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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 some compressive, shear and bearing properties of a total of 90 samples of 2014, 2024, 6061, 7075 and 7178 aluminum alloy extrusions in the TX51X temper have been determined. The extrusions ranged in thicknesses from 0.051 in. to 6.500 in. Ratios among these properties have also been computed.

Stress-corrosion tests of 18 samples of TX51X extrusions have been initiated.

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THIRD 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, limited 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 Third Quarterly Report summarizes the results of tensile and some compressive, shear, bearing and stress-corrosion tests made to date on 90 samples of the various alloys in the TX51X temper. The samples ranged in thickness from 0.051 to 6.500 in.

II. Material.

A total of 92 samples of commercially-produced extrusions in the TX51X temper and 14 samples in the O temper have been received from two producers. The section thickness and identification of each sample is shown in Table I. Twelve of the samples in the O temper have been heat treated or heat treated and aged in accordance with applicable conditions in MIL-H-6088D.

III. Procedure.

Mechanical Properties

Tensile, compressive, shear and bearing specimens were taken at locations described in the Second Quarterly Report, dated September 15, 1966. The general dimensions of these specimens were shown in Figs. 1 to 3 inclusive of the Second Quarterly Report; the testing procedures are as outlined in the First Quarterly Report, dated June 15, 1966.

Some fracture toughness, axial-fatigue and tensile and compressive modulus specimens have been machined. Procedures for testing the fracture toughness and fatigue specimens are described in the First Quarterly Report.

The tensile and compressive specimens to be used for the modulus and stress-strain tests are as shown in Figs. 1 and 2. In all tests of longitudinal tensile specimens, strains will be measured over a 6-in. gage length with an Amsler-Martens mirror-type extensometer. In most of the tests of transverse tensile specimens it will be necessary to use smaller specimens and measure strains over a 4-, 2- or 1-in. gage length. The Amsler-Martens mirror-type extensometer will be used to measure strains over 4- and 2-in. gage lengths; the Tuckerman optical strain gage will be used for the 1-in. gage length. In all compressive tests, the Tuckerman optical strain gage will be used (2- or 1-in. gage length). The Amsler-Martens extensometer over the 6-in. gage length is probably ASTM Class A; over the 4-in. and 2-in. gage length it is an ASTM Class B-1. The Tuckerman extensometer is an ASTM Class A.

Resistance to Stress Corrosion

Stress-corrosion tests were initiated with specimens from 18 samples of TX51X extrusions. Additional samples were selected for corrosion testing, 6 in the TX51X temper and 7 in the heat-treated-by-user or heat-treated-and-aged-by-user temper. Test specimens were machined from these samples and these specimens will be stressed to the desired levels after determination of appropriate tensile properties. The specimens used and the procedures followed are as described in the First Quarterly Report.

IV. Summary.

The results of tensile and some compressive, shear and bearing tests of 90 samples of extrusions in the TX51X temper are as shown in Table II. The tensile properties of all samples exceed the applicable specified minimum values as shown in Table III.

The ratios among the tensile, compressive and shear properties are as shown in Table IV. The ratios among the bearing and tensile properties are as shown in Table V. The ratios among the properties at different locations with regard to width and thickness are as shown in Table VI. The ratios among bearing properties obtained using edgewise specimens to those using flatwise specimens, are shown in Table VII.

The current status of the stress-corrosion tests is given in Table VIII. Preliminary test results show that stress-corrosion cracking has occurred only among specimens from the

2024-T3510 and 7075-T6510 alloy extrusions. Although tests have thus far progressed for a maximum period of only 30 days, these results indicate typical performance of the various materials.

For the same alloy and temper, there sometimes is considerable scatter among certain stresses or ratios of certain stresses. In some cases, it is obvious that there is a trend with thickness. However, trends may also be dependent on other variables, but until a larger percentage of the total number of samples has been tested, it does not seem desirable to try to analyze this situation thoroughly.

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V. Tables and Figures.

TABLE I
 SAMPLES OF EXTRUSIONS RECEIVED AS OF DECEMBER 15, 1966
 (AF33(615)380)

201*			202*			500*			705*			778*		
Temper	Section Thickness, in.	ARC Sample Number	Temper	Section Thickness, in.	ARC Sample Number	Temper	Section Thickness, in.	ARC Sample Number	Temper	Section Thickness, in.	ARC Sample Number	Temper	Section Thickness, in.	ARC Sample Number
-0	0.195 0.200 0.499	318171* 317923 318061	-0	0.064 0.083 0.430	318046* 317855 318135*	-0	0.246 1.625	318090 317947	-0	0.063 0.128 0.250 1.225 2.250	318034* 317901 317955 318053* 317923	-0 -T6510	0.051 0.047 0.111 0.111 0.121	317901 317901 317901 317901 317901
-T6510	0.061 0.070 0.072 0.246 0.250 0.271 0.625 0.750 1.957	317950 318017* 317951 318130* 340154 317904 317952 317924 318046	-T6510	0.075 0.094 0.101 0.106	318022* 318134* 317887 317888	-T6510	0.050 0.075 0.090 0.125	318176* 317857 318027* 317846	-T6510	0.065 0.065 0.080 0.132 0.160 0.260 0.273 0.275 0.433 0.463 0.935 1.023 1.188 1.500 2.000 2.190 3.040	317899 318031* 317851 318028* 318052* 318028* 317906 317854 317859 318032* 340154 318033* 317950 317950 317950 318136*			
			-T6511 -T6510	0.106 0.120 0.151 0.151 0.238 0.238 0.275 0.510 0.525 0.550	317891 317892 318024* 317922 317894 317894 317894 317894 317894 317894		6.500	317897						
			-T6511 -T6510	0.642 0.950 1.150 1.200 1.450 2.250 2.750	318021* 318177* 318021* 318021* 318021* 318021* 318048									

* Producer E; all others from Producer A

TABLE II
MECHANICAL PROPERTIES OF STRESS-RELIEVED STRUTTED ALUMINUM ALLOY EXTRUSIONS
[AF53 (615)-3586]

Alloy and Temper	Section Thickness, in.	Seamless	Loca- tion	Direc- tion	Tensile Ultimate Stress, psi	Tensile Yield Stress, psi	Elongation in 2 in. or 4D, %	Comp. Yield Stress, psi	Shear Ultimate Stress, psi	Flattening			
										Ultimate Stress, psi	Yield Stress, psi	Ultimate Stress, psi	Yield Stress, psi
2014-T6510	0.061	317950	T/2	L	67 100	62 200	9.0	64 600	--	105 600	88 200	103 900	--
	0.070	318017	T/2	L	74 700	68 600	9.0**	--	--	--	--	--	--
	0.072	317951	T/2	L	64 900	61 900	9.5	62 800	--	104 500	88 500	103 800	--
	0.246	318130	T/2	L	62 800	59 100	11.5	59 900	--	--	--	--	--
	0.271	317994	T/2	L	64 100	60 400	10.0	61 000	--	--	--	--	--
	0.625	317952	T/2	L	67 500	63 800	13.5	63 400	47 200	106 900	93 400	108 000	--
	0.750	317924	T/2	L	71 700	64 600	6.2	--	44 700	--	--	--	--
	1.657	318046	T/4	L	75 300	61 900	14.3	60 300	44 700	110 000	93 600	106 200	--
			T/2	L	70 700	63 500	11.5	73 100	42 800	105 700	88 000	103 100	--
			T/2	L	72 300	66 100	10.5	67 800	41 500	104 800	85 700	98 700	--
2024-T3510	0.075	318132	T/2	L	67 400	60 200	7.8	66 200	41 500	--	--	--	--
	0.075	318132	T/2	L	65 900	53 000	18.0	45 200	--	97 200	77 900	92 300	--
2024-T3511	0.094	318015	T/2	L	70 500	52 800	15.0**	57 800	--	102 500	76 200	90 000	--
	0.101	317885	T/2	L	63 900	51 700	16.5	45 300	--	102 200	77 200	91 100	--
	0.106	317904	T/2	L	64 400	51 700	20.5	42 100	--	101 900	77 900	92 600	--
	0.120	318018	T/2	L	65 400	54 400	17.0	42 400	--	102 300	78 300	91 200	--
	0.151	317866	T/2	L	66 900	54 400	17.0	42 400	--	99 100	74 700	85 000	--
	0.255	317942	T/2	L	67 700	59 300	11.0**	55 300	43 200	105 300	81 000	99 400	--
	0.258	318047	T/2	L	72 100	60 800	16.0	52 200	41 800	106 300	81 200	97 000	--
	0.375	317943	T/2	L	72 800	60 900	19.0***	53 100	43 300	107 200	75 900	97 700	--
	0.510	317936	T/2, 1/2	L	63 700	49 300	20.0***	58 100	42 200	106 200	79 500	101 400	--
	0.525	318020	T/2, 1/4	L	57 500	48 900	21.5	57 400**	41 600	100 600	77 400	94 800	--
2024-T3510	0.550	317956	T/2, 1/2	L	63 000	48 500	18.0	50 000	40 600	102 000	74 400	87 900	--
	0.642	317945	T/2, 1/4	L	62 600	48 200	23.0	52 500	39 800	105 100	73 500	97 300	--
	0.950	317944	T/2, 1/4	L	61 200	42 600	23.0	40 300	41 200	102 000	74 400	87 900	--
	1.150	318077	T/2, 1/4	L	63 200	43 500	12.0	54 500	40 800	105 100	73 500	97 300	--
			T/2, 1/4	L	63 200	43 500	15.5	53 300	39 800	100 900	76 700	92 300	--
			T/2, 1/4	L	71 000	53 800	13.6	51 800	40 400	100 600	76 700	91 600	--
			T/2, 1/4	L	64 500	47 900	15.0	52 900	39 000	102 400	75 900	90 500	--
			T/2, 1/4	L	60 900	50 200	15.0	54 000	39 700	104 000	78 000	96 100	--
			T/2, 1/4	L	69 500	61 500	12.8	53 500	39 500	100 000	78 200	93 900	--
			T/2, 1/4	L	76 800	52 200	10.9	55 300	40 100	102 900	75 400	95 800	--
2024-T3510	1.200	317946	T/2, 1/4	L	69 600	59 700	16.5	54 600	38 400	105 500	75 400	97 500	--
			T/2, 1/4	L	80 300	63 500	14.5	58 000	59 900	101 900	130 900	77 900	91 900

