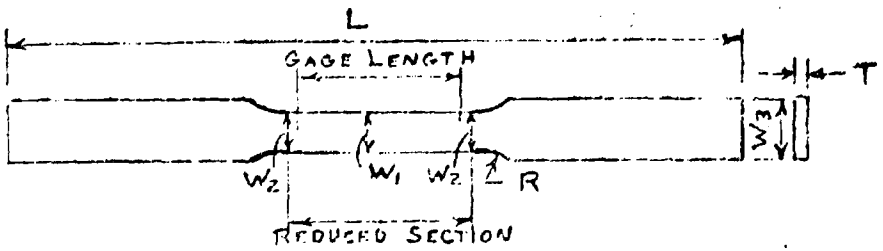
†† Tests in progress for periods shown, with maximum duration of 84 days

††† Results are average values for tension tests of specimens which did not fail by stress-corrosion cracking.

*** Short transverse yield strengths determined by tests of duplicate 0.050" diameter tension specimens

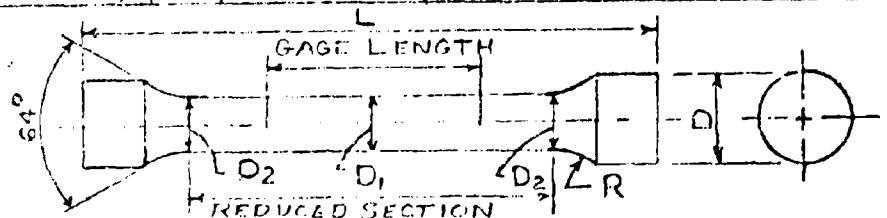
§ Failure occurred outside the reduced section beneath the protective coating used to isolate all parts of the stressing frame.

§§ Accumulated corrosion products prevented ready detection of these failures. Specimens were chemically cleaned to confirm suspected failure.



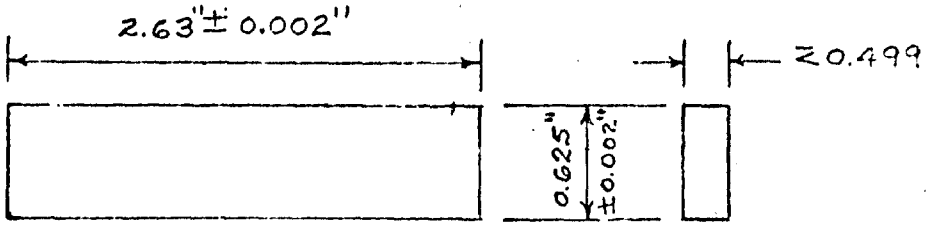
SHEET-TYPE SPECIMENS

WIDTH, IN.			GAGE LENGTH, IN.	REDUCED SECTION LENGTH, IN.	RADIUS (R), IN.	THICKNESS (T), IN.	LENGTH (L), IN.
W_1	W_2	W_3					
0.500 ± 0.010	W_1 + 0.005 / 0.003	3/4	2.000 ± 0.002	2-1/4	7/8	≥ 0.499	9 MIN.
0.250 ± 0.002	W_1 + 0.003 / 0.001	3/8	1.000 ± 0.002	1-1/4	3/8	≥ 0.250	4 MIN.
0.125 ± 0.001	W_1 + 0.004 / 0.002	3/16	0.500 ± 0.002	5/8	3/16	≥ 0.125	2-1/4 MIN.

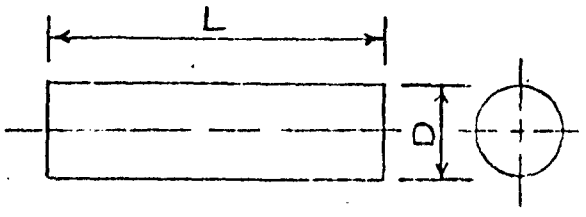


TAPERED-SEAT SPECIMENS

DIAMETER, IN.		GAGE LENGTH, IN.	REDUCED SECTION LENGTH, IN.	RADIUS (R), IN.	DIAMETER (D), IN.	LENGTH (L), IN.
D_1	D_2					
0.500 ± 0.005	D_1 + 0.005 / 0.003	2.000 ± 0.002	3-1/8	3/8	3/4	4-3/4
0.357 ± 0.004	D_1 + 0.004 / 0.003	1.400 ± 0.002	2-15/64	17/64	17/32	3-3/8
0.250 ± 0.003	D_1 + 0.002 / 0.001	1.000 ± 0.002	1-9/16	3/16	3/8	2-3/8
0.160 ± 0.002	D_1 + 0.002 / 0.001	0.640 ± 0.002	1	0.120	15/64	1-1/2
0.125 ± 0.001	D_1 + 0.002 / 0.001	0.500 ± 0.002	25/32	3/32	3/16	1-1/4

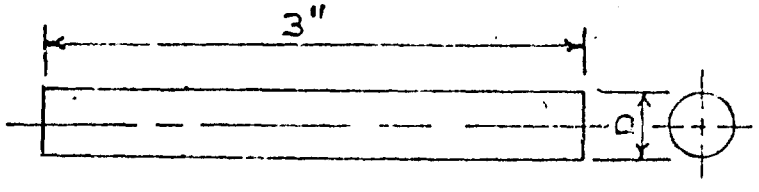


Sheet-Type Compressive Specimen



NOMINAL DIAM, IN.	D, IN.	L, IN.
1/2	0.4980 / 0.4950	1-29/32 / 1-27/32
7/16	0.4390 / 0.4360	1-21/32 / 1-3/8
3/8	0.3745 / 0.3733	1-17/32 / 1-1/2

