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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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Sixth Quarterly Report
June 15, 1967 - September 15, 1967
New Kensington, Pa. September 15, 1967

NOTICE

ABSTRACT

The tensile, compressive, shear and bearing properties of 18 samples of 2014, 6061, 7075, 7079 and 7178 aluminum alloy extrusions in the TX51X tempers have been determined. Ratios among these properties have been computed.

Results of fatigue and stress-corrosion tests made to date are summarized.

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SIXTH 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 Sixth Quarterly Report summarizes the results of tensile, compressive, shear and bearing tests made in the past three months on 18 samples in the TX51X tempers and the results of fatigue and stress-corrosion tests made to date on samples of extrusions in the TX51X and "heat-treated-by-user" tempers. The total number of samples tested to date is 143 in the TX51X temper and 28 in the "heat-treated-by-user" temper.

All of the samples of commercially-produced extrusions to be tested on this contract now have been received. However, because of the inevitable fluctuations in customer orders, certain combinations of alloy, temper and thickness originally ordered did not become available. But, with the number of

extrusions received, the total number of tests required in the contract will be exceeded. Therefore, all unfilled orders have been cancelled.

It is planned that this will be the last quarterly report before issuance of the final report.

II. Material.

A total of 143 samples of commercially-produced extrusions in the TX51X temper and 24 samples in the O temper have been received from two producers. The section thickness and identification of each sample is shown in Table I. The 24 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. Six samples each 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 36.

III. Procedure.

The specimens and test procedures used are as outlined in the Fifth Quarterly Report, dated June 15, 1967.

IV. Summary.

The results of the tensile, compressive, shear and bearing tests made in the past three months on 18 samples of extrusions in the TX51X temper are shown in Table II. The tensile properties of all samples exceed the values in applicable Federal Specifications; the specified minimum tensile properties for extrusions are shown in Table III.

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

The tensile, compressive, shear and bearing (flatwise) tests of all the extrusions in the TX51X temper to be used in the contract have been completed. From the results of these tests the ratios of the various properties to the longitudinal tensile ultimate and yield values have been computed. Statistical analyses of these ratios are now being made to determine minimum ratios for use in computing "A" and "B" minimum design values for MIL-HDBK-5A.

All stress-strain tests have been completed. Minimum ("A" value) and typical tensile and compressive stress-strain and compressive tangent-modulus curves will be prepared on the basis of data from these tests and the minimum ratios now being determined by statistical analysis.

The results of the axial-stress fatigue tests (R=0.0) made to date are shown in Figs. 1 through 7.

The current status of the stress-corrosion tests for extrusions in the TX51X and "heat-treated-by-user" tempers is shown in Tables VIII and IX, respectively.

Presently, the remaining tensile, compressive, shear, bearing, fatigue, fracture-toughness and stress-corrosion

specimens of samples in the TX51X tempers and "heat-treated-by-user" tempers are being machined or tested.

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V. Tables and Figues.

TABLE I

SAMPLES OF EXTRUSIONS RECEIVED AS OF SEPT. 15, 1967
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2014

Temper	Section Thickness, in.	ARL Sample Number
[illegible]	[illegible]	318151*
	[illegible]	[illegible]
	[illegible]	318061
	[illegible]	340488
[illegible]	[illegible]	317950
	[illegible]	318017*
	[illegible]	[illegible]
	[illegible]	318130*
	[illegible]	340154
	[illegible]	[illegible]
	[illegible]	[illegible]
	[illegible]	[illegible]
	[illegible]	[illegible]
	[illegible]	[illegible]
	[illegible]	318046
	[illegible]	[illegible]

2024

Temper	Section Thickness, in.	ARL Sample Number	Temper	Section Thickness, in.	ARL Sample Number
-0	0.064	318026*			
	0.083	317955			
	0.430	3181[illegible]*			
	0.500	340296			
	1.120	340435			
	2.952	340[illegible]			
-T3510	0.075	318[illegible]*	-T8510	0.075	3180[illegible]*
	0.094	318019*		0.094	3191[illegible]*
	0.101	[illegible]		0.101	[illegible]
	0.106	317904		0.106	317886
	0.120	318018**		0.120	3180[illegible]*
	0.151	317866		0.151	317880
	0.255	317942		0.255	317890
	0.258	318047		0.258	318082
	0.375	[illegible]		0.375	[illegible]
	0.510	317926		0.510	317892
	0.525	318020*		0.525	318024*
	0.550	317856		0.550	[illegible]
	0.642	317945		0.642	317894
	0.815	340418*		0.815	340419*
	0.950	317944		0.950	317893
	1.150	319077		1.150	318078
	1.200	317946		1.200	317895
	1.450	318021**		1.450	318025**
	1.705	340213		1.705	340169
	2.[illegible]	318173*		2.520	340420*
	2.760	318048		2.760	3180[illegible]
	4.000	340214		4.000	340225
	4.500	340388		4.500	340389

6061

Temper	Section Thickness, in.	ARL Sample Number
-0	0.125	340436
	0.246	318090
	1.625	317947
-T6510	0.050	318136*
	0.075	317857
	0.090	318027*
	0.125	317846
	0.126	317847
	0.160	340482
	0.245	340421*
	0.250	317648
	0.254	340422*
	0.310	317905
	0.315	317953
	0.375	317927
	0.375	[illegible]
	0.918	317906
	1.004	340423*
	1.240	[illegible]
	[illegible]	[illegible]*
	1.360	317896
	3.000	340226
	6.500	[illegible]

7075

Temper	Section Thickness, in.	ARL Sample Number
-0	0.063	318034*
	0.126	317901
	0.250	[illegible]
	1.275	3180[illegible]*
	2.250	[illegible]
	2.812	[illegible]
-T6510	0.056	[illegible]
	0.065	318021*
	0.080	[illegible]
	0.153	318023*
	0.153	340390
	0.160	318030*
	0.209	340407
	0.260	318028*
	0.313	317906
	0.325	340457
	0.375	317964
	0.438	317859
	0.463	318032*
	0.936	340155
	1.023	3180[illegible]
	1.168	[illegible]
	1.188	[illegible]
	1.500	[illegible]
	2.000	317961
	2.190	318157*
	2.750	340404
	2.812	340494
	3.040	318138*
	3.090	340[illegible]
	5.000	340503
-T73510	0.080	317862
	0.209	340393
	0.313	317909
	0.325	340436
	0.375	317900
	0.438	317910
	0.9[illegible]	340292
	1.000	340434
	1.188	326912
	1.500	317956
	2.000	317948
	2.750	340440
	2.812	340495
	3.090	340392
	5.000	340504