(Continued)

TABLE II

TABLE II
(Continued)
MECHANICAL PROPERTIES OF STRESS-RELIEVED STRENGTHENED ALUMINUM ALLOY EXTRUSIONS
A75(615)-550

Alloy and Temper	Section Thickness, in.	Sample Number	Local Direction	Tensile Ultimate Stress, psi	Tensile Yield Stress, psi	Elongation in 2 in. or 4D, %	Comp. Yield Stress, psi	Shear Ultimate Stress, psi	Extrusion			
									Ultimate Stress, psi	Yield Stress, psi	Ultimate Stress, psi	Yield Stress, psi
2024-T3511	1.450	3180218	T/2, N/A	80 400	62 300	14.0	58 100	40 000	105 100	132 200	101 900	131 100
			L	68 000	49 000	13.5	52 100	39 700	104 200	129 300	100 600	127 600
2024-T3510	2.520	3181351	T/2, N/2	79 800	60 800	15.5	56 500	39 100	104 200	129 300	100 600	127 600
			L	68 900	49 100	14.6	52 800	39 100	104 200	129 300	100 600	127 600
			T/4, N/A	81 100	61 500	14.0	54 000	39 100	104 200	129 300	100 600	127 600
			L	67 000	46 200	14.1	54 000	39 100	104 200	129 300	100 600	127 600
2024-T3510	2.760	318048	T/2, N/2	80 900	61 900	14.5	54 000	39 100	104 200	129 300	100 600	127 600
			L	67 000	46 200	14.5	54 000	39 100	104 200	129 300	100 600	127 600
			T/4, N/A	80 900	61 900	14.5	54 000	39 100	104 200	129 300	100 600	127 600
			L	67 000	46 200	14.5	54 000	39 100	104 200	129 300	100 600	127 600
			T/2, N/2	80 900	61 900	14.5	54 000	39 100	104 200	129 300	100 600	127 600
			L	67 000	46 200	14.5	54 000	39 100	104 200	129 300	100 600	127 600
			T/4, N/A	80 900	61 900	14.5	54 000	39 100	104 200	129 300	100 600	127 600
			L	67 000	46 200	14.5	54 000	39 100	104 200	129 300	100 600	127 600
2024-T3510	0.075	3180228	T/2	72 400	68 400	6.0	70 000	47 800	110 200	141 400	98 900	114 800
			L	77 500	69 600	3.0***	73 300	47 800	110 200	141 400	98 900	114 800
			T/2	72 400	68 400	7.0	73 300	47 800	110 200	141 400	98 900	114 800
			L	77 500	69 600	3.0***	73 300	47 800	110 200	141 400	98 900	114 800
			T/2	72 400	68 400	6.0	73 300	47 800	110 200	141 400	98 900	114 800
			L	77 500	69 600	3.0***	73 300	47 800	110 200	141 400	98 900	114 800
			T/2	72 400	68 400	8.5	73 300	47 800	110 200	141 400	98 900	114 800
			L	77 500	69 600	3.0***	73 300	47 800	110 200	141 400	98 900	114 800
			T/2	72 400	68 400	8.5	73 300	47 800	110 200	141 400	98 900	114 800
			L	77 500	69 600	3.0***	73 300	47 800	110 200	141 400	98 900	114 800
			T/2	72 400	68 400	10.0***	73 300	47 800	110 200	141 400	98 900	114 800
			L	77 500	69 600	3.0***	73 300	47 800	110 200	141 400	98 900	114 800
2024-T3510	0.075	3180228	T/2	72 400	68 400	6.0	70 000	47 800	110 200	141 400	98 900	114 800
			L	77 500	69 600	3.0***	73 300	47 800	110 200	141 400	98 900	114 800
			T/2	72 400	68 400	7.0	73 300	47 800	110 200	141 400	98 900	114 800
			L	77 500	69 600	3.0***	73 300	47 800	110 200	141 400	98 900	114 800
			T/2	72 400	68 400	8.5	73 300	47 800	110 200	141 400	98 900	114 800
			L	77 500	69 600	3.0***	73 300	47 800	110 200	141 400	98 900	114 800
			T/2	72 400	68 400	8.5	73 300	47 800	110 200	141 400	98 900	114 800
			L	77 500	69 600	3.0***	73 300	47 800	110 200	141 400	98 900	114 800
			T/2	72 400	68 400	10.0***	73 300	47 800	110 200	141 400	98 900	114 800
			L	77 500	69 600	3.0***	73 300	47 800	110 200	141 400	98 900	114 800
			T/2	72 400	68 400	7.5	73 300	47 800	110 200	141 400	98 900	114 800
			L	77 500	69 600	3.0	73 300	47 800	110 200	141 400	98 900	114 800
2024-T3510	0.075	3180228	T/2	72 400	68 400	6.0	70 000	47 800	110 200	141 400	98 900	114 800
			L	77 500	69 600	3.0	73 300	47 800	110 200	141 400	98 900	114 800
			T/2	72 400	68 400	7.5	73 300	47 800	110 200	141 400	98 900	114 800
			L	77 500	69 600	3.0	73 300	47 800	110 200	141 400	98 900	114 800
			T/2	72 400	68 400	8.5	73 300	47 800	110 200	141 400	98 900	114 800
			L	77 500	69 600	3.0	73 300	47 800	110 200	141 400	98 900	114 800
			T/2	72 400	68 400	8.5	73 300	47 800	110 200	141 400	98 900	114 800
			L	77 500	69 600	3.0	73 300	47 800	110 200	141 400	98 900	114 800
			T/2	72 400	68 400	10.0	73 300	47 800	110 200	141 400	98 900	114 800
			L	77 500	69 600	3.0	73 300	47 800	110 200	141 400	98 900	114 800
			T/2	72 400	68 400	7.5	73 300	47 800	110 200	141 400	98 900	114 800
			L	77 500	69 600	3.0	73 300	47 800	110 200	141 400	98 900	114 800
2024-T3510	0.075	3180228	T/2	72 400	68 400	6.0	70 000	47 800	110 200	141 400	98 900	114 800
			L	77 500	69 600	3.0	73 300	47 800	110 200	141 400	98 900	114 800
			T/2	72 400	68 400	7.5	73 300	47 800	110 200	141 400	98 900	114 800
			L	77 500	69 600	3.0	73 300	47 800	110 200	141 400	98 900	114 800
			T/2	72 400	68 400	8.5	73 300	47 800	110 200	141 400	98 900	114 800
			L	77 500	69 600	3.0	73 300	47 800	110 200	141 400	98 900	114 800
			T/2	72 400	68 400	8.5	73 300	47 800	110 200	141 400	98 900	114 800
			L	77 500	69 600	3.0	73 300	47 800	110 200	141 400	98 900	114 800
			T/2	72 400	68 400	10.0	73 300	47 800	110 200	141 400	98 900	114 800
			L	77 500	69 600	3.0	73 300	47 800	110 200	141 400	98 900	114 800
			T/2	72 400	68 400	7.5	73 300	47 800	110 200	141 400	98 900	114 800
			L	77 500	69 600	3.0	73 300	47 800	110 200	141 400	98 900	114 800