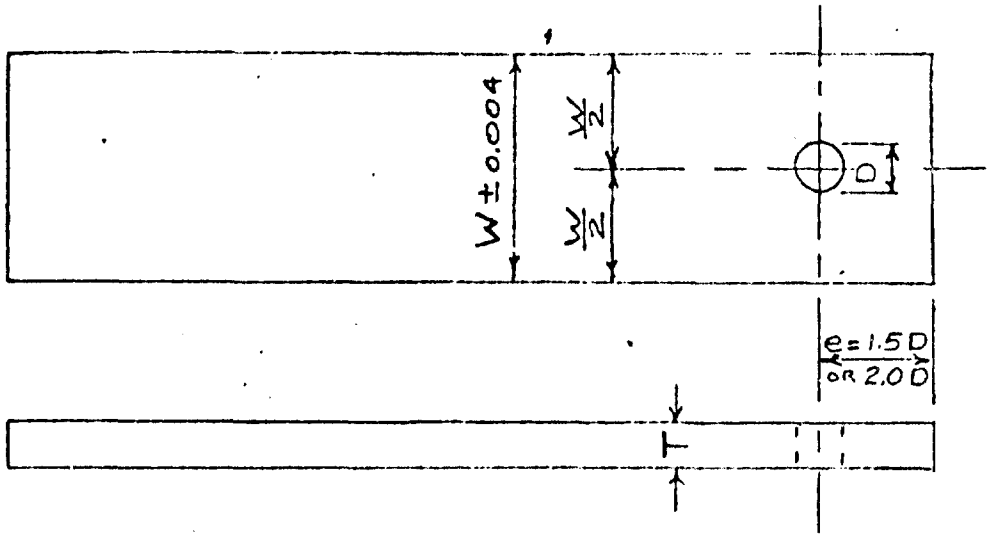
Round Compressive Specimen



NOMINAL DIAM, IN.	D, IN.
3/8	0.3730 / 0.3720
1/4	0.2490 / 0.2480
3/16	0.1865 / 0.1855

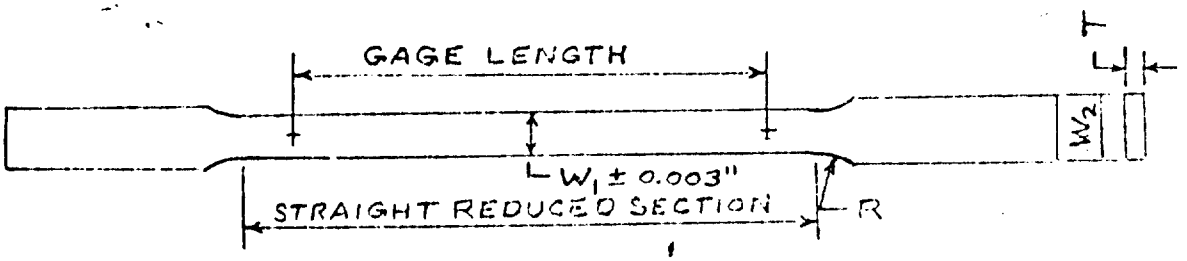
Shear Specimen

Fig. 2. General Dimensions of Compressive and Shear Specimens



TYPE	T, IN.	W, IN.	D, IN.
A	0.063	1	$\frac{0.2500}{0.2505}$
B	0.040 - 0.074	1-1/2	$\frac{0.2500}{0.2505}$
C	0.075 - 0.109	1-1/2	$\frac{0.3750}{0.3755}$
D	0.110 - 0.250	2	$\frac{0.5000}{0.5005}$

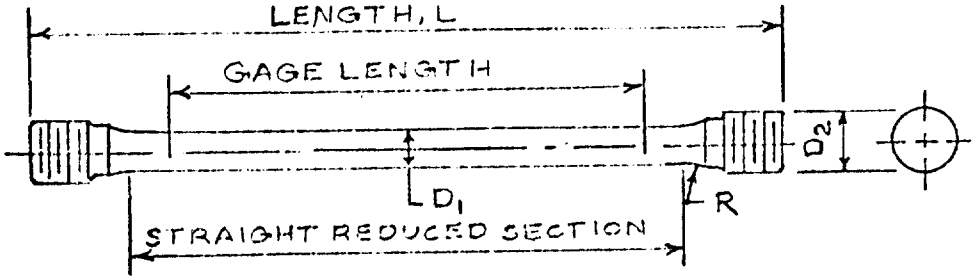
Fig. 3. General Dimensions of Bearing Specimens



WIDTH, IN.		GAGE LENGTH, IN.	REDUCED SECTION LENGTH, IN.	RADIUS (R), IN.	THICKNESS, (T), IN.
W_1	W_2				
0.500 ± 0.003	3/4	6.000 ± 0.002 *	7 *	7/8	≅ 0.499
0.250 ± 0.002	3/8	1.000 ± 0.002	1-1/2	3/8	≅ 0.250

* FOR SOME LONG-TRANSVERSE SPECIMENS, GAGE LENGTHS – 4 IN. REDUCED-SECTION LENGTHS – 5 IN.

Sheet-Type Specimens

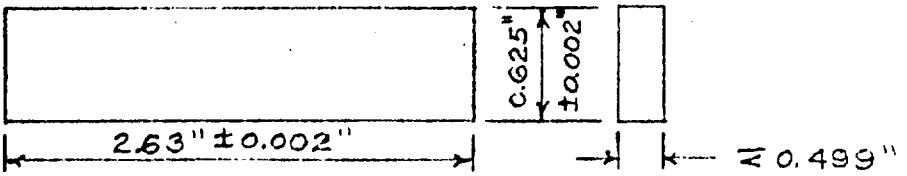


DIAMETER, IN.		GAGE LENGTH, IN.	REDUCED SECTION LENGTH, IN.	RADIUS (R), IN.	LENGTH (L), IN.
D_1	D_2				
0.500 ± 0.003	3/4	6.000 ± 0.002	7	5/8	9-1/2
0.500 ± 0.003	3/4	4.000 ± 0.002	5	5/8	7-1/2
0.500 ± 0.003	3/4	2.000 ± 0.002	3 +	5/8	5-1/2 +
0.438 ± 0.003	5/8	2.000 ± 0.002	2-7/8 +	≥ D_1	5-1/4 +
0.375 ± 0.003	9/16	2.000 ± 0.002	2-3/4	≥ D_1	5

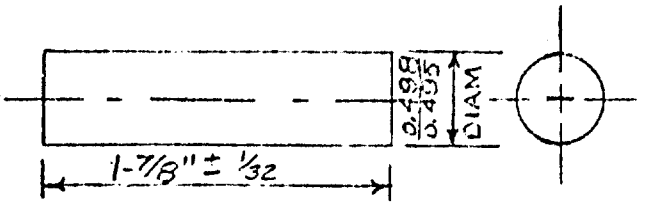
\+ FOR SHORTER LONG-TRANSVERSE SPECIMENS, GAGE LENGTHS – 1 IN., REDUCED-SECTION LENGTHS – 1 IN. PLUS TWO TIMES D_1

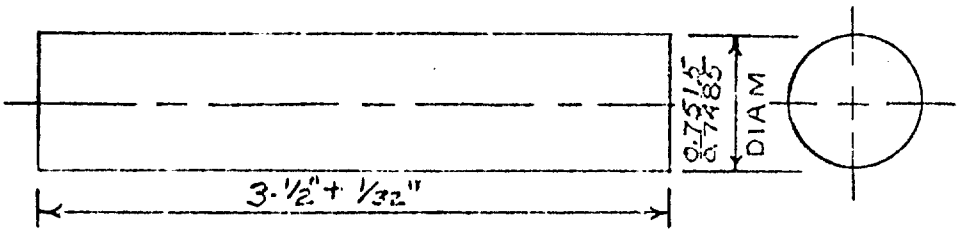
Round Specimens

Fig. 4 General Dimensions of Tensile Specimens For Modulus and Stress-Strain Tests



Sheet-Type Specimen





Round Specimens

Fig. 5 General Dimensions of Compressive Specimens For Modulus and Stress-Strain Tests