7079

Temper	Section Thickness, in.	ARL Sample Number
-0	0.222	340441
-T6510	0.080	340405
	0.090	340430*
	0.146	340406
	0.151	[illegible]
	[illegible]	[illegible]
	0.500	340426*
	[illegible]	[illegible]

7178

Temper	Section Thickness, in.	ARL Sample Number
-0	[illegible]	[illegible]
	[illegible]	[illegible]*
	0.40[illegible]	[illegible]
	1.500	[illegible]
-T6510	[illegible]	[illegible]
	[illegible]	[illegible]*
	[illegible]	[illegible]*
	0.142	[illegible]
	0.154	[illegible]*
	0.162	[illegible]*
	[illegible]	[illegible]
	[illegible]	[illegible]
	0.26[illegible]	[illegible]*
	[illegible]	[illegible]
	0.390	[illegible]
	[illegible]	[illegible]
	0.780	[illegible]*
	1.188	[illegible]
	1.200	[illegible]*
	1.435	[illegible]
	1.500	[illegible]
	2.150	[illegible]*

*[illegible] B, all others - from Producer A
[illegible]
[illegible]

TABLE II

MECHANICAL PROPERTIES OF STRESS-RELIEVED STRETCHED ALUMINUM ALLOY EXTRUSIONS

AF33(615)-3580

Sample: Section Thickness, in.	Sample: Cross-Sectional Area, in.²	Sample: Number	Location*	Direction†	Tensile Ultimate Stress, psi	Tensile Yield Stress,‡ psi	Elong. 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-T6510									
0.628	3.4	340486	T/2,W/4	L	71 400	64 100	11.4	64 900	39 900	105 600	137 000	88 300	104 500	--	--	--	--
				LT	69 600	62 200	15.6	66 000	--	--	--	--	--	--	--	--	--
			T/2,W/2	L	70 800	63 600	10.0	64 400	39 000	106 200	137 000	89 300	102 800	--	--	--	--
				LT	69 300	62 100	10.0	64 600	40 000	--	--	--	--	--	--	--	--
1.755		340487	T/4,W/4	L	68 500	63 400	11.8	61 600	43 300	103 800	134 900	90 100	106 200	93 800	129 800	86 900	106 700
				LT	67 900	62 100	5.0	--	--	--	--	--	--	--	--	--	--
			T/2,W/2	L	68 800	63 400	11.0	63 000	42 400	105 400	132 400	90 600	104 400	100 600	132 400	87 700	108 700
				LT	67 900	61 700	5.7	65 500	40 600	--	--	--	--	--	--	--	--
								6061-T6510									
0.180	1.6	340482	T/2	L	49 200	46 000	12.0	46 500	--	81 600	105 500	70 200	78 000	--	--	--	--
				LT	46 900	43 400	20.0**	45 700	--	--	--	--	--	--	--	--	--
1.890	4.5	340489	T/2,W/4	L	54 500	50 400	14.5	50 800	28 000	76 600	100 000	61 000	74 300	75 300	96 700	60 100	72 600
				LT	48 000	43 000	18.8	46 200	--	--	--	--	--	--	--	--	--
			T/2,W/2	L	53 200	48 900	16.0	49 400	29 500	76 000	98 900	61 800	74 400	74 600	93 500	59 300	72 600
				LT	48 300	43 400	15.0	46 400	28 000	--	--	--	--	--	--	--	--
								7075-T6510									
0.153	4.0	340390	T/2	L	86 400	77 900	10.0	77 900	--	127 800	159 000	112 100	127 200	--	--	--	--
				LT	88 500	79 600	10.0	85 500	--	132 600	158 700	113 300	135 600	--	--	--	--
1.188	27.1	326914	T/2,W/4	L	86 400	79 200	12.0	78 000	50 200	130 400	161 900	108 000	124 300	109 000	147 200	100 900	120 600
				LT	84 000	75 400	13.0	81 000	48 600	128 900	157 600	108 100	129 900	112 800	153 200	100 000	124 400
			T/2,W/2	L	86 900	80 200	11.5	78 700	48 600	128 200	160 300	107 000	122 500	112 500	150 900	101 200	122 400
				LT	84 000	75 700	14.0	80 900	47 400	126 000	155 100	107 300	128 500	109 500	152 800	99 400	117 100
2.812	11.3	340494	T/4,W/4	L	90 400	83 600	10.5	84 300	48 400	127 800	159 400	102 300	122 900	122 800	157 400	102 500	123 200
				LT	79 300	70 900	10.0	77 100	--	--	--	--	--	--	--	--	--
			T/2,W/2	L	88 300	81 100	10.0	81 700	45 800	121 800	155 300	97 100	116 900	117 000	148 600	96 600	115 800
				LT	77 000	68 400	7.1	74 300	45 100	--	--	--	--	--	--	--	--
				ST	74 000	65 900	3.0	72 800	47 100	--	--	--	--	--	--	--	--

TABLE II (Conc.)

MECHANICAL PROPERTIES OF STRESS-RELIEVED STRETCHED ALUMINUM ALLOY EXTRUSIONS

[AF33(615)-3580]