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TABLE II
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TABLE II
(Continued)
MECHANICAL PROPERTIES OF STRESS-RELIEVED STRENGTHENED ALUMINUM ALLOY EXTRUSIONS
[AF33(815)-356]

Alloy and Temper	Sample		Loca- tion	Direc- tion	Properties					Properties							
	Section Thick- ness, in.	Number			Tensile Ultimate Stress, psi	Tensile Yield Stress, * 2 in. or KD, psi	Elongation in 2 in., %	Comp. Tensile Stress, * psi	Shear Ultimate Stress, psi	Plastic		Ultimate					
										Stress, psi	Strain	Stress, psi	Strain				
7075-T6510	0.065	317859	T/2	L	87 000	79 200	11.0	75 400	—	126 600	158 400	106 900	125 100	—	—	—	—
	0.065	318031	T/2	L	85 200	77 700	10.5	77 300	—	125 900	158 700	102 400	125 400	—	—	—	—
	0.080	317858	T/2	L	88 600	74 500	12.0***	80 500	—	125 500	159 900	109 600	124 900	—	—	—	—
	0.125	318029	T/2	L	84 200	72 800	9.0	76 600	—	124 600	156 200	107 000	123 900	—	—	—	—
	0.160	318030	T/2	L	82 800	72 600	15.0***	78 900	—	126 500	160 100	108 600	126 600	—	—	—	—
	0.260	318028	T/2	L	87 500	79 400	12.0	78 800	48 500	126 100	158 000	104 800	123 400	—	—	—	—
	0.312	317906	T/2	L	84 400	74 400	11.5	78 800	—	—	—	—	—	—	—	—	—
	0.375	317954	T/2	L	89 400	82 700	11.0	85 300	49 400	—	—	—	—	—	—	—	—
	0.436	317959	T/2	L	88 000	80 900	11.0	79 200	48 000	125 000	160 600	104 400	128 600	—	—	—	—
	0.463	317959	T/2	L	87 500	74 600	12.0	82 100	47 100	129 100	160 200	113 000	128 500	—	—	—	—
7075-T351	0.065	318032	T/2	L	86 100	77 500	11.5	85 700	46 600	121 900	155 400	99 400	119 000	—	—	—	—
	1.023	318033	T/2, W/A	L	82 400	70 800	10.0	78 400	45 200	121 000	156 100	100 000	123 100	—	—	—	—
	1.188	317860	T/2, W/A	L	86 600	79 800	9.0	84 200	47 100	126 900	159 400	108 600	121 400	—	—	—	—
	1.500	317955	T/2	L	84 300	73 300	12.0	79 500	51 100	128 000	158 400	111 500	128 600	—	—	—	—
	2.000	317861	T/4	L	85 100	78 000	13.0	81 000	48 200	125 300	155 600	107 400	119 400	—	—	—	—
	2.190	318037	T/4, W/A	L	82 100	72 000	9.5	80 000	47 500	128 700	159 900	110 800	127 800	—	—	—	—
	3.040	317955	T/2	L	93 600	86 700	12.0	88 000	48 200	122 400	156 300	102 300	121 400	—	—	—	—
	3.040	317861	T/4	L	87 600	82 500	11.0	86 400	49 200	127 200	164 500	108 600	126 400	—	—	—	—
	3.040	318037	T/4, W/A	L	82 100	72 000	18.0	84 100	47 000	127 200	155 700	102 300	122 900	—	—	—	—
	3.040	318037	T/4, W/A	L	89 300	82 000	10.0	88 700	46 000	—	—	—	—	—	—	—	—
7075-T351	0.065	318038	T/2, W/A	L	81 500	71 500	3.6	75 000	—	—	—	—	—	—	—	—	—
	0.080	318038	T/2, W/A	L	81 700	71 300	3.9	75 000	—	—	—	—	—	—	—	—	—
	0.160	318038	T/4, W/A	L	77 500	68 600	10.0	73 300	—	—	—	—	—	—	—	—	—
	0.260	318038	T/4, W/A	L	77 500	68 600	10.0	73 300	—	—	—	—	—	—	—	—	—
	0.312	318038	T/4, W/A	L	77 500	68 600	10.0	73 300	—	—	—	—	—	—	—	—	—
	0.375	318038	T/4, W/A	L	77 500	68 600	10.0	73 300	—	—	—	—	—	—	—	—	—
	0.436	318038	T/4, W/A	L	77 500	68 600	10.0	73 300	—	—	—	—	—	—	—	—	—
	0.463	318038	T/4, W/A	L	77 500	68 600	10.0	73 300	—	—	—	—	—	—	—	—	—
	1.023	317962	T/2	L	79 400	71 100	9.0	74 000	44 200	—	—	—	—	—	—	—	—
	1.188	317962	T/2	L	74 900	64 300	11.5	69 800	44 200	113 400	146 300	92 300	109 400	—	—	—	—
7075-T351	0.065	317906	T/2	L	84 200	72 800	11.0	76 600	42 800	—	—	—	—	—	—	—	—
	0.080	317906	T/2	L	82 800	72 600	12.0	78 800	45 100	—	—	—	—	—	—	—	—
	0.160	317906	T/2	L	77 200	67 500	12.0	71 800	41 100	—	—	—	—	—	—	—	—
	0.260	317906	T/2	L	77 200	67 500	12.0	71 800	41 100	—	—	—	—	—	—	—	—
	0.312	317906	T/2	L	77 200	67 500	12.0	71 800	41 100	—	—	—	—	—	—	—	—
	0.375	317906	T/2	L	77 200	67 500	12.0	71 800	41 100	—	—	—	—	—	—	—	—
	0.436	317906	T/2	L	77 200	67 500	12.0	71 800	41 100	—	—	—	—	—	—	—	—
	0.463	317906	T/2	L	77 200	67 500	12.0	71 800	41 100	—	—	—	—	—	—	—	—
	1.023	317906	T/2	L	77 200	67 500	12.0	71 800	41 100	—	—	—	—	—	—	—	—
	1.188	317906	T/2	L	77 200	67 500	12.0	71 800	41 100	—	—	—	—	—	—	—	—

TABLE II
(Concluded)

MECHANICAL PROPERTIES OF STRESS-RELIEVED STRETCHED ALUMINUM ALLOY EXTRUSIONS
(AF33(615)-3580)