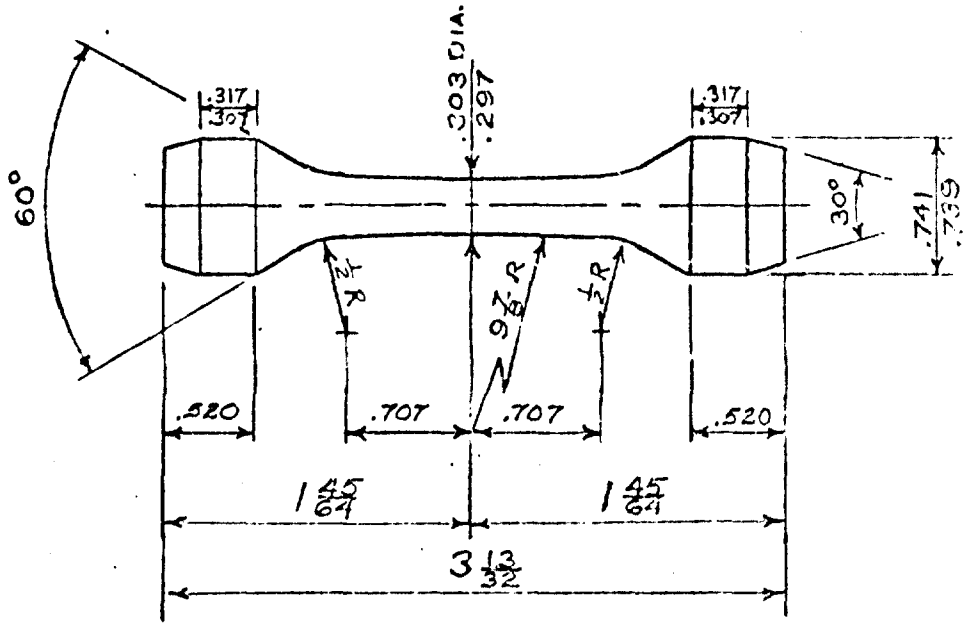
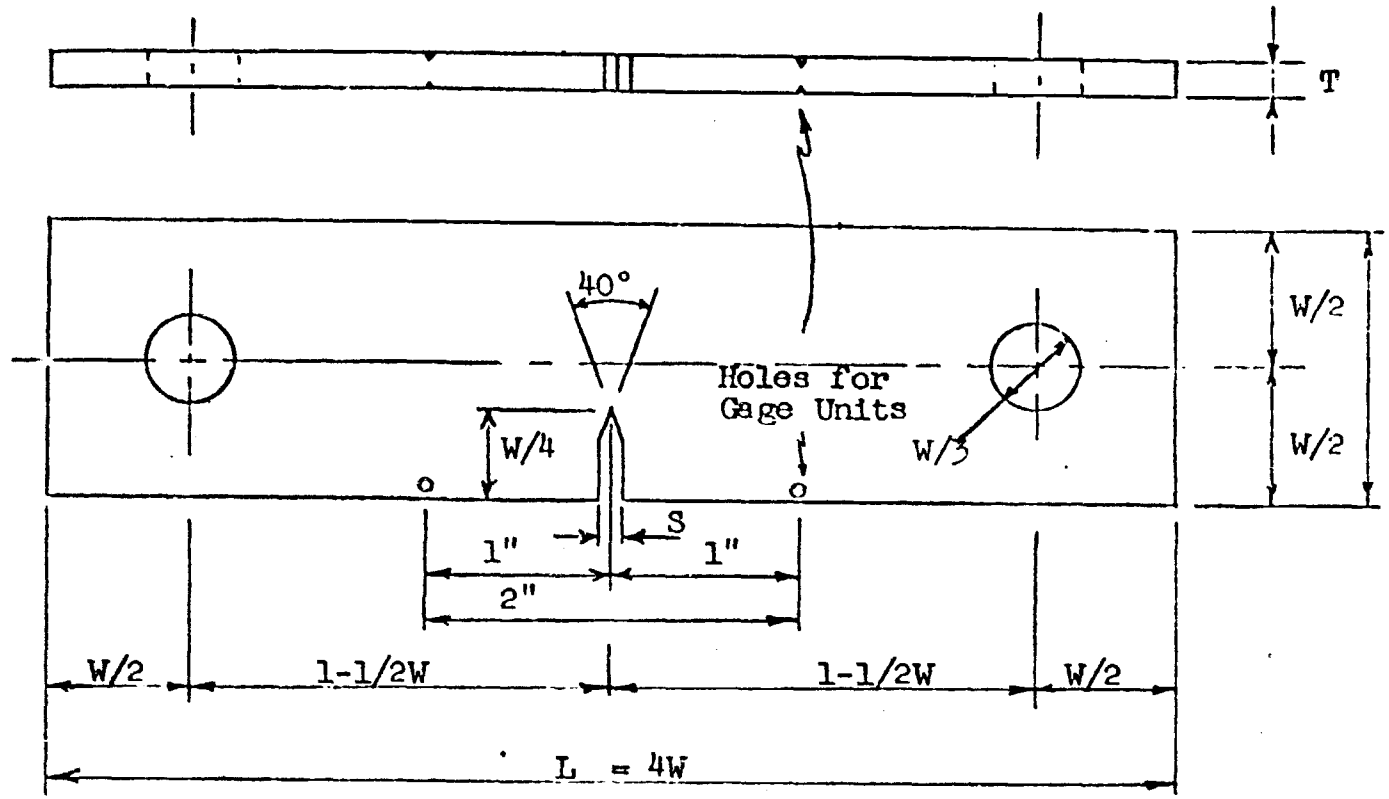


Fig. 6 Axial-Stress Fatigue Specimen

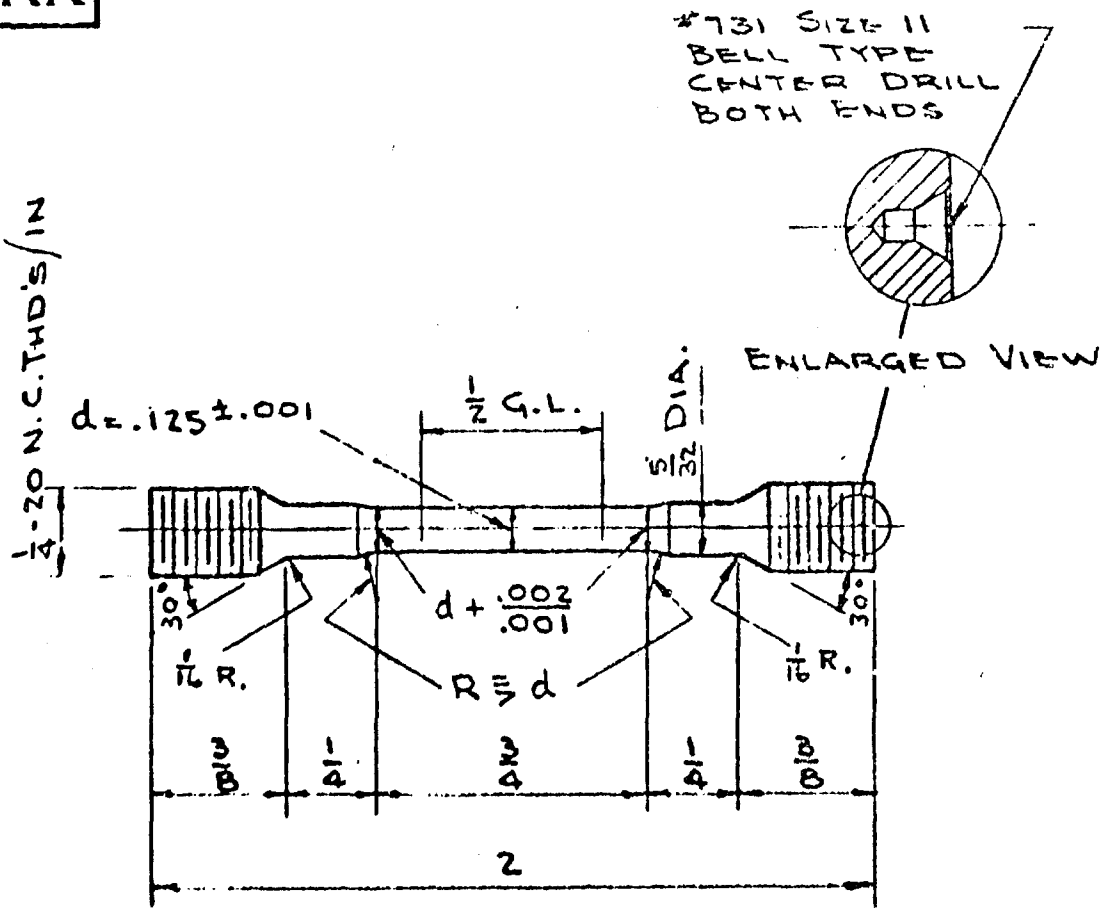


Type	W	T	L	S
1	15/16	3/16-5/16	3-3/4	1/8
2	1-1/2	3/16-1/2	6	1/8
3	2-1/4	3/8- 3/4	9	5/16
4	3	3/8-1	12	5/16
5	4-1/2	1-1/8-1-1/2	18	5/16
6	6	1 - 2	24	5/16

Fig. 7 Single-Edge-Notched Fracture-Toughness Specimens.