Sample: Section Thickness, in.	Sample: Cross-Sectional Area, in.²	Number	Location*	Direction*	Tensile Ultimate Stress, psi	Tensile Yield Stress,† psi	Elong. in 2 in. or 4D, %	Comp. Yield Stress,† psi	Shear Ultimate Stress, psi	Bearing**: Plainlug: Ultimate Stress, psi	Bearing**: Plainlug: Yield Stress†† psi	Bearing**: Edgelug: Ultimate Stress, psi	Bearing**: Edgelug: Yield Stress†† psi
										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
5.000	30.0	340503	T/4,W/4	L	86 700	77 400	10.0	77 900	45 900	116 100 / 152 000	97 800 / 116 800	118 100 / 145 100	96 000 / 115 700
				LT	78 600	63 700	5.0	70 200	44 400	113 400 / 149 400	98 600 / 122 900	106 200 / 141 600	95 400 / 114 300
			T/2,W/2	L	83 700	73 900	10.0	71 900	45 100	115 300 / 145 700	93 600 / 111 400	113 000 / [illegible] 000	93 900 / 110 700
				LT	73 100	61 100	6.0	67 300	42 800	-- / --	-- / --	-- / --	-- / --
				ST	72 600	59 300	5.5	66 600	44 700	-- / --	-- / --	-- / --	-- / --
								7075-T73510					
1.188	27.1	326912	T/2,W/4	L	74 600	63 600	12.8	64 700	43 900	112 100 / 144 300	91 200 / 108 700	100 600 / 136 700	87 500 / 110 100
				LT	72 600	62 200	11.5	66 500	42 900	111 500 / 146 000	90 800 / 110 200	101 300 / 135 400	87 300 / 105 700
			T/2,W/2	L	74 500	64 600	12.0	63 900	43 300	112 100 / 143 700	91 800 / 108 600	98 700 / 132 900	89 700 / 107 100
				LT	73 700	63 500	12.5	66 500	42 300	112 800 / 145 500	89 400 / 111 700	100 600 / 135 000	88 500 / 106 400
2.812	11.3	340496	T/4,W/4	L	74 400	66 700	11.5	67 300	42 200	111 100 / 142 600	88 600 / 103 400	108 200 / 138 100	87 400 / 103 700
				LT	69 600	59 500	10.0	63 700	-- / --	-- / --	-- / --	-- / --	-- / --
			T/2,W/2	L	73 200	64 700	11.5	66 900	40 800	107 400 / 138 400	85 900 / 101 300	102 400 / 136 400	85 500 / 102 300
				LT	67 400	58 300	7.1	61 500	39 900	-- / --	-- / --	-- / --	-- / --
				ST	64 100	56 900	5.0	61 100	42 000	-- / --	-- / --	-- / --	-- / --
3.000	24.3	340502	T/4,W/4	L	76 100	66 600	11.5	66 800	41 700	112 600 / 144 300	92 900 / 109 400	107 400 / 137 200	88 800 / 112 600
				LT	72 800	63 400	9.0	66 200	41 600	112 600 / 142 900	90 700 / 110 100	102 800 / 131 800	87 400 / 100 100
			T/2,W/2	L	75 300	64 300	11.0	66 600	41 400	107 100 / 139 800	92 100 / 112 200	103 100 / 132 800	89 500 / 104 600
				LT	70 200	61 700	9.5	64 800	39 900	106 900 / 140 300	86 000 / 101 900	102 500 / 131 100	82 000 / [illegible] 600
				ST	66 600	58 900	6.0	64 400	41 700	-- / --	-- / --	-- / --	-- / --
5.000	30.0	340504	T/4,W/4	L	72 700	62 400	12.0	64 800	41 900	104 200 / 137 100	85 800 / 101 400	103 400 / 134 700	84 500 / 102 400
				LT	67 100	56 700	8.0	60 600	40 100	105 700 / 141 700	87 100 / 109 300	99 400 / 128 300	83 800 / 101 600
			T/2,W/2	L	70 200	60 200	11.5	59 900	40 800	102 000 / 132 200	82 500 / 97 100	100 900 / 131 600	82 100 / 96 500
				LT	65 300	53 600	9.5	57 300	41 500	-- / --	-- / --	-- / --	-- / --
				ST	65 200	52 900	8.0	56 700	39 800	-- / --	-- / --	-- / --	-- / --
								7079-T6510					
0.080	0.45	340490#	T/2	L	78 500	73 000	11.0	74 500	--	122 500 / 155 400	102 300 / 115 800	-- / --	-- / --
0.635	1.8	340532	T/2,W/4	L	88 400	82 500	12.0	82 900	48 300	126 900 / 162 800	103 200 / 117 300	-- / --	-- / --
				LT	75 800	68 900	12.0	--	--	-- / --	-- / --	-- / --	-- / --
			T/2,W/2	L	83 900	78 400	12.0	80 200	46 200	122 900 / 159 700	99 300 / 117 500	-- / --	-- / --
				LT	77 400	70 800	10.0	76 500	46 000	-- / --	-- / --	-- / --	-- / --
								7178-T6510					
0.065	0.33	340491	T/2	L	85 900	83 100	9.0	84 800	--	129 900 / 169 100	106 800 / 126 900	-- / --	-- / --
				LT	86 100	79 800	5.0##	85 800	--	-- / --	-- / --	-- / --	-- / --
0.390	3.6	340506	T/2	L	91 700	83 900	10.5	83 200	50 800	129 000 / 162 500	109 600 / 125 700	-- / --	-- / --
				LT	89 700	79 700	14.5##	86 100	47 000	131 800 / 161 100	113 600 / 139 200	-- / --	-- / --
1.188	27.1	326919	T/2,W/4	L	91 800	86 400	10.5	84 200	52 000	137 600 / 162 900	117 100 / 132 100	115 700 / 152 600	120 300 / 131 400
				LT	99 500	92 000	10.5	89 000	51 500	136 300 / 162 500	117 000 / 136 500	111 900 / 153 800	107 600 / 128 600
			T/2,W/2	L	91 900	86 800	12.0	85 000	52 000	135 700 / 169 600	114 300 / 132 200	118 500 / 153 100	109 300 / 133 100
				LT	89 200	82 200	12.5	88 200	50 500	131 800 / 162 000	114 500 / 139 000	112 700 / 155 300	108 900 / 129 400
1.500	11.3	340557	T/2,W/4	L	93 300	85 700	10.0	83 400	50 000	130 300 / 163 400	109 300 / 126 200	116 400 / 148 600	108 600 / 127 600
				LT	88 700	79 900	7.9	85 800	48 300	130 300 / 154 200	111 400 / 130 300	114 300 / 150 900	107 100 / 124 600
			T/2,W/2	L	91 900	84 400	10.0	80 500	49 500	129 300 / 161 400	108 700 / 129 300	-- / 149 400	-- / 122 500
				LT	86 600	77 200	8.0	83 000	47 000	126 900 / 157 500	108 800 / 122 500	104 900 / 147 200	98 000 / 121 100

* 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 Tosco 3 solvent
†† Offset equals 2 per cent of pin diameter
‡‡ Subsize sheet-type specimen; 1/4-in. width; 1-in. gage length

TABLE II (Cont.)