Alloy and Temper	Sample Section Thickness, in.	Loca- tion* tion†	Tensile Ultimate Stress, psi	Tensile Yield Stress, psi	Elongation in 2 in. or 4D, %	Comp. Yield Stress, * psi	Shear Ultimate Stress, psi	Reactions							
								Flattise		Reveals					
								Ultimate Stress, psi	Yield Stress, psi	Ultimate Stress, psi	Yield Stress, psi				
7075-T73510	1.500	T/2	79 700	72 100	11.0	73 800	44 700	$e/D=1.5$	111 100	145 700	93 800	111 500	---	---	---
								---	---	---	---	---	---	---	
								---	---	---	---	---	---	---	
								---	---	---	---	---	---	---	
7175-T6510	0.063	T/2	95 400	89 900	9.5	90 400	---	133 500	117 400	138 900	---	---	---	---	
			94 200	86 900	10.7**	87 800	---	---	---	---	---	---	---		
			92 200	82 400	9.5	82 200	---	131 600	114 900	137 300	---	---	---		
			92 000	82 400	14.0***	92 200	---	---	---	---	---	---	---		
	0.154	T/2	92 200	85 500	10.5	89 200	---	138 200	117 200	138 500	---	---	---		
			91 400	85 400	10.5	89 200	---	132 600	114 400	125 800	---	---	---		
			92 600	86 900	10.0	89 200	---	132 600	112 700	125 800	---	---	---		
			92 600	86 900	10.7	88 500	---	132 400	114 800	134 900	---	---	---		
	0.265	T/2, W/4	91 100	81 500	10.2	88 200	---	132 400	113 600	134 200	---	---	---		
			92 600	85 500	10.7	88 200	---	131 000	113 600	129 300	---	---	---		
			92 600	85 900	11.4	87 500	---	---	---	---	---	---	---		
			94 400	89 900	11.4	87 500	---	---	---	---	---	---	---		
1.200	T/2, W/4	T/2, W/4	94 400	89 900	11.4	87 500	---	---	---	---	---	---			
			92 200	86 900	11.4	87 500	---	---	---	---	---	---	---		
1.438	T/2	T/2	101 300	96 500	6.5	97 200	---	135 100	117 700	137 100	---	---	---		
			101 300	96 500	6.5	97 200	---	---	---	---	---	---	---		
2.180	T/4, W/4	T/4, W/4	91 100	85 300	8.0	---	---	---	---	---	---	---	---		
			92 600	86 900	5.0	---	---	---	---	---	---	---	---		

** Specimens and fixtures cleaned ultrasonically in Tescor 3 solvent.
*** Offset equals 2 per cent of pin diameter.
** Average of two tests; all others, single tests
*** 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.

TABLE III

SPECIFIED MINIMUM VALUES FOR ALUMINUM ALLOY EXTRUSIONS TESTED
[AF 33(615)-3580]

Alloy and Temper	Thickness, in.	Area, sq in.	Tensile Ultimate Stress, psi	Yield Stress, * psi	Elongation in 2 in. or 4D, %	Federal Specification
2014-T6510	≤ 0.499	All	60 000	53 000	7	QQ-A-200/2b
	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	
-T8510, -T8511	0.050-0.249	All	64 000	56 000	4	QQ-A-200/8b
	0.250-1.499	All	66 000	58 000	5	
	≥ 1.500	≥ 32	66 000	58 000	5	
6061-T6510	All	All	38 000	35 000	10	QQ-A-200/11b
7075-T6510	≤ 0.249	All	78 000	70 000	7	
	0.250-0.499	All	81 000	73 000	7	
	0.500-2.999	All	81 000	72 000	7	
-T73510	3.000-4.499	≥ 20	81 000	71 000	7	
	≤ 0.249	---	---	---	---	None
	0.250-0.499	---	---	---	---	
	0.500-2.999	---	---	---	---	
7178-T6510	≤ 0.249	All	85 000	78 000	5	QQ-A-200/13
	0.250-1.499	All	88 000	79 000	5	
	1.500-2.999	All	86 000	78 000	5	

* Offset equals 0.2 per cent.

TABLE IV
RATIOS AMONG THE TENSILE, COMPRESSIVE AND SHEAR PROPERTIES
OF STRESS-RELIEVED STRENGTHENED ALUMINUM ALLOY EXTRUSIONS
(AF53(615)-3580)

Alloy and Temper	Section Thickness, In. Number	Location*	T _{TS} (LT) T _{TS} (LT)	T _{TS} (ST) T _{TS} (LT)	T _{CS} (LT) T _{CS} (LT)	T _{CS} (ST) T _{CS} (LT)	T _{SS} (LT) T _{SS} (LT)	T _{SS} (ST) T _{SS} (LT)	T _{SS} (LT) T _{SS} (LT)	T _{SS} (ST) T _{SS} (LT)
2024-T6510	0.061	317950	T/2	1.11	1.10	---	1.04	---	---	---
	0.070	318017+	T/2	---	---	---	1.01	---	---	---
	0.073	317951	T/2	---	---	---	1.01	---	---	---
	0.246	318130+	T/2	---	---	---	1.01	---	---	---
	0.271	317924	T/2	1.06	1.01	---	0.99	---	---	---
	0.285	317952	T/2	---	---	---	0.97	---	---	---
	0.750	317924	T/2	0.92	0.89	---	1.03	0.96	---	---
	1.657	318046	T/2	0.93	0.91	---	1.03	---	---	---
	0.075	318132+	T/2	1.07	0.91	---	0.85	1.09	---	---
	0.101	317885	T/2	---	---	---	0.85	---	---	---
2024-T3511 2024-T3510	0.106	317904	T/2	---	---	---	0.81	---	---	---
	0.120	318018+	T/2	---	---	---	0.83	---	---	---
	0.151	317886	T/2	0.97	0.90	---	0.83	1.01	---	---
	0.255	317942	T/2	0.96	0.89	---	0.84	0.97	---	---
	0.258	318047	T/2	0.94	0.87	---	0.87	0.95	---	---
	0.275	317943	T/2	0.90	0.79	---	0.76	0.92	---	---
	0.510	317926	T/2, W/2	0.98	0.88	---	0.88	0.92	---	---
	0.525	318020+	T/2, W/2	1.00	0.90	---	0.87	0.98	---	---
	0.550	317856	T/2, W/2	1.01	0.85	---	0.85	0.93	---	---
	0.642	317945	T/2, W/2	0.81	0.73	---	0.85	0.92	---	---
2024-T3511 2024-T3510	0.950	317944	T/2, W/2	0.86	0.85	---	0.80	0.89	---	---
	1.150	318077	T/2, W/2	0.87	0.82	---	0.84	0.88	---	---
	1.200	317946	T/2, W/2	0.84	0.78	---	0.91	0.88	---	---
	1.450	318021+	T/2, W/2	0.85	0.79	---	0.91	0.84	---	---
	2.520	318133+	T/2, W/2	0.83	0.73	---	0.91	0.84	---	---
	2.760	318048	T/2, W/2	0.82	0.74	---	0.91	0.84	---	---
				0.78	0.80	0.72	0.93	0.81	0.48	0.51
				0.76	0.76	0.72	0.94	0.85	0.48	0.51
				---	---	---	1.02	1.07	---	---
				---	---	---	1.02	---	---	---
2024-T8510	0.075	318022+	T/2	1.07	1.02	---	1.02	---	---	---
	0.101	317887	T/2	---	---	---	1.01	---	---	---
	0.106	317888	T/2	---	---	---	1.01	---	---	---
	0.120	318023+	T/2	---	---	---	1.00	---	---	---
	0.151	317889	T/2	1.05	1.05	---	1.05	1.04	---	---
	0.252	317890	T/2	0.99	1.02	---	1.07	1.05	0.55	0.57
	0.258	318082	T/2	0.99	1.02	---	1.07	1.05	0.55	0.57
	0.275	317891	T/2	0.97	1.00	---	1.06	1.05	0.56	0.56
	0.510	317892	T/2, W/2	0.97	0.99	---	1.06	0.98	0.57	0.56
	0.525	318024+	T/2, W/2	0.98	0.99	---	1.02	0.98	0.57	0.56

(continued)

TABLE IV

TABLE IV
(Continued)
RATIOS AMONG THE TENSILE, COMPRESSIVE AND SHEAR PROPERTIES
OF STRESS-RELIEVED 7075-T6 ALUMINUM ALLOY EXTRUSIONS