Fig. 7

L-7034-RK



SPECIMEN —— [ ] REQ'D

MACHINING SETUP	D-6996-RK
TOOL BIT	D-7647-RK
CENTER & FACE TOOL	D-7444-RK
TEMPLATE	D-6989-RK
DRIVER	D-6981-RK

DATE	NO.	REVISION RECORD	DR	CK
1-15-58		SUPERSEDES D-2276-RK		

ALUMINUM COMPANY OF AMERICA
ALCOA RESEARCH LABORATORIES
MECHANICAL ENGINEERING DIVISION NEW KENSINGTON, PA.

MECHANICAL TESTING DIVISION.

3/8-DIA. THREADED END TENSILE SPECIMEN — DETAILS

IN CHG OF E.S. HOWARTH		DESIGN	
SCALE 2/4=1'-0	DATE 1-15-58	DRAWN	R. McCLELLAN
L-7034-RK		CHECK	
		APPR	

FR 34 X-1264

Fig. 8

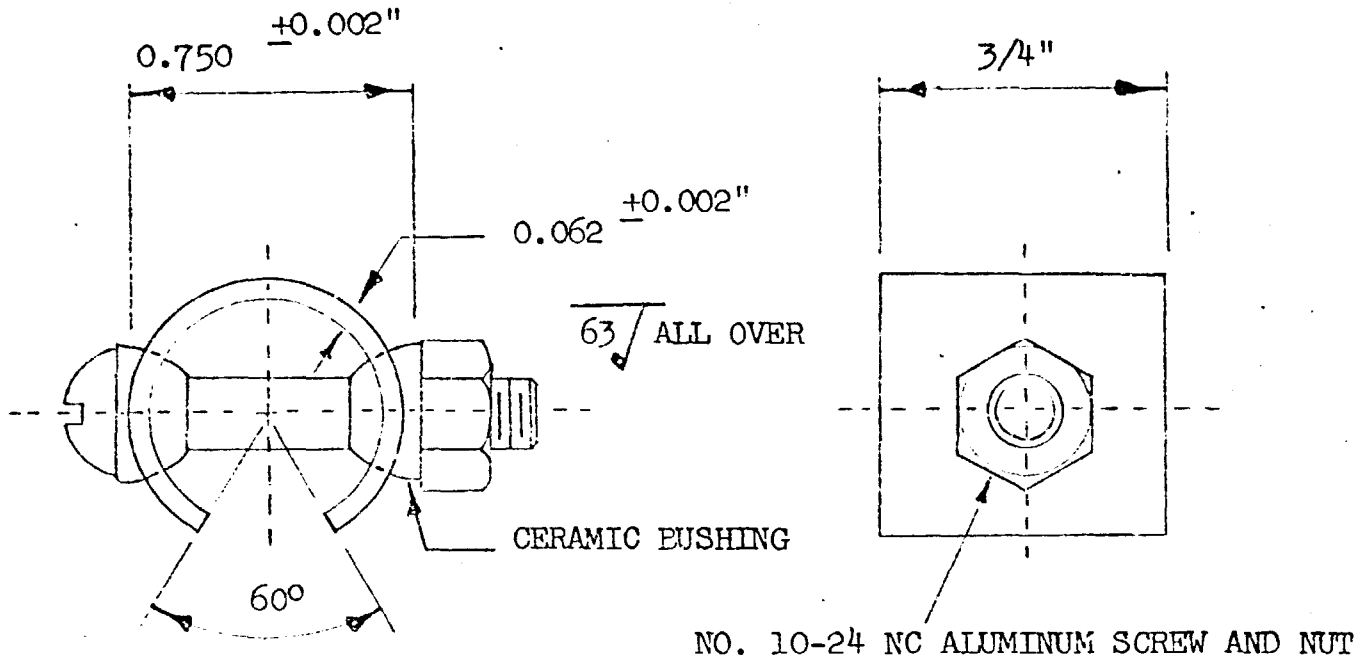
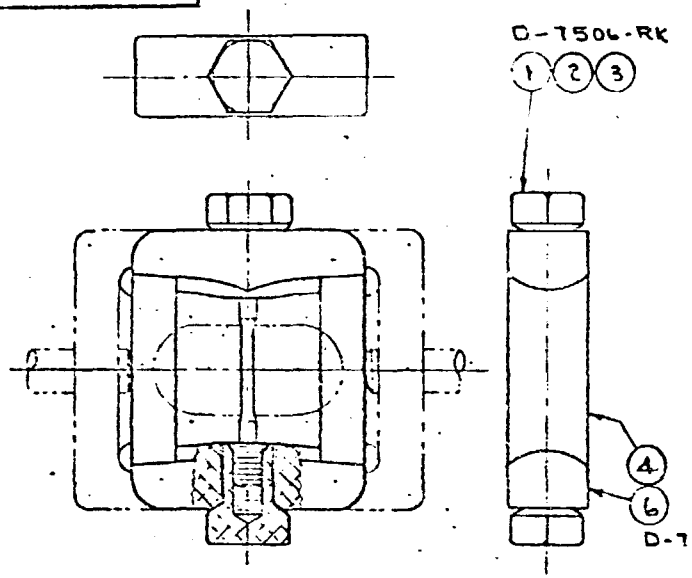


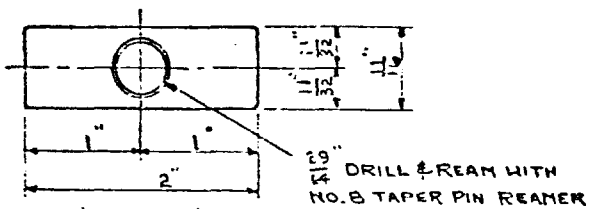
FIGURE 9. C-RING ASSEMBLY FOR -TRA... ...ESS-CORROSION TESTS

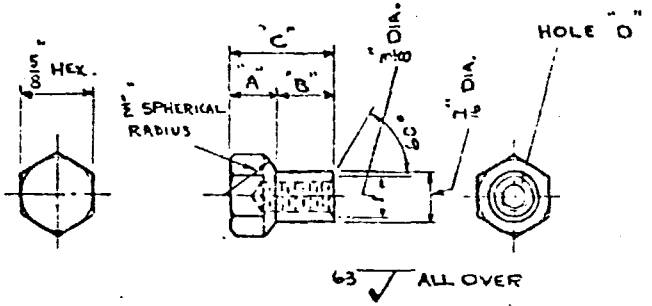
Fig. 9

D-[illegible]6-RK



ASSEMBLY



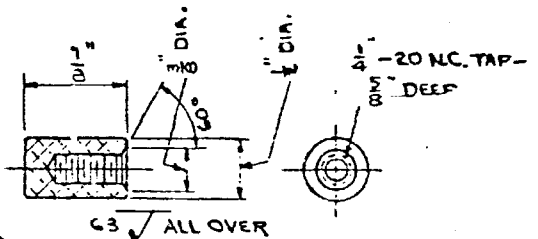


(1) NUT – 2 REQ'D. – "A" = 3/8" – "B" = 1/2" – "C" = 7/8"
HOLE "D" NO. 5 DRILL – 1/4"-20 TAP – 5/8" DEEP

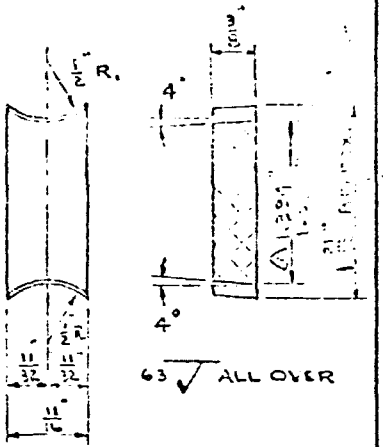
(2) NUT – 2 REQ'D. – "A" = 3/8" – "B" = 23/32" – C = 1 3/32"
HOLE "D" – NO. 5 DRILL – 1/4"-20 TAP – 5/8" DEEP

(3) NUT – 2 REQ'D. – "A" = 3/8" – "B" = 23/32" – "C" = 1 3/32"
HOLE "D" – NO. 21 DRILL – 10-32 TAP – 7/16" DEEP

6061-T6 AL.