TABLE III

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	Elongation 2 in. or 4D, %	Federal Specification
2014-T62	≤0.749	All	60 000	53 000	7	
-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,	≤0.249	All	57 000	42 000	12	
-T3511	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	QQ-A-200/3b
	≥1.500	≤25	57 000	38 000	10	
-T8510,	0.050-0.249	All	64 000	56 000	4	
-T8511	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‡,	≤0.249	All	38 000	35 000	8**	QQ-A-200/8b
-T6510	≥0.250	All	38 000	35 000	10	
7075-T62‡,	≤0.249	All	78 000	70 000	7	
-T6510	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	QQ-A-200/11b
	3.000-4.499	>20, ≤32	78 000	70 000	6	
	4.500-5.000	≤32	78 000	68 000	6	
-T73,	≤0.249	--	--	--	--	
-T73510	0.250-0.499	--	--	--	--	
	0.500-1.499	--	--	--	--	
	1.500-2.999	--	--	--	--	None
	3.000-4.499	--	--	--	--	
	4.500-5.000	--	--	--	--	
7079-T62,‡	≤0.249	≤20	75 000	67 000	7	
-T6510	0.250-0.499	≤20	77 000	68 000	7	QQ-A-200/12b
	0.500-1.499	≤20	78 000	70 000	7	
7178-T62‡	≤0.061	≤20	79 000**	73 000**	5	
	0.250-1.499	≤20	82 000**	74 000**	5	
-T6510	0.062-0.249	≤20	84 000**	76 000**	5	QQ-A-200/13
	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.

TABLE IV

RATIOS AMONG THE TENSILE COMPRESSIVE AND SHEAR PROPERTIES OF STRESS-RELIEVED STRETCHED 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)
						2014-T6510							
0.628	3.4	340486†	T/2,W/4	0.97	--	0.97	--	1.01	1.03	--	0.56	--	--
			T/2,W/2	0.98	--	0.98	--	1.01	1.02	--	0.55	0.56	--
1.755	7.2	340487†	T/4,W/4	0.99	--	0.98	--	0.97	--	--	0.63	--	--
			T/2,W/2	0.99	--	0.98	--	0.99	1.03	--	0.62	0.59	--
						6061-T6510							
0.180	1.6	340482	T/2	0.95	--	0.94	--	1.01	0.99	--	--	--	--
1.490	4.5	340489†	T/2,W/4	0.88	--	0.85	--	1.01	0.92	--	0.51	--	--
			T/2,W/2	0.91	--	0.89	--	1.01	0.95	--	0.55	0.53	--
						7075-T6510							
0.153	4.0	340390	T/2	1.02	--	1.02	--	1.00	1.10	--	--	--	--
1.188	27.1	326914	T/2,W/4	0.97	--	0.95	--	0.98	1.02	--	0.58	0.56	--
			T/2,W/2	0.97	--	0.94	--	0.98	1.01	--	0.56	0.55	--
2.812	11.3	340494	T/4,W/4	0.88	--	0.86	--	1.01	0.92	--	0.54	--	--
			T/2,W/2	0.87	0.84	0.84	0.81	1.01	0.92	0.90	0.52	0.51	0.53
5.000	30.0	340503	T/4,W/4	0.86	--	0.82	--	1.01	0.91	--	0.53	0.51	--
			T/2,W/2	0.87	0.87	0.83	0.80	0.97	0.91	0.90	0.54	0.51	0.53
						7075-T73510							
1.188	27.1	326912	T/2,W/4	0.98	--	0.98	--	1.02	1.03	--	0.59	0.58	--
			T/2,W/2	0.99	--	0.98	--	0.99	1.03	--	0.58	0.57	--
2.812	11.3	340495	T/4,W/4	0.93	--	0.91	--	1.02	0.97	--	0.57	--	--
			T/2,W/2	0.92	0.90	0.90	0.88	1.02	0.95	0.94	0.56	0.55	0.57
3.090	24.3	340392	T/4,W/2	0.95	--	0.95	--	1.00	0.99	--	0.55	0.55	--
			T/2,W/2	0.94	0.92	0.93	0.89	1.00	0.98	0.97	0.55	0.53	0.55
5.000	30.0	340504	T/4,W/4	0.92	--	0.89	--	1.02	0.96	--	0.58	0.55	--
			T/2,W/2	0.93	0.93	0.89	0.88	1.00	0.95	0.94	0.58	0.59	0.57
						7079-T6510							
0.080	0.45	340490†	T/2	--	--	--	--	1.02	--	--	--	--	--
0.535	1.8	340532	T/2,W/4	0.86	--	0.84	--	1.00	--	--	0.55	--	--
			T/2,W/2	0.92	--	0.90	--	1.02	0.98	--	0.55	0.55	--
						7178-T6510							
0.065	0.33	340491	T/2	0.96	--	0.96	--	1.02	1.03	--	--	--	--
0.390	3.6	340506	T/2	0.98	--	0.95	--	0.99	1.03	--	0.55	0.51	--
1.188	27.1	326919	T/2,W/4	0.97	--	0.95	--	0.97	1.03	--	0.57	0.56	--
			T/2,W/2	0.97	--	0.95	--	0.98	1.02	--	0.57	0.55	--
1.500	11.3	340557	T/2,W/4	0.95	--	0.93	--	0.97	1.00	--	0.54	0.52	--
			T/2,W/2	0.94	--	0.91	--	0.95	0.98	--	0.54	0.51	--

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

TABLE IV

TABLE V

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

[AP33(615)-3580]