Alloy and Temper	Section Thickness In. Number	Location*	T _{0.2} (U) T _{0.2} (L)	T _{0.2} (U) T _{0.2} (L)	T _{0.2} (U) T _{0.2} (L)	T _{0.2} (U) T _{0.2} (L)	T _{0.2} (U) T _{0.2} (L)	T _{0.2} (U) T _{0.2} (L)	T _{0.2} (U) T _{0.2} (L)	T _{0.2} (U) T _{0.2} (L)
2024-T651C	C-550	T/2, W/A	0.97	0.98	1.04	1.02	0.96	0.96	0.96	0.96
	C-642	T/2, W/A	0.95	0.96	1.02	1.02	0.95	0.95	0.95	0.95
	C-590	T/2, W/A	0.97	1.02	1.04	1.05	0.96	0.96	0.96	0.96
	C-150	T/2, W/A	0.97	1.01	1.03	1.03	0.96	0.96	0.96	0.96
	1-200	T/2, W/A	0.94	0.96	1.02	1.03	0.95	0.95	0.95	0.95
	1-150	T/2, W/A	0.95	0.97	1.02	1.03	0.96	0.96	0.96	0.96
	2-760	T/2, W/A	0.92	0.97	1.02	1.02	0.95	0.95	0.95	0.95
	2-760	T/2, W/A	0.93	0.98	1.01	1.01	0.96	0.96	0.96	0.96
	C-050	T/2	0.96	0.95	0.98	0.99	0.96	0.96	0.96	0.96
	C-075	T/2	0.97	0.93	1.00	1.00	0.96	0.96	0.96	0.96
2024-T651	2-17822	T/2	1.03	1.00	1.03	1.04	0.98	0.98	0.98	0.98
	2-17827	T/2	0.92	0.93	1.00	1.00	0.96	0.96	0.96	0.96
	2-17846	T/2	0.92	0.93	1.00	1.00	0.96	0.96	0.96	0.96
	2-17847	T/2	0.92	0.93	1.00	1.00	0.96	0.96	0.96	0.96
	2-17848	T/2	0.92	0.93	1.00	1.00	0.96	0.96	0.96	0.96
	2-17849	T/2	0.92	0.93	1.00	1.00	0.96	0.96	0.96	0.96
	2-17850	T/2	0.92	0.93	1.00	1.00	0.96	0.96	0.96	0.96
	2-17851	T/2	0.92	0.93	1.00	1.00	0.96	0.96	0.96	0.96
	2-17852	T/2	0.92	0.93	1.00	1.00	0.96	0.96	0.96	0.96
	2-17853	T/2	0.92	0.93	1.00	1.00	0.96	0.96	0.96	0.96
7075-T651C	C-060	T/2	0.97	0.96	1.04	1.04	0.98	0.98	0.98	0.98
	C-061	T/2	0.97	0.96	1.04	1.04	0.98	0.98	0.98	0.98
	C-062	T/2	0.97	0.96	1.04	1.04	0.98	0.98	0.98	0.98
	C-063	T/2	0.97	0.96	1.04	1.04	0.98	0.98	0.98	0.98
	C-064	T/2	0.97	0.96	1.04	1.04	0.98	0.98	0.98	0.98
	C-065	T/2	0.97	0.96	1.04	1.04	0.98	0.98	0.98	0.98
	C-066	T/2	0.97	0.96	1.04	1.04	0.98	0.98	0.98	0.98
	C-067	T/2	0.97	0.96	1.04	1.04	0.98	0.98	0.98	0.98
	C-068	T/2	0.97	0.96	1.04	1.04	0.98	0.98	0.98	0.98
	C-069	T/2	0.97	0.96	1.04	1.04	0.98	0.98	0.98	0.98

(Continued)

TABLE IV
(Concluded)
RATIOS AMONG THE TENSILE, COMPRESSIVE AND SHEAR PROPERTIES
OF STRESS-RELIEVED STRETCHED ALUMINUM ALLOY EXTRUSIONS
[AF23(615)-3580]

Alloy and Temper	Section Thickness, in. Number	Location*	T _{TS} (LT) T _{TS} (L)	T _{TS} (ST) T _{TS} (L)	T _{TS} (LT) T _{TS} (L)	T _{TS} (ST) T _{TS} (L)	C _{TS} (LT) T _{TS} (L)	C _{TS} (ST) T _{TS} (L)	S _{TS} (LT) T _{TS} (L)	S _{TS} (ST) T _{TS} (L)
7075-T6510	1.188	T/2, W/4	0.97	---	0.96	---	1.00	1.02	0.52	---
	2.000	T/2, W/2	0.96	---	0.92	---	0.97	1.00	0.52	---
	2.500	T/2	0.85	---	0.78	---	1.01	---	0.51	---
	3.040	T/4, W/4	0.87	---	0.82	---	1.01	0.99	0.52	---
7075-T73510	2.190	T/4, W/4	0.85	0.84	0.91	0.81	---	---	---	---
	3.040	T/2, W/2	0.85	0.85	0.85	0.80	---	---	---	---
	3.040	T/2, W/2	0.87	0.85	0.84	0.80	---	---	---	---
	3.040	T/2, W/2	0.87	0.85	0.84	0.80	---	---	---	---
7178-T6510	0.212	T/2	---	---	---	---	1.05	1.04	0.67	---
	0.275	T/2	0.97	---	0.97	---	1.02	1.06	0.59	---
	0.438	T/2	0.99	---	1.00	---	1.03	---	0.58	---
	1.500	T/4	0.90	---	0.85	---	1.02	---	0.56	---
7178-T6510	2.000	T/2	0.90	---	0.86	---	1.02	0.93	0.56	---
	0.083	T/2	0.99	---	0.97	---	1.01	1.04	---	---
	0.132	T/2	0.99	---	0.96	---	1.06	---	---	---
	0.154	T/2	---	---	---	---	1.06	---	---	---
7178-T6510	0.154	T/2	---	---	---	---	1.06	---	---	---
	0.154	T/2	---	---	---	---	1.06	---	---	---
	0.255	T/2	---	---	---	---	1.06	---	---	---
	0.625	T/2	---	---	---	---	1.06	---	---	---
7178-T6510	2.200	T/2, W/4	0.97	---	0.94	---	0.97	1.01	0.54	---
	2.200	T/2, W/2	0.96	---	0.83	---	0.97	1.01	0.55	---
	2.200	T/2, W/2	0.91	---	0.88	---	0.97	1.01	0.55	---
	2.200	T/2, W/2	0.90	---	0.88	---	0.97	1.01	0.55	---
7178-T6510	1.438	T/4, W/4	0.91	0.84	0.81	0.80	1.02	---	0.55	---
	2.180	T/2, W/2	0.91	0.84	0.81	0.80	1.02	---	0.55	---
	2.180	T/2, W/2	0.91	0.84	0.81	0.80	1.02	---	0.55	---
	2.180	T/2, W/2	0.91	0.84	0.81	0.80	1.02	---	0.55	---

* T - Thickness; W - Width
+ Producer B; all others from Producer A

TABLE V

RATIOS OF MEASUREMENTS TO TENSILE PROPERTIES OF STRESS-RELIEVED STRENGTHENED
ALUMINUM ALLOY EXTENSIONS
(AF23(615)-3560)