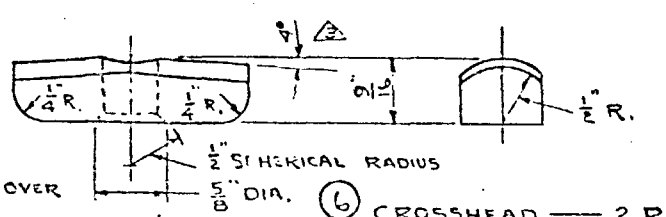


(5) PROTECTIVE CAP — [ ] REQ'D.
6061-T6 AL.



(4) SIDE BAR — 2 REQ'D.
6061-T6 AL.

ITEM (1) FOR USE WITH STD. 1/8" DIA.
SPECIMEN — DWG. L-7034
ITEM (2) FOR USE WITH SHORT 1/8" DIA.
SPECIMEN — OVERALL LGTH. 1 1/2" – 1 5/8"
ITEM (3) FOR USE WITH 3/32" DIA.
SPECIMEN — DWG. D-4683



(6) CROSSHEAD — 2 REQ'D.
6061-T6 AL.

DATE	NO	REVISION RECORD	DR	CK
10-2-63	3	ANGLE NOTED		
3-31-59	2	HAS 1 1/2"	LV	
2-25-59	1	REDRAWN FROM C-2401	LV	

ALUMINUM COMPANY OF AMERICA
ALCOA RESEARCH LABORATORIES
MECHANICAL ENGINEERING DIVISION — NEW KENSINGTON, PA.

CHEMICAL METALLURGY
STRESSING FORMS
SPECIMENS

IN CHG OF
SCALE 1" = 1" DATE
D-7[illegible]-RK

FIG. 10

Fig. 10

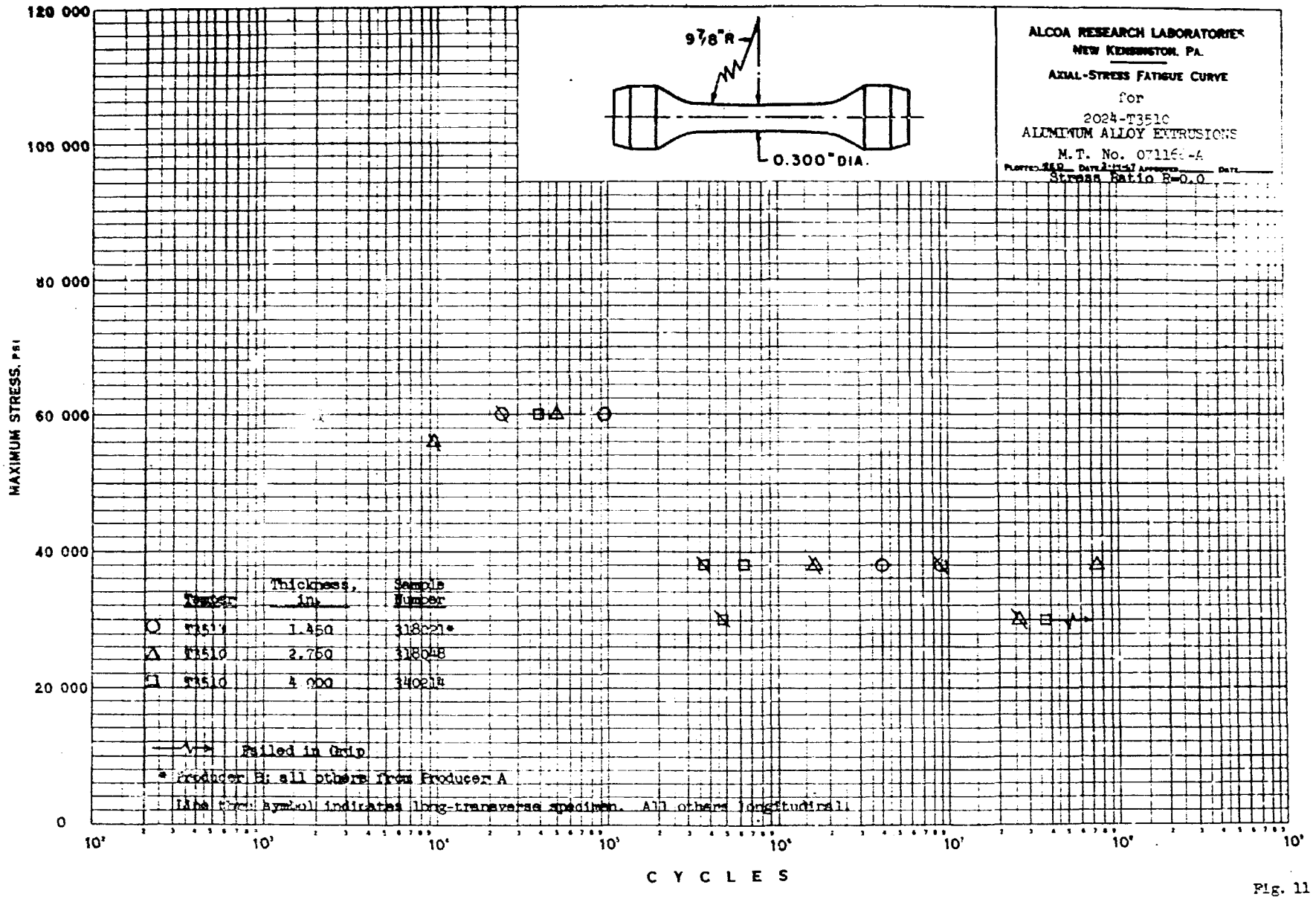

9 7/8" R
0.300" DIA.
ALCOA RESEARCH LABORATORIES
NEW KENSINGTON, PA.
AXIAL-STRESS FATIGUE CURVE
for
2024-T3510
ALUMINUM ALLOY EXTRUSIONS
M.T. No. 07116-4
Stress Ratio R=0.0
MAXIMUM STRESS, PSI
120 000
100 000
80 000
60 000
40 000
20 000
0
10²
10³
10⁴
10⁵
10⁶
10⁷
10⁸
CYCLES
Tester
Thickness, in.
Sample Number
T351*
1.450
318021*
T3510
2.750
318048
T3510
4.000
340214
Failed in Grip
* Producer B; all others from Producer A
The open symbol indicates long-transverse specimen. All others longitudinal.