Sample: Section Thickness, in.	Sample: Cross-Sectional Area, in.^{2}	Number	Location*	Flatwise: $F_{BRU}(L)/F_{TU}(L)$ e/D=1.5	Flatwise: $F_{BRU}(L)/F_{TU}(L)$ e/D=2.0	Flatwise: $F_{BRU}(L)/F_{TY}(L)$ e/D=1.5	Flatwise: $F_{BRU}(L)/F_{TY}(L)$ e/D=2.0	Flatwise: $F_{BRU}(LT)/F_{TU}(L)$ e/D=1.5	Flatwise: $F_{BRU}(LT)/F_{TU}(L)$ e/D=2.0	Flatwise: $F_{BRU}(LT)/F_{TY}(L)$ e/D=1.5	Flatwise: $F_{BRU}(LT)/F_{TY}(L)$ e/D=2.0	Edgewise: $F_{BRU}(L)/F_{TU}(L)$ e/D=1.5	Edgewise: $F_{BRU}(L)/F_{TU}(L)$ e/D=2.0	Edgewise: $F_{BRU}(L)/F_{TY}(L)$ e/D=1.5	Edgewise: $F_{BRU}(L)/F_{TY}(L)$ e/D=2.0	Edgewise: $F_{BRU}(LT)/F_{TU}(L)$ e/D=1.5	Edgewise: $F_{BRU}(LT)/F_{TU}(L)$ e/D=2.0	Edgewise: $F_{BRU}(LT)/F_{TC}(L)$ e/D=1.5	Edgewise: $F_{BRU}(LT)/F_{TC}(L)$ e/D=2.0
								2014-T6510											
0.628	3.4	340486†	T/2,W/4	1.48	1.92	1.38	1.63	--	--	--	--	--	--	--	--	--	--	--	--
			T/2,W/2	1.50	1.94	1.40	1.62	--	--	--	--	--	--	--	--	--	--	--	--
1.755	7.2	340487†	T/4,W/4	1.52	1.97	1.42	1.68	--	--	--	--	1.37	1.89	1.37	1.68	--	--	--	--
			T/2,W/2	1.53	1.92	1.43	1.65	--	--	--	--	1.46	1.92	1.38	1.71	--	--	--	--
								6061-T6510											
0.180	1.6	340482	T/2	1.66	2.14	1.53	1.70	--	--	--	--	--	--	--	--	--	--	--	--
1.490	4.5	340489†	T/2,W/4	1.41	1.83	1.21	1.47	--	--	--	--	1.38	1.77	1.19	1.44	--	--	--	--
			T/2,W/2	1.43	1.86	1.26	1.52	--	--	--	--	1.40	1.76	1.21	1.48	--	--	--	--
								7075-T6510											
0.153	4.0	340390	T/2	1.48	1.84	1.44	1.63	1.53	1.84	1.45	1.74	--	--	--	--	--	--	--	--
1.188	27.1	326918	T/2,W/4	1.51	1.87	1.36	1.57	1.49	1.82	1.36	1.64	1.26	1.70	1.27	1.52	1.31	1.77	1.26	1.57
			T/2,W/2	1.48	1.84	1.33	1.53	1.45	1.78	1.34	1.60	1.29	1.74	1.26	1.53	1.26	1.76	1.24	1.48
2.812	11.3	340494	T/4,W/4	1.41	1.76	1.22	1.47	--	--	--	--	1.36	1.74	1.23	1.47	--	--	--	--
			T/2,W/2	1.38	1.76	1.20	1.44	--	--	--	--	1.33	1.68	1.19	1.43	--	--	--	--
5.000	30.0	340503	T/4,W/4	1.34	1.75	1.26	1.51	1.31	1.72	1.27	1.59	1.32	1.67	1.24	1.49	1.22	1.63	1.23	1.48
			T/2,W/2	1.38	1.74	1.27	1.51	--	--	--	--	1.35	1.74	1.27	1.50	--	--	--	--
								7075-T73510											
1.188	27.1	326912	T/2,W/4	1.51	1.95	1.43	1.71	1.51	1.97	1.43	1.73	1.36	1.85	1.38	1.73	1.37	1.83	1.37	1.66
			T/2,W/2	1.50	1.93	1.42	1.68	1.51	1.95	1.38	1.73	1.32	1.78	1.39	1.66	1.35	1.81	1.37	1.65
2.812	11.3	340392	T/4,W/4	1.49	1.92	1.35	1.57	--	--	--	--	1.45	1.86	1.33	1.58	--	--	--	--
			T/2,W/2	1.47	1.89	1.33	1.58	--	--	--	--	1.41	1.86	1.32	1.58	--	--	--	--
3.000	24.3	340504	T/4,W/4	1.48	1.90	1.40	1.64	1.48	1.88	1.36	1.65	1.41	1.80	1.33	1.68	1.35	1.73	1.31	1.50
			T/2,W/2	1.45	1.85	1.39	1.69	1.42	1.85	1.28	1.54	1.37	1.76	1.35	1.64	1.36	1.74	1.24	1.49
5.000	30.0	340504	T/4,W/4	1.43	1.89	1.36	1.60	1.45	1.95	1.37	1.72	1.42	1.85	1.33	1.62	1.37	1.76	1.32	1.61
			T/2,W/2	1.45	1.88	1.37	1.61	--	--	--	--	1.44	1.87	1.36	1.64	--	--	--	--
								7079-T6510											
0.080	0.45	340490	T/2	1.56	1.98	1.40	1.59	--	--	--	--	--	--	--	--	--	--	--	--
0.635	1.8	340532	T/2,W/4	1.44	1.84	1.25	1.42	--	--	--	--	--	--	--	--	--	--	--	--
			T/2,W/2	1.46	1.90	1.27	1.50	--	--	--	--	--	--	--	--	--	--	--	--
								7178-T6510											
0.065	0.33	340491	T/2	1.44	1.88	1.29	1.53	--	--	--	--	--	--	--	--	--	--	--	--
0.390	3.6	340506	T/2	1.41	1.77	1.31	1.50	1.44	1.76	1.35	1.66	--	--	--	--	--	--	--	--
1.188	27.1	326919	T/2,W/4	1.50	1.77	1.36	1.53	1.48	1.77	1.35	1.60	1.26	1.68	1.28	1.52	1.22	1.68	1.24	1.49
			T/2,W/2	1.48	1.84	1.32	1.52	1.45	1.76	1.32	1.60	1.29	1.67	1.26	1.53	1.23	1.69	1.25	1.49
1.500	11.3	340557	T/2,W/4	1.40	1.75	1.28	1.50	1.40	1.65	1.30	1.52	1.25	1.59	1.27	1.49	1.23	1.62	1.25	1.45
			T/2,W/2	1.41	1.76	1.29	1.53	1.38	1.71	1.29	1.45		1.63		1.45	1.14	1.60	1.16	1.43