Alloy and Temper	Section Thickness, in.	Number	Location*	Tensile				Yield				Elongation			
				AS10	AS10	AS10	AS10	AS10	AS10	AS10	AS10	AS10	AS10	AS10	AS10
2024-T6510	0.061	217950	T/2	1.27	1.42	1.67	1.81	1.21	1.36	1.51	1.65	1.21	1.36	1.51	1.65
			T/2	1.61	1.42	1.58	1.42	1.21	1.42	1.58	1.42	1.21	1.42	1.58	1.42
			T/2	1.58	1.42	1.42	1.42	1.21	1.42	1.58	1.42	1.21	1.42	1.58	1.42
			T/2	1.42	1.42	1.42	1.42	1.21	1.42	1.58	1.42	1.21	1.42	1.58	1.42
2024-T5510	0.061	218019*	T/2	1.52	1.48	1.52	1.48	1.21	1.48	1.52	1.48	1.21	1.48	1.52	1.48
			T/2	1.52	1.48	1.52	1.48	1.21	1.48	1.52	1.48	1.21	1.48	1.52	1.48
			T/2	1.52	1.48	1.52	1.48	1.21	1.48	1.52	1.48	1.21	1.48	1.52	1.48
			T/2	1.52	1.48	1.52	1.48	1.21	1.48	1.52	1.48	1.21	1.48	1.52	1.48
2024-T5510	0.106	217950*	T/2	1.27	1.42	1.67	1.81	1.21	1.36	1.51	1.65	1.21	1.36	1.51	1.65
			T/2	1.61	1.42	1.58	1.42	1.21	1.42	1.58	1.42	1.21	1.42	1.58	1.42
			T/2	1.58	1.42	1.42	1.42	1.21	1.42	1.58	1.42	1.21	1.42	1.58	1.42
			T/2	1.42	1.42	1.42	1.42	1.21	1.42	1.58	1.42	1.21	1.42	1.58	1.42
2024-T5510	0.151	217950*	T/2	1.27	1.42	1.67	1.81	1.21	1.36	1.51	1.65	1.21	1.36	1.51	1.65
			T/2	1.61	1.42	1.58	1.42	1.21	1.42	1.58	1.42	1.21	1.42	1.58	1.42
			T/2	1.58	1.42	1.42	1.42	1.21	1.42	1.58	1.42	1.21	1.42	1.58	1.42
			T/2	1.42	1.42	1.42	1.42	1.21	1.42	1.58	1.42	1.21	1.42	1.58	1.42
2024-T5510	0.250	217950*	T/2	1.27	1.42	1.67	1.81	1.21	1.36	1.51	1.65	1.21	1.36	1.51	1.65
			T/2	1.61	1.42	1.58	1.42	1.21	1.42	1.58	1.42	1.21	1.42	1.58	1.42
			T/2	1.58	1.42	1.42	1.42	1.21	1.42	1.58	1.42	1.21	1.42	1.58	1.42
			T/2	1.42	1.42	1.42	1.42	1.21	1.42	1.58	1.42	1.21	1.42	1.58	1.42
2024-T5510	0.375	217950*	T/2	1.27	1.42	1.67	1.81	1.21	1.36	1.51	1.65	1.21	1.36	1.51	1.65
			T/2	1.61	1.42	1.58	1.42	1.21	1.42	1.58	1.42	1.21	1.42	1.58	1.42
			T/2	1.58	1.42	1.42	1.42	1.21	1.42	1.58	1.42	1.21	1.42	1.58	1.42
			T/2	1.42	1.42	1.42	1.42	1.21	1.42	1.58	1.42	1.21	1.42	1.58	1.42
2024-T5510	0.525	217950*	T/2	1.27	1.42	1.67	1.81	1.21	1.36	1.51	1.65	1.21	1.36	1.51	1.65
			T/2	1.61	1.42	1.58	1.42	1.21	1.42	1.58	1.42	1.21	1.42	1.58	1.42
			T/2	1.58	1.42	1.42	1.42	1.21	1.42	1.58	1.42	1.21	1.42	1.58	1.42
			T/2	1.42	1.42	1.42	1.42	1.21	1.42	1.58	1.42	1.21	1.42	1.58	1.42
2024-T5510	0.842	217950*	T/2	1.27	1.42	1.67	1.81	1.21	1.36	1.51	1.65	1.21	1.36	1.51	1.65
			T/2	1.61	1.42	1.58	1.42	1.21	1.42	1.58	1.42	1.21	1.42	1.58	1.42
			T/2	1.58	1.42	1.42	1.42	1.21	1.42	1.58	1.42	1.21	1.42	1.58	1.42
			T/2	1.42	1.42	1.42	1.42	1.21	1.42	1.58	1.42	1.21	1.42	1.58	1.42
2024-T5510	1.150	217950*	T/2	1.27	1.42	1.67	1.81	1.21	1.36	1.51	1.65	1.21	1.36	1.51	1.65
			T/2	1.61	1.42	1.58	1.42	1.21	1.42	1.58	1.42	1.21	1.42	1.58	1.42
			T/2	1.58	1.42	1.42	1.42	1.21	1.42	1.58	1.42	1.21	1.42	1.58	1.42
			T/2	1.42	1.42	1.42	1.42	1.21	1.42	1.58	1.42	1.21	1.42	1.58	1.42
2024-T5510	1.200	217950*	T/2	1.27	1.42	1.67	1.81	1.21	1.36	1.51	1.65	1.21	1.36	1.51	1.65
			T/2	1.61	1.42	1.58	1.42	1.21	1.42	1.58	1.42	1.21	1.42	1.58	1.42
			T/2	1.58	1.42	1.42	1.42	1.21	1.42	1.58	1.42	1.21	1.42	1.58	1.42
			T/2	1.42	1.42	1.42	1.42	1.21	1.42	1.58	1.42	1.21	1.42	1.58	1.42
2024-T5510	2.760	218045	T/2	1.27	1.42	1.67	1.81	1.21	1.36	1.51	1.65	1.21	1.36	1.51	1.65
			T/2	1.61	1.42	1.58	1.42	1.21	1.42	1.58	1.42	1.21	1.42	1.58	1.42
			T/2	1.58	1.42	1.42	1.42	1.21	1.42	1.58	1.42	1.21	1.42	1.58	1.42
			T/2	1.42	1.42	1.42	1.42	1.21	1.42	1.58	1.42	1.21	1.42	1.58	1.42
2024-T5510	0.075	218022*	T/2	1.52	1.48	1.52	1.48	1.21	1.48	1.52	1.48	1.21	1.48	1.52	1.48
			T/2	1.52	1.48	1.52	1.48	1.21	1.48	1.52	1.48	1.21	1.48	1.52	1.48
			T/2	1.52	1.48	1.52	1.48	1.21	1.48	1.52	1.48	1.21	1.48	1.52	1.48
			T/2	1.52	1.48	1.52	1.48	1.21	1.48	1.52	1.48	1.21	1.48	1.52	1.48

(Continued)

TABLE V
(Continued)
RATIOS OF BEARING TO TENSILE PROPERTIES OF STRESS-RELIEVED STRUTTED
ALUMINUM ALLOY EXTRUSIONS
AP23(615)-3580

Alloy and Temper	Sample Thickness, in.	Number	Location*	Platewise				Extrusion				Extrusion				Extrusion			
				$\frac{R_{TS}(1)}{R_{TS}(1)}$	$\frac{R_{TS}(1)}{R_{TS}(1)}$	$\frac{R_{TS}(1)}{R_{TS}(1)}$	$\frac{R_{TS}(1)}{R_{TS}(1)}$	$\frac{R_{TS}(1)}{R_{TS}(1)}$	$\frac{R_{TS}(1)}{R_{TS}(1)}$	$\frac{R_{TS}(1)}{R_{TS}(1)}$	$\frac{R_{TS}(1)}{R_{TS}(1)}$	$\frac{R_{TS}(1)}{R_{TS}(1)}$	$\frac{R_{TS}(1)}{R_{TS}(1)}$	$\frac{R_{TS}(1)}{R_{TS}(1)}$	$\frac{R_{TS}(1)}{R_{TS}(1)}$	$\frac{R_{TS}(1)}{R_{TS}(1)}$	$\frac{R_{TS}(1)}{R_{TS}(1)}$	$\frac{R_{TS}(1)}{R_{TS}(1)}$	$\frac{R_{TS}(1)}{R_{TS}(1)}$
2024-T3510	0.151	317689	T/2	1.57	1.56	1.76	1.47	1.88	1.41	1.66	1.51	1.57	1.56	1.76	1.47	1.88	1.41	1.66	1.51
	0.252	317690	T/2	1.48	1.48	1.62	1.45	1.88	1.41	1.58	1.48	1.48	1.48	1.62	1.45	1.88	1.41	1.58	1.48
	0.322	317691	T/2	1.57	1.57	1.64	1.47	1.88	1.41	1.64	1.57	1.57	1.57	1.64	1.47	1.88	1.41	1.64	1.57
	0.410	317692	T/2	1.55	1.55	1.64	1.45	1.88	1.41	1.64	1.55	1.55	1.55	1.64	1.45	1.88	1.41	1.64	1.55
	0.510	317693	T/2	1.55	1.55	1.64	1.45	1.88	1.41	1.64	1.55	1.55	1.55	1.64	1.45	1.88	1.41	1.64	1.55
	0.625	317694	T/2	1.45	1.45	1.64	1.40	1.88	1.41	1.64	1.45	1.45	1.45	1.64	1.40	1.88	1.41	1.64	1.45
	0.742	317695	T/2	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40
	0.842	317696	T/2	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40
	0.950	317697	T/2	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40
	1.150	317698	T/2	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40
2024-T3511	1.200	317699	T/2	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40
	1.450	317700	T/2	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40
	1.760	317701	T/2	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40
	2.760	317702	T/2	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40
	0.075	317703	T/2	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40
	0.082	317704	T/2	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40
	0.082	317705	T/2	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40
	0.082	317706	T/2	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40
	0.082	317707	T/2	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40
	0.082	317708	T/2	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40
2024-T3510	0.075	317709	T/2	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40
	0.082	317710	T/2	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40
	0.082	317711	T/2	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40
	0.082	317712	T/2	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40
	0.082	317713	T/2	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40
	0.082	317714	T/2	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40
	0.082	317715	T/2	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40
	0.082	317716	T/2	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40
	0.082	317717	T/2	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40
	0.082	317718	T/2	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40	1.40	1.40	1.64	1.40	1.88	1.41	1.64	1.40