Fig. 11

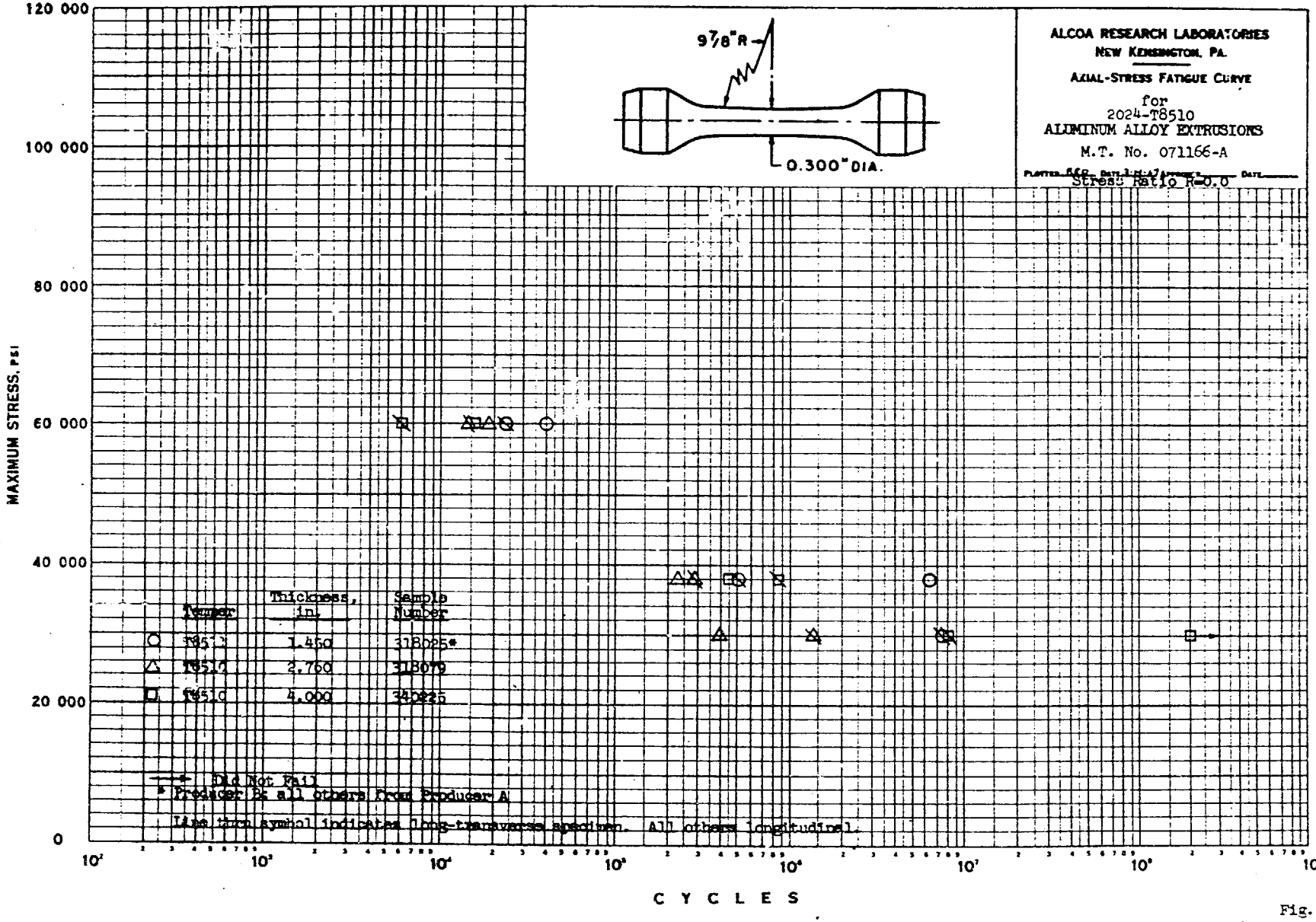

ALCOA RESEARCH LABORATORIES
NEW KENSINGTON, PA.
AXIAL-STRESS FATIGUE CURVE
for
2024-T8510
ALUMINUM ALLOY EXTRUSIONS
M.T. No. 071166-A
Stress Ratio R=0.0
9 7/8" R
0.300" DIA.
MAXIMUM STRESS, PSI
120 000
100 000
80 000
60 000
40 000
20 000
0
10²
10³
10⁴
10⁵
10⁶
10⁷
10⁸
CYCLES
Temper
Thickness, in.
Sample Number
T851
1.460
318025*
T851
2.760
318079
T851
4.000
340225
Did Not Fail
* Product B; all others from Producer A
Line thru symbol indicates long-transverse specimen. All others longitudinal.