TABLE V

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

TABLE VI

RATIOS AMONG THE MECHANICAL PROPERTIES AT DIFFERENT LOCATIONS IN STRESS-RELIEVED STRETCHED ALUMINUM ALLOY EXTRUSIONS

AF33(615)-3580

Alloy and Temper	Sample: Section Thickness, in.	Sample: Cross-Sectional Area, in.^{2}	Sample: 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
2014-T6510	0.628	3.4	340486**	L	W/2/W/4	0.99	0.99	0.99	0.98	1.01	1.00	1.01	0.98
				LT		1.00	1.00	0.98	--	--	--	--	--
	1.755	7.2	340487**	L	TW/2/TW/4	1.00	1.00	1.02	0.96	1.02	0.98	1.01	0.98
				L		--	--	--	--	1.07‡	1.02‡	1.01‡	1.02‡
				LT		1.00	0.99	--	--	--	--	--	--
6061-T6510	1.490	4.5	340489**	L	W/2/W/4	0.98	0.97	0.97	1.05	0.99	0.99	1.01	1.00
				L		--	--	--	--	0.99‡	0.97‡	0.99‡	1.00‡
				LT		1.01	1.01	1.00	--	--	--	--	--
7075-T6510	1.188	27.1	326914	L	W/2/W/4	1.01	1.01	1.01	0.97	0.98	0.99	0.99	0.99
				L		--	--	--	--	1.03‡	1.03‡	1.00‡	1.01‡
				LT		1.00	1.00	1.00	0.98	0.98	0.98	0.99	0.99
				LT		--	--	--	--	[illegible]‡	1.00‡	0.99‡	0.94‡
	2.812	11.3	340494	L	TW/2/TW/4	0.98	0.97	0.97	0.95	0.95	0.97	0.95	0.95
				L		--	--	--	--	0.95‡	0.94‡	0.94‡	0.94‡
				LT		0.97	0.96	0.96	--	--	--	--	--
	5.000	30.0	340503	L	TW/2/TW/4	0.97	0.95	0.92	0.98	0.99	0.96	0.96	0.95
				L		--	--	--	--	0.99‡	1.01‡	0.98‡	0.96‡
				LT		0.98	0.96	0.96	0.96	--	--	--	--
7075-T73510	1.188	27.1	326912	L	W/2/W/4	1.01	1.02	0.99	0.99	1.00	1.00	1.01	1.00
				L		--	--	--	--	0.98‡	0.97‡	1.02‡	0.97‡
				LT		1.02	1.02	1.01	0.99	1.01	1.00	0.96	1.01
				LT		--	--	--	--	0.99‡	1.00‡	1.01‡	1.01‡
	2.812	11.3	340495	L	TW/2/TW/4	0.98	0.98	0.98	0.97	0.97	0.97	0.97	0.99
				L		--	--	--	--	0.96‡	0.99‡	0.96‡	0.99‡
				LT		0.98	0.98	0.97	--	--	--	--	--
	3.090	24.3	340392	L	TW/4/TW/2	0.99	1.00	0.99	0.99	0.97	0.97	0.99	1.03
				L		--	--	--	--	0.96‡	0.97‡	1.01‡	0.97‡
				LT		0.98	0.97	0.98	0.96	0.92	0.98	0.94	0.93
				LT		--	--	--	--	1.00‡	0.99‡	0.94‡	0.99‡
	5.000	30.0	340504	L	TW/2/TW/4	0.97	0.95	0.93	0.97	0.98	0.96	0.96	0.96
				L		--	--	--	--	0.98‡	0.98‡	0.97‡	0.96‡
				LT		0.97	0.95	0.95	1.03	--	--	--	--
7079-T6510	0.535	1.8	340532	L	W/2/W/4	0.95	0.95	0.97	0.96	0.97	0.98	0.96	1.00
				LT		1.02	1.03	--	--	--	--	--	--
7178-T6510	1.188	27.1	326919	L	W/2/W/4	1.00	1.00	1.01	1.01	0.99	1.04	0.98	1.00
				L		--	--	--	--	1.02‡	1.00‡	0.99‡	1.01‡
				LT		1.00	1.00	0.99	0.98	0.97	1.00	0.98	1.00
				LT		--	--	--	--	1.01‡	1.01‡	1.01‡	1.00‡
	1.500	11.3	340557	L	W/2/W/4	0.98	0.98	0.97	0.99	0.99	0.99	0.99	1.01
				L		--	--	--	--	[illegible]‡	1.01‡	[illegible]‡	0.96‡
				LT		0.98	0.97	0.97	0.97	0.97	1.02	0.98	0.94
				LT		--	--	--	--	0.92‡	0.98‡	0.92‡	0.97‡

* L - Longitudinal; LT - Long Transverse
† T - Thickness, W - Width
‡ Edgewise bearing specimens; others - flatwise specimens
** Producer B; all others from Producer A

TABLE VII

RATIO 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
6061-T6510	1.490	4.5	340489‡	T/2,W/4	L	0.98	0.97	0.99	0.98
				T/2,W/2	L	0.98	0.95	0.96	0.98
7075-T6510	1.188	27.1	326914	T/2,W/4	L	0.84	0.91	0.93	0.97
					LT	0.88	0.97	0.93	0.96
				T/2,W/2	L	0.88	0.94	0.95	1.00
					LT	0.87	0.99	0.93	0.91
	2.812	11.3	340494	T/4,W/4	L	0.96	0.99	1.00	1.00
				T/2,W/2	L	0.96	0.96	0.99	0.99
	5.000	30.0	340503	T/4,W/4	L	0.98	0.95	0.98	0.99
					LT	0.94	0.95	0.97	0.93
				T/2,W/2	L	0.98	1.00	1.00	0.99
7075-T73510	1.188	27.1	326912	T/2,W/4	L	0.90	0.95	0.96	1.01
					LT	0.91	0.93	0.96	0.96
				T/2,W/2	L	0.88	0.92	0.98	0.99
					LT	0.89	0.93	0.99	0.95
	2.812	11.3	340495	T/4,W/4	L	0.97	0.97	0.98	1.00
				T/2,W/2	L	0.96	0.99	1.00	1.00
	3.090	24.3	340392	T/4,W/4	L	0.95	0.95	0.96	1.03
					LT	0.91	0.92	1.04	0.91
				T/2,W/2	L	0.95	0.95	0.97	0.97
					LT	0.96	0.93	0.96	0.97
	5.000	30.0	340504	T/4,W/4	L	0.99	0.98	0.98	1.01
					LT	0.94	0.91	0.96	0.93
				T/2,W/2	L	0.99	1.00	1.00	1.01
7178-T6510	1.188	27.1	326919	T/2,W/4	L	0.84	0.94	0.94	0.99
					LT	0.82	0.95	0.92	0.93
				T/2,W/2	L	0.87	0.91	0.96	1.01
					LT	0.86	0.96	0.95	0.93
	1.500	11.3	340557	T/2,W/4	L	0.89	0.91	0.99	1.00
					LT	0.88	0.98	0.96	0.96
				T/2,W/2	L		0.93		0.95
					LT	0.83	0.93	0.90	0.99