(Continued)

TABLE V
(Concluded)
RATIOS OF BEARING TO TENSILE PROPERTIES OF STRESS-RELIEVED STRETCHED
ALUMINUM ALLOY EXTENSIONS
(AF33(615)-3580)

Alloy and Temper	Sample Section, Thick- ness, in.	Number	Location*	Flatwise				Edgewise									
				BRS (A) BRS (L)		BRS (A) BRS (L)		BRS (A) BRS (L)		BRS (A) BRS (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						
7075-T6510	0.090	31785	1/2	1.43	1.81	1.41	1.74	1.50	1.75	1.40	1.67	---	---	---	---	---	---
	0.130	31809*	1/2	1.46	1.86	1.41	1.74	---	---	---	---	---	---	---	---	---	---
	0.150	31809*	1/2	1.47	1.87	1.41	1.74	---	---	---	---	---	---	---	---	---	---
	0.250	31809*	1/2	1.47	1.87	1.41	1.74	---	---	---	---	---	---	---	---	---	---
	0.375	31785	1/2	1.47	1.87	1.41	1.74	---	---	---	---	---	---	---	---	---	---
	0.430	31809*	1/2	1.47	1.87	1.41	1.74	---	---	---	---	---	---	---	---	---	---
	0.430	31809*	1/2	1.47	1.87	1.41	1.74	---	---	---	---	---	---	---	---	---	---
	0.430	31785	1/2	1.47	1.87	1.41	1.74	---	---	---	---	---	---	---	---	---	---
	0.430	31785	1/2	1.47	1.87	1.41	1.74	---	---	---	---	---	---	---	---	---	---
	0.430	31785	1/2	1.47	1.87	1.41	1.74	---	---	---	---	---	---	---	---	---	---
7075-T73510	1.500	31785	1/2	1.45	1.85	1.41	1.74	1.49	1.83	1.40	1.61	1.26	1.71	1.23	1.65	1.21	1.51
	2.000	31785	1/2	1.45	1.85	1.41	1.74	1.49	1.83	1.40	1.61	1.26	1.71	1.23	1.65	1.21	1.51
	0.375	31790	1/2	1.45	1.85	1.41	1.74	---	---	---	---	---	---	---	---	---	---
	0.430	31790	1/2	1.45	1.85	1.41	1.74	---	---	---	---	---	---	---	---	---	---
	1.500	31790	1/2	1.45	1.85	1.41	1.74	---	---	---	---	---	---	---	---	---	---
	2.000	31790	1/2	1.45	1.85	1.41	1.74	---	---	---	---	---	---	---	---	---	---
7075-T6510	0.062	31792	1/2	1.40	1.77	1.41	1.74	---	---	---	---	---	---	---	---	---	---
	0.125	31792	1/2	1.40	1.77	1.41	1.74	---	---	---	---	---	---	---	---	---	---
	0.150	31809*	1/2	1.40	1.77	1.41	1.74	---	---	---	---	---	---	---	---	---	---
	0.250	31792	1/2	1.40	1.77	1.41	1.74	---	---	---	---	---	---	---	---	---	---
	0.375	31792	1/2	1.40	1.77	1.41	1.74	---	---	---	---	---	---	---	---	---	---
	0.430	31792	1/2	1.40	1.77	1.41	1.74	---	---	---	---	---	---	---	---	---	---
	0.430	31792	1/2	1.40	1.77	1.41	1.74	---	---	---	---	---	---	---	---	---	---
	0.430	31792	1/2	1.40	1.77	1.41	1.74	---	---	---	---	---	---	---	---	---	---
	0.430	31792	1/2	1.40	1.77	1.41	1.74	---	---	---	---	---	---	---	---	---	---
	0.430	31792	1/2	1.40	1.77	1.41	1.74	---	---	---	---	---	---	---	---	---	---

* π - thickness; π - width
+ Producer B; all others from Producer A
** Bearing specimen failed before reaching yield stress (2 per cent offset).
Note: L - Longitudinal; IT - Long-Transverse

TABLE VI
RATIOS AMONG THE MECHANICAL PROPERTIES AT DIFFERENT LOCATIONS
[AF33(615)-3580]

Alloy and Temper	Section Thickness, In.	Sample Number	Direction*	Location†	Tensile		Compressive Yield Stress	Shear Ultimate Stress	Pearline	
					Ultimate Stress	Yield Stress			Ultimate Stress $e/D=1.5$	Yield Stress $e/D=1.5$
2024-T3510	1.657	318046	L	$T/4$	1.01	1.01	1.01	1.00	0.99	0.98
	0.525	318020**	L	$W/4$	0.99	1.00	1.03	0.98	--	--
	2.150	318077	LT	$W/4$	1.03	1.02	--	--	--	--
	1.450	318021**	L	$W/4$	0.97	0.96	0.94	1.01	0.99	1.02
2024-T3511	1.450	318021**	LT	$W/4$	1.01	0.97	0.99	--	--	--
	1.450	318021**	L	$W/4$	0.99	0.98	0.97	0.99	0.99	0.98
	2.520	318033**	LT	$W/4$	--	--	--	--	0.99*	0.97*
	2.760	318048	L	$W/4$	1.01	1.00	1.01	--	--	--
2024-T3510	2.520	318033**	L	$W/4$	1.00	1.01	--	--	--	--
	2.760	318048	LT	$W/4$	1.00	1.02	1.00	0.96	1.03	1.05
	0.525	318024**	L	$W/4$	1.03	1.06	1.04	1.01	0.96*	0.97*
	2.150	318078	LT	$W/4$	0.99	0.98	0.99	0.99	0.99	0.97
2024-T3511	1.450	318025**	L	$W/4$	1.00	1.00	1.00	1.00	--	--
	1.450	318025**	LT	$W/4$	1.00	1.00	0.98	1.00	0.99	1.02
	2.760	318079	L	$W/4$	1.01	1.02	--	--	0.99*	1.01*
	2.760	318079	LT	$W/4$	1.00	1.00	1.00	1.00	1.05	1.01
2024-T3510	2.760	318079	L	$W/4$	1.01	1.02	0.99	1.00	0.94*	0.97*
	2.760	318079	LT	$W/4$	1.01	1.02	0.99	1.03	1.02	0.97

(Continued)

TABLE VI
(Continued)
RATIOS AMONG THE MECHANICAL PROPERTIES AT DIFFERENT LOCATIONS
(AF33(615)-9580)

Alloy and Temper	Section Thickness, in.	Sample Number	Direction* Location†	Tensile Ultimate Stress	Tensile Yield Stress	Compressive Yield Stress	Shear Ultimate Stress	Bearing	
								Ultimate Stress $\sigma/D=1.5$	Yield Stress $\sigma/D=1.5$
6061-T6510	1.240	317907	L $\frac{W}{2}$	1.01	1.01	0.98	0.99	—	—
	1.960	317896	L $\frac{W}{4}$	1.01	1.01	1.02	0.96	0.99	1.00
	6.500	317897	L $\frac{W}{4}$	0.99	0.99	0.99	0.99	0.98	0.99
			LT $\frac{W}{4}$	0.99	0.97	0.97	0.99	—	—
7075-T6510	1.188	317860	L $\frac{W}{2}$	0.96	0.95	0.97	0.94	0.99	0.99
			LT $\frac{W}{4}$	—	—	—	—	1.02*	1.02*
	2.000	317861	L $\frac{W}{4}$	0.98	0.96	0.99	0.99	1.00	0.99
	2.120	318137**	L $\frac{W}{4}$	—	—	—	—	1.03*	0.98*
7075-T73510	3.040	318138**	L $\frac{W}{4}$	0.96	0.97	0.98	0.97	0.95	0.95
			LT $\frac{W}{4}$	0.97	0.96	—	—	—	—
	2.000	317948	L $\frac{W}{4}$	1.03	0.99	—	—	—	—
	0.625	317937	L $\frac{W}{4}$	0.99	1.00	—	—	—	—
7170-T6510	1.200	316139**	LT $\frac{W}{4}$	0.99	0.98	0.98	0.99	1.01	0.99
			L $\frac{W}{4}$	0.98	0.98	0.98	1.00	0.98	0.96
	2.150	318140**	LT $\frac{W}{4}$	0.97	0.95	0.99	1.00	—	—
			L $\frac{W}{4}$	1.00	0.98	—	—	—	—