Fig. 12

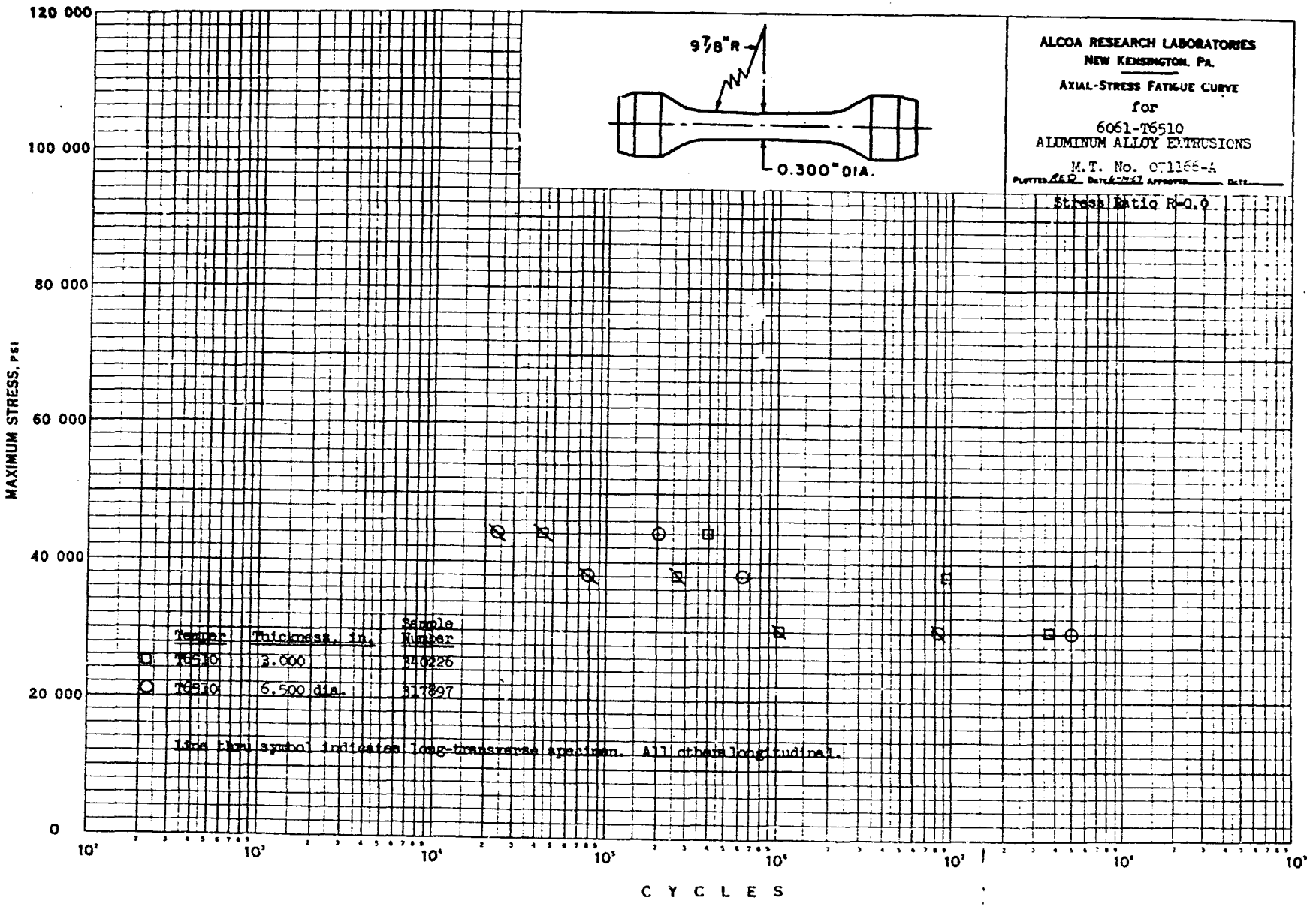

9 7/8" R
0.300" DIA.
ALCOA RESEARCH LABORATORIES
NEW KENSINGTON, PA.
AXIAL-STRESS FATIGUE CURVE
for
6061-T6510
ALUMINUM ALLOY EXTRUSIONS
M.T. No. 071166-A
Stress Ratio R=0.0
MAXIMUM STRESS, PSI
120 000
100 000
80 000
60 000
40 000
20 000
0
Temper
Thickness, in.
Sample Number
T6510
3.000
340226
T6510
6.500 dia.
317897
Line thru symbol indicates long-transverse specimen. All others longitudinal.
10²
10³
10⁴
10⁵
10⁶
10⁷
10⁸
CYCLES

Fig. 13

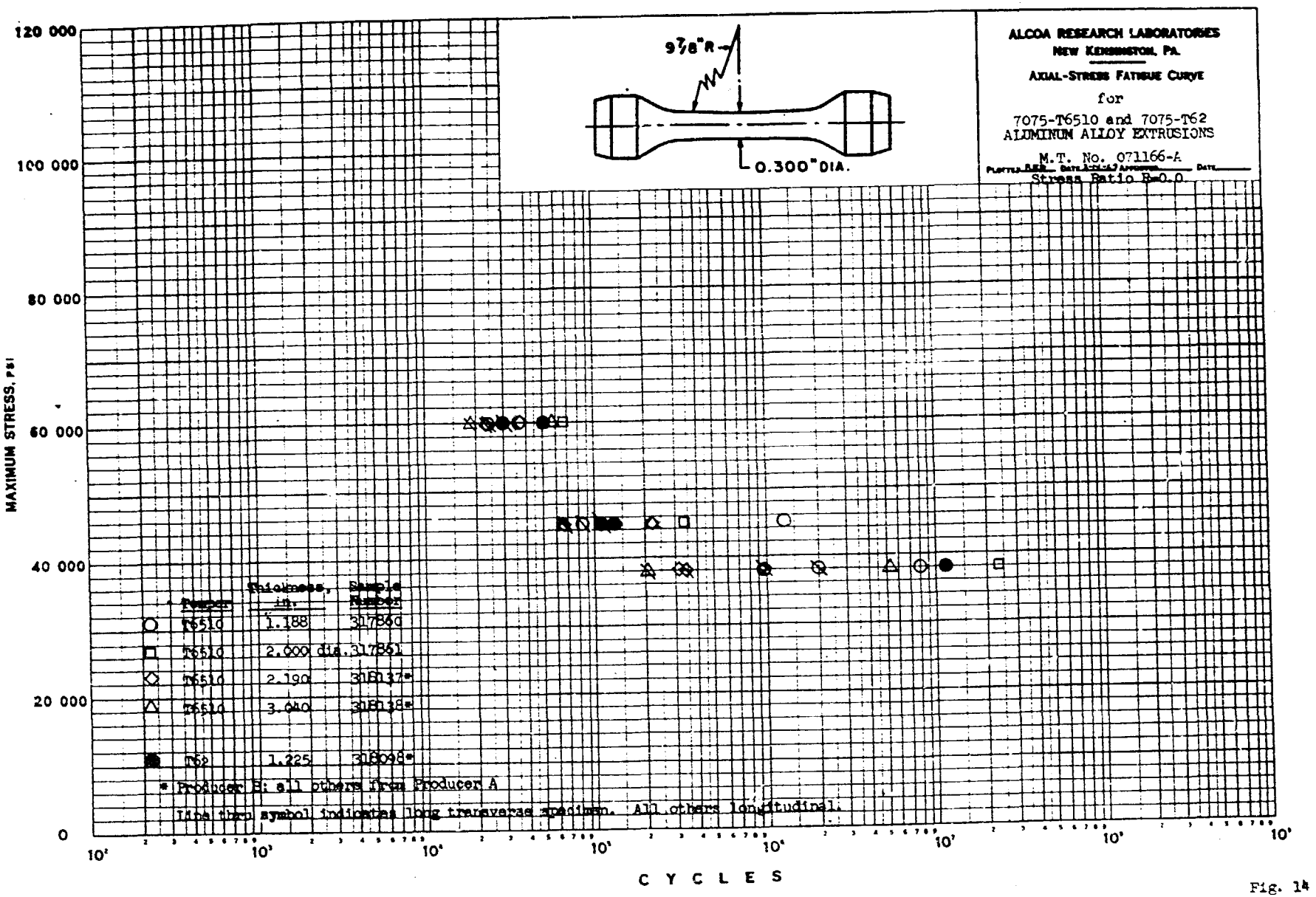

ALCOA RESEARCH LABORATORIES
NEW KENSINGTON, PA.
AXIAL-STRESS FATIGUE CURVE
for
7075-T6510 and 7075-T62
ALUMINUM ALLOY EXTRUSIONS
M.T. No. 071166-A
Stress Ratio R=0.0
9 7/8" R
0.300" DIA.
MAXIMUM STRESS, PSI
120 000
100 000
80 000
60 000
40 000
20 000
0
10⁴
10⁵
10⁶
10⁷
CYCLES
Temper
Thickness, in.
Sample Number
T6510 1.188 317860
T6510 2.000 dia. 317851
T6510 2.190 318137*
T6510 3.040 318138*
T62 1.225 318098*
* Producer B; all others from Producer A
Ring thru symbol indicates long transverse specimen. All others longitudinal.