* T - Thickness; W - Width

† L - Longitudinal; LT - Long Transverse

‡ Producer B; all others from Producer A

TABLE VII

TABLE VIII

RESISTANCE TO STRESS-CORROSION CRACKING OF STRESS-RELIEVED STRETCHED ALUMINUM ALLOY EXTRUSIONS
Exposure: 3.5% NaCl Solution by Alternate Immersion
Stressed - 75% Yield Strength
(AF33(615)-3580)

Alloy	Section Thickness, Inches	Number	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-T6510	0.250	340154	0/2	84	5	2/2	2, 2***	--	--	--
	0.625	340486	0/2	27		0/2	27		--	--
	1.755	340487*							2/2	2, 2
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(OK84)	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	22	2/2	12, 26	--	1/2	40(OK84)
	4.000	340214**	0/2	84	27	2/2	2, 5	--	2/2	84, 84§
2024-T8510	0.255	317890	0/2	84	6	0/2	84	6	--	--
	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	84	8	0/2	84	9	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	84	0	0/2	84	0	0/2	84
7075-T6510	0.375	317954	0/2	84	3	1/2	17(OK84)	7	--	--
	0.438	317859	0/2	84	3	0/2	84	4	--	--
	0.935	340155*	0/2	84		1/2	72(OK84)		2/2	1, 4
	1.188	317860*	0/2	84	3	0/2	84	6	2/2	5, 5
	2.190	318137	0/2	84	7	1/2	8(OK84)	18	2/2	4, 4
	3.040	318138	0/2	84	5	2/2	4, 4	--	2/2	9, 9
	3.090	340391	0/2	42		2/2	2, 2	--	2/2	6, 6
	5.000	340503	0/2	27		2/2	2, 2	--	2/2	2, 2
7075-T73510	0.375	317900	0/2	84	0	0/2	84	0	--	--
	0.438	317910	0/2	84	2	0/2	84	3	--	--
	0.935	340292*	0/2	84		0/2	84		0/2	42
	1.000	340439*	0/2	27		0/2	27			
	3.090	340392	0/2	27		0/2	27		0/2	23
	5.000	340504	0/2	27		0/2	27		0/2	42
7079-T6510	0.251	340253	0/2	84		0/2	84		--	--
	0.500	340424	0/2	48		0/2	48		--	--
7178-T6510	0.625	317997	0/2	84	9	1/2	81(OK84)	14	--	--
	1.200	318139*	0/2	84	10	2/2	3, 7	--	2/2	4, 5
	1.500	340677								
	2.180	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" or 0.160" 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.

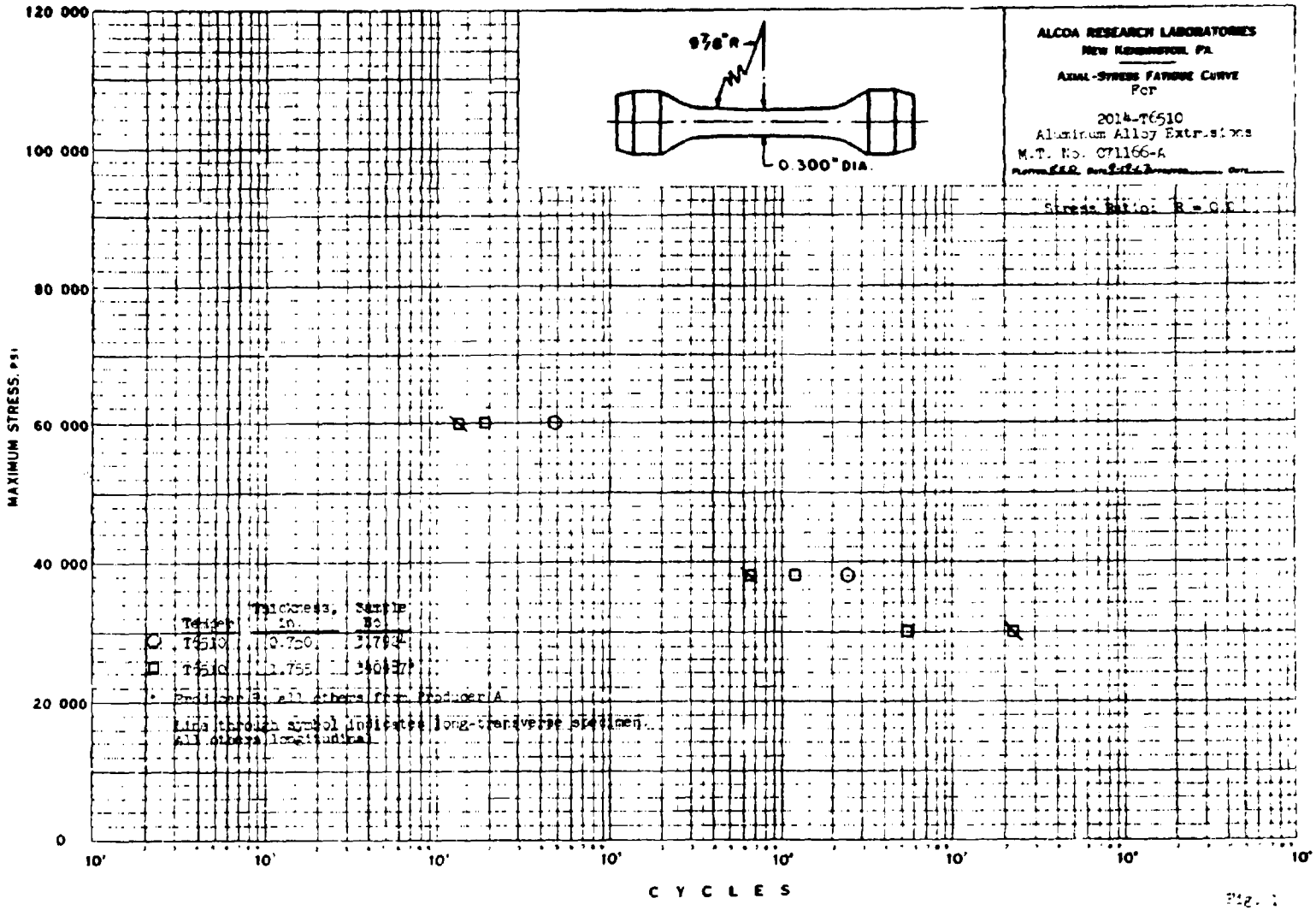
TABLE IX

RESISTANCE TO STRESS-CORROSION CRACKING OF ALUMINUM ALLOY EXTRUSIONS
IN THE "HEAT-TREATED-BY-USER" TEMPER
Exposure: 3.5% NaCl Solution by Alternate Immersion
Stressed - 75% Yield Strength
(AF33(615)-3580)