* L - Longitudinal; LT - Long-Transverse
† W - Width
* Ed-wise bearing specimens; others - flatwise specimens
** Producer B; all others from Producer A

TABLE VII

RATIOS OF BEARING PROPERTIES IN THE EDGEWISE DIRECTION TO THOSE IN THE FLATWISE DIRECTION
FOR STRESS-RELIEVED STRETCHED ALUMINUM ALLOY EXTRUSIONS

Alloy and Temper	Sample		Location*	Direction†	Edgewise/Flatwise	
	Section Thickness, in.	Number			$\frac{BYS(E)/BYS(F)}{e/D=1.5}$	$\frac{BYS(F)/BYS(F)}{e/D=2.0}$
2024-T3510	1.150	318077	T/2, W/4	L	0.91	0.97
2024-T3511	1.200	317946	T/2, W/4	L	0.97	0.98
	1.450	318021#	T/2, W/4	L	0.97	0.99
			T/2, W/2	L	0.97	0.99
2024-T3510	2.760	318048	T/4, W/4	L	1.01	1.04
				LT	0.92	0.96
			T/2, W/2	L	0.94	0.96
2024-T8510	1.150	318078	T/2, W/4	L	0.87	0.93
2024-T8511	1.200	317895	T/2, W/4	L	0.95	0.97
	1.450	318025#	T/2, W/4	L	0.96	0.96
			T/2, W/2	L	0.96	0.96
2024-T8510	2.760	318079	T/4, W/4	L	1.07	1.00
				LT	1.03	1.02
			T/2, W/2	L	0.95	0.96
6061-T6510	1.240	317907	T/2, W/2	L	0.99	0.98
	1.960	317896	T/2, W/2	L	0.99	1.00
	6.500	317897	T/4	L	1.00	0.99
7075-T6510	1.188	317860	T/2, W/4	L	0.99	0.97
				LT	0.90	0.90
			T/2, W/2	L	0.87	0.89
				LT	0.88	0.93
				LT	0.90	0.88

* T - Thickness; W - Width.

† L - Longitudinal; LT - Long-Transverse

Producer B; all others from Producer A

** Bearing specimen failed before reaching yield stress (2 per cent offset).

TABLE VIII

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

Alloy	Sample		Stress 75% Yield Strength*			
	Section Thickness, In.	Number	Longitudinal		Short Transverse	
			F/N	Days	F/N	Days
2024-T3510	0.255	317942	0/2	30	---	---
	0.510	317926	0/2	30	---	---
	0.950	317944++	0/2	30	2/2	6, 6
	1.200	317946++	0/2	30	2/2	6, 6
2024-T8510	0.255	317890	0/2	30	---	---
	0.510	317892	0/2	30	---	---
	0.950	317893++	0/2	30	0/2	16
	1.200	317895++	0/2	30	0/2	16
6061-T6510	0.315	317953	0/2	30	---	---
	0.375	317927	0/2	30	---	---
	1.240	317907	0/2	30	---	---
	1.960	317896	0/2	30	---	---
7075-T6510	0.375	317954	0/2	30	---	---
	0.438	317859	0/2	30	---	---
	1.188	317860++	0/2	30	2/2	6, 6
7075-T73510	0.375	317900	0/2	30	---	---
	0.438	317910	0/2	30	---	---
7178-T6510	0.625	317997	0/2	30	---	---

Notes:

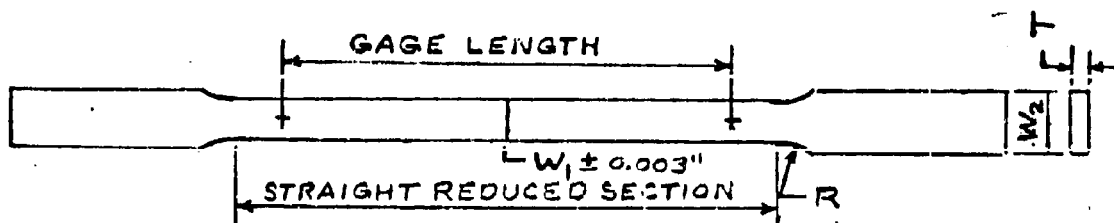
* Specimens used are described in the first Quarterly Report.

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

++ Short transverse yield strengths obtained by tests of duplicate 0.050" diameter tension specimens.

S. - No.	Yield Strength, psi
317944	49 000
317946	48 200
317893	65 000
317895	65 700
317860	73 600

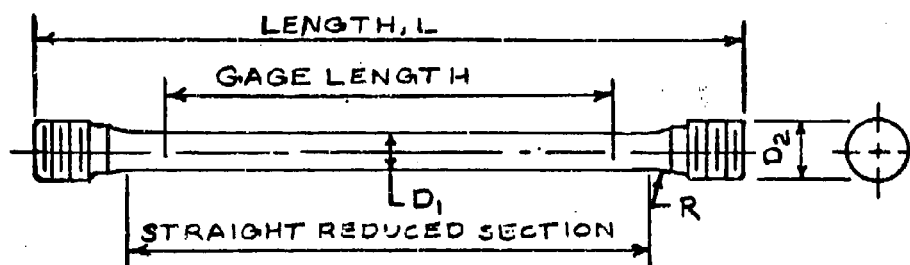
TABLE VIII



WIDTH, IN.		GAGE LENGTH, IN.	REDUCED SECTION LENGTH, IN.	RADIUS (R), IN.	THICKNESS (T), IN.
W_1	W_2				
0.500 ± 0.003	$3/4$	$6.000 \pm 0.002^*$	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 ARE 4 IN., REDUCED-SECTION LENGTHS ARE 5 IN.

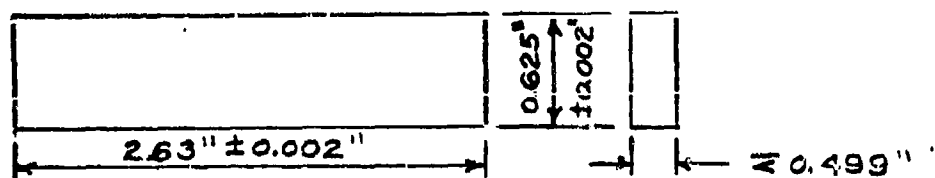
Sheet-Type Specimens



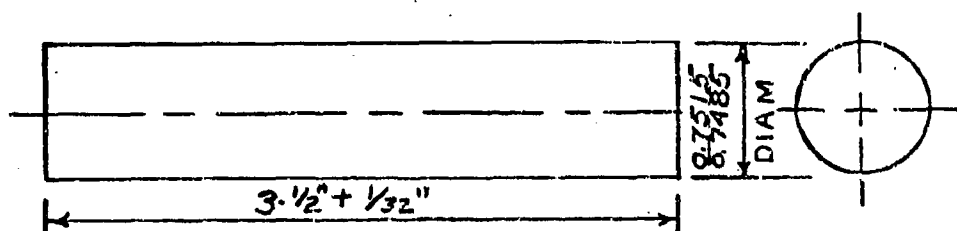
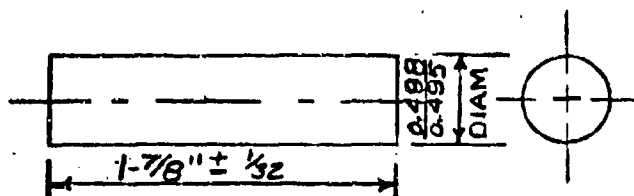
DIAMETER, IN.		GAGE LENGTH, IN.	REDUCED SECTION LENGTH, IN.	RADIUS (R), IN.	LENGTH (L), IN.
D_1	D_2				
0.500 ± 0.003	$3/4$	6.000 ± 0.002	7	$5/8$	$9-1/2$
0.500 ± 0.003	$3/4$	4.000 ± 0.002	5	$5/8$	$7-1/2$
0.500 ± 0.003	$3/4$	2.000 ± 0.002	3	$5/8$	$5-1/2$
0.438 ± 0.003	$5/8$	2.000 ± 0.002	$2-7/8$	$\geq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

Round Specimens

Fig. 1 General Dimensions of Tensile Specimens For Modulus and Stress-Strain Tests



Sheet-Type Specimen



Round Specimens

Fig. 2 General Dimensions of Compressive Specimens
For Modulus and Stress-Strain Tests