Fig. 14

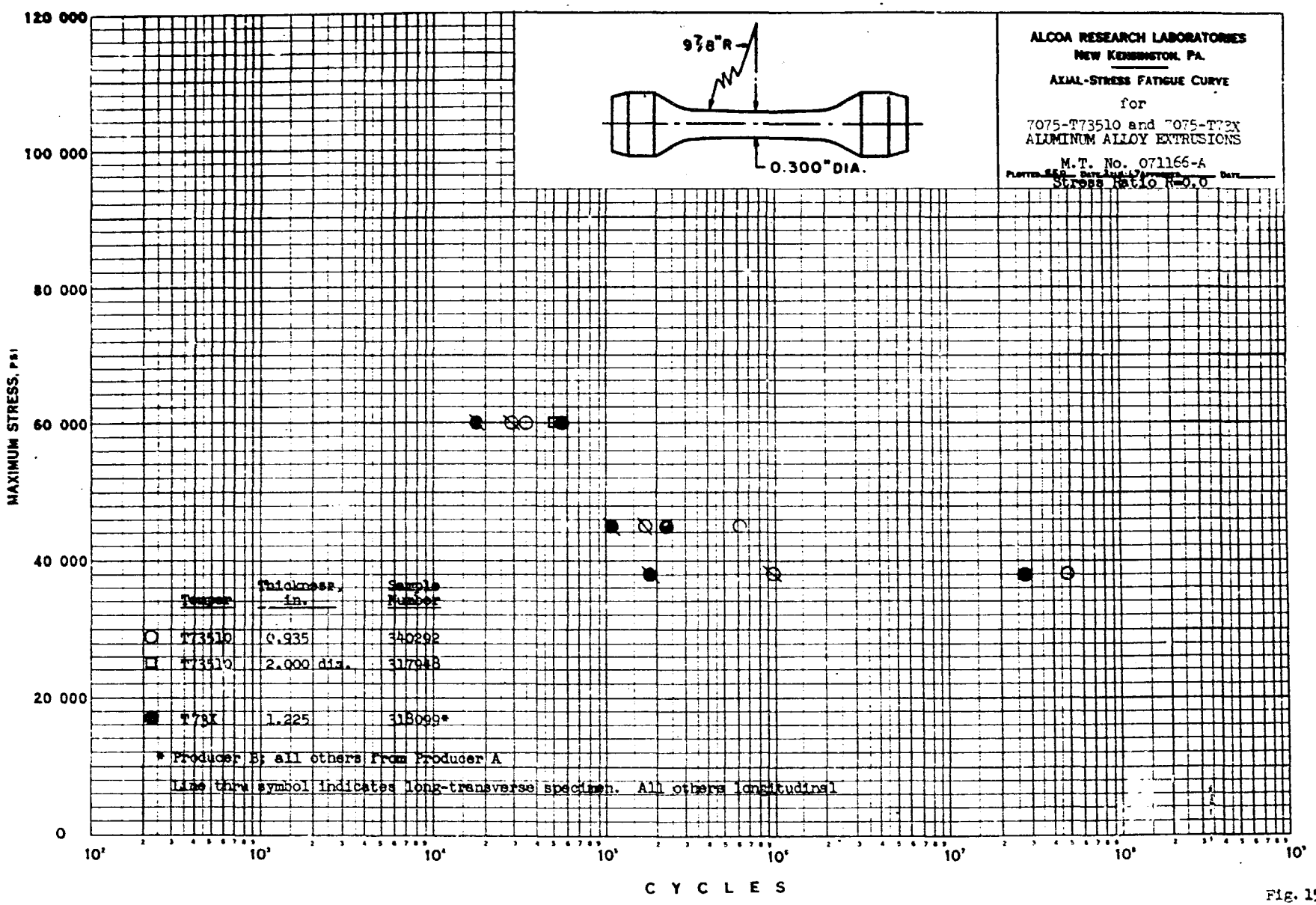

9 7/8"R
0.300"DIA.
ALCOA RESEARCH LABORATORIES
NEW KENSINGTON, PA.
AXIAL-STRESS FATIGUE CURVE
for
7075-T73510 and 7075-T73X
ALUMINUM ALLOY EXTRUSIONS
M.T. No. 071166-A
Stress Ratio R=0.0
MAXIMUM STRESS, PSI
120 000
100 000
80 000
60 000
40 000
20 000
0
10³
10⁴
10⁵
10⁶
10⁷
10⁸
CYCLES
Temper
Thickness, in.
Sample Number
T73510
0.935
340292
T73510
2.000 dia.
317948
T73X
1.225
318099*
* Producer B; all others from Producer A
Line thru symbol indicates long-transverse specimen. All others longitudinal

Fig. 15

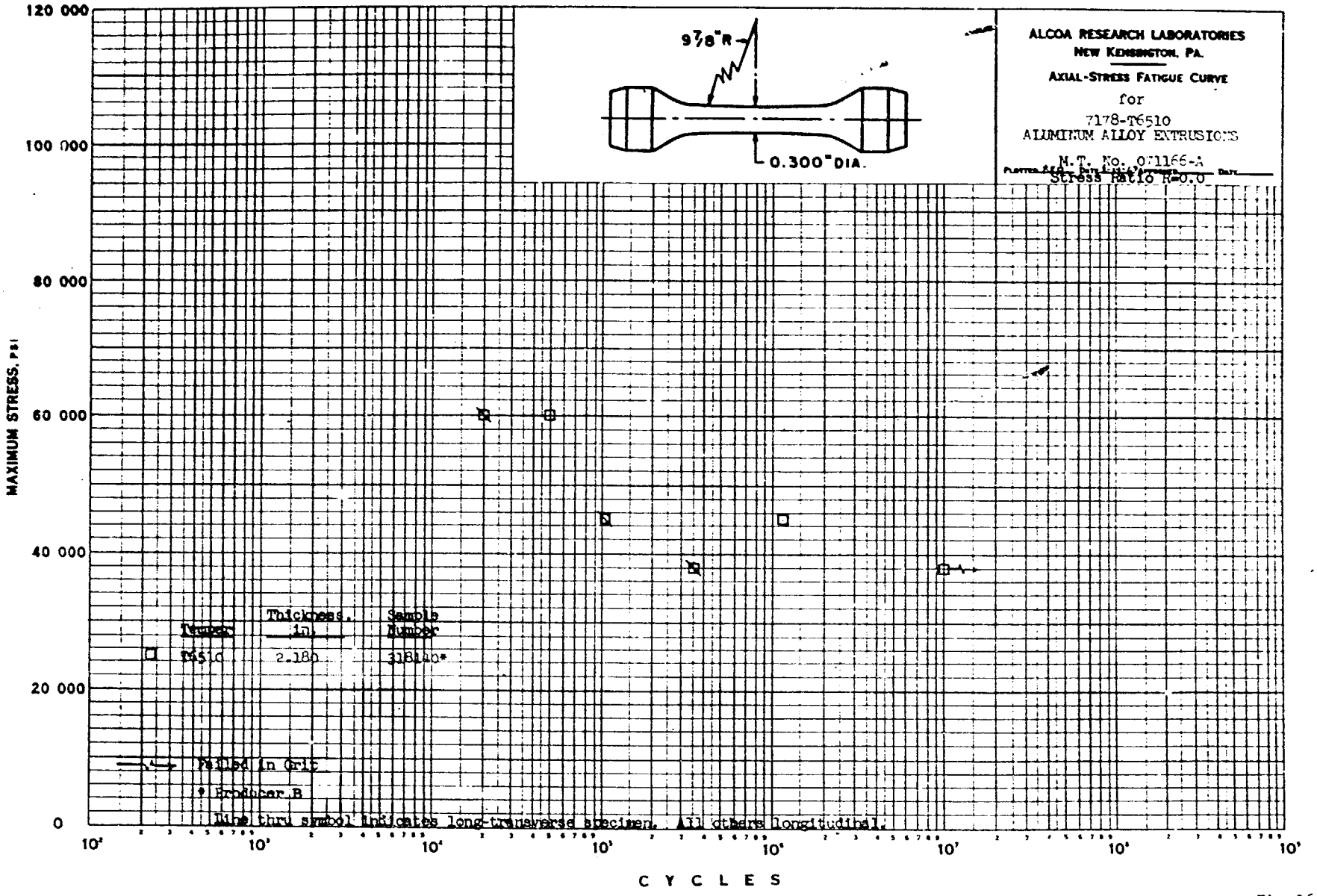

9 7/8"R
0.300"DIA.
ALCOA RESEARCH LABORATORIES
NEW KENSINGTON, PA.
AXIAL-STRESS FATIGUE CURVE
for
7178-T6510
ALUMINUM ALLOY EXTRUSIONS
M.T. No. 071166-A
Stress Ratio R=0.0
MAXIMUM STRESS, PSI
120 000
100 000
80 000
60 000
40 000
20 000
0
10⁴
10⁵
10⁶
10⁷
CYCLES
Temper
Thickness, in.
Sample Number
T6510
2.180
318140*
Failed in Grip
* Producer B
Bar thru symbol indicates long-transverse specimen. All others longitudinal.

Fig. 16