Alloy	Section Thickness, Inches	Number	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**(OK84)	11	1/2	24**(OK84)	13	--	--
2024-T42	0.430	340241	0/2	84		0/2	84			
	2.562	340245	0/2	84		2/2	2,2	--	2/2	84, 84
2024-T62	0.430	340242	0/2	84		0/2	84		--	--
	2.562	340246	0/2	84		0/2	84		0/2	84
6061-T62	0.246	318090	0/2	84	0	0/2	84	2	--	--
	1.625	318091*	0/2	84	2	0/2	84	1	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, 84
7075-T73	0.350	318097	0/2	84	2	0/2	84	4	--	--
	1.225	318099*	0/2	84	1	0/2	84	5	0/2	84
7178-T6	0.403	340249	2/2	37, 42	--	2/2	37, 42	--	--	--

† 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.

TABLE IX


ALCOA RESEARCH LABORATORIES
NEW KENSINGTON, PA.
AXIAL-STRESS FATIGUE CURVE
FOR
2014-T6510
Aluminum Alloy Extrusions
M.T. No. C71166-A
Stress Ratio: R = 0.5
9⅞"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 No.
T6510
0.750
T6510
1.755
Fig. 1

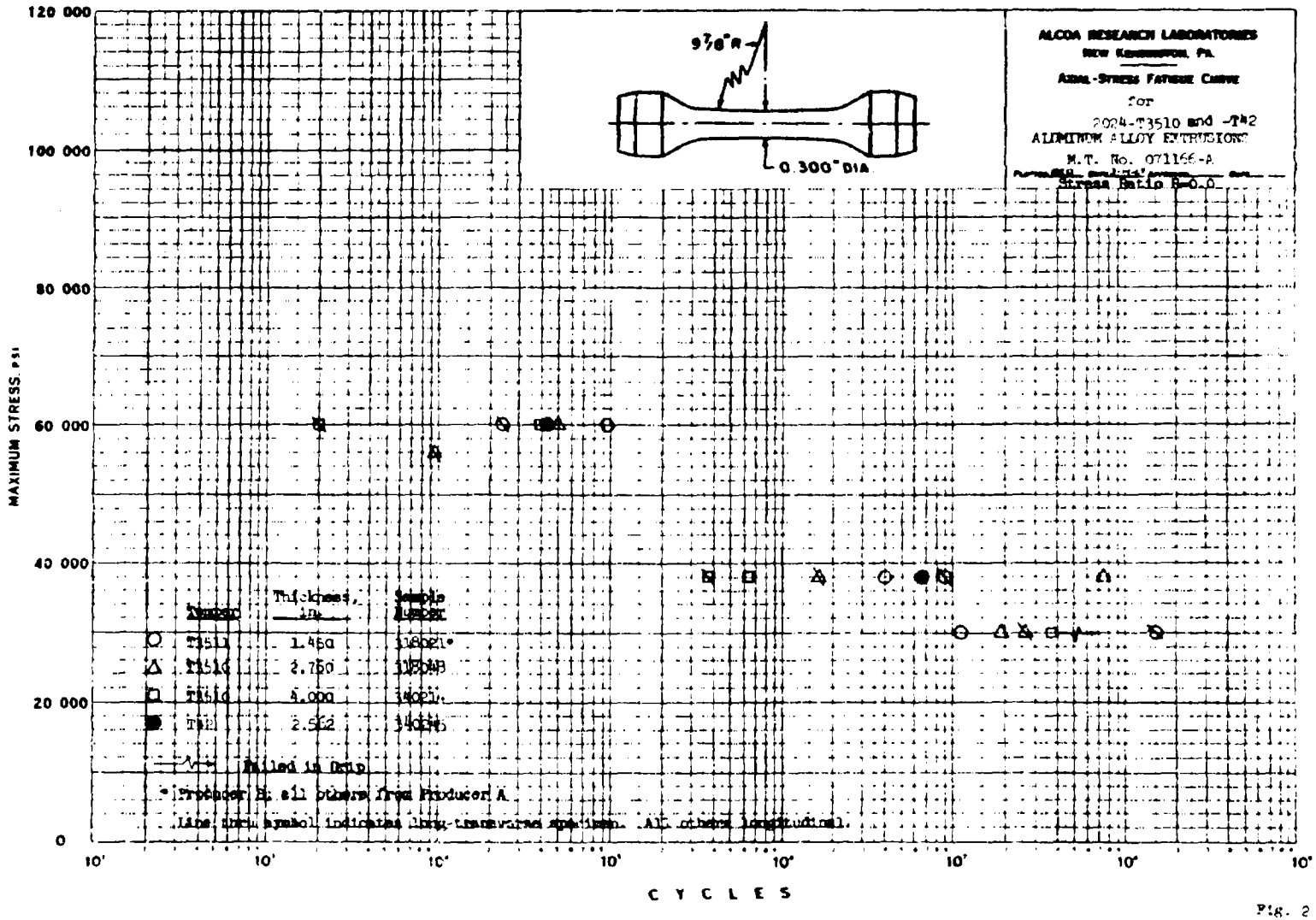

ALCOA RESEARCH LABORATORIES
New Kensington, Pa.
Axial-Stress Fatigue Curve
for
2024-T3510 and -T3512
ALUMINUM ALLOY EXTRUSIONS
M.T. No. 071166-A
Stress Ratio R=0.0
9⅞"R
0.300" DIA
MAXIMUM STRESS, psi
120 000
100 000
80 000
60 000
40 000
20 000
0
10⁴
10⁵
10⁶
10⁷
10⁸
CYCLES
Thickness, in.
Sample Number
T3511
1.450
T3510
2.750
T3510
4.000
T3512
2.562
Failed in Grip
Producer B, all others from Producer A
Line thru symbol indicates long-transverse specimen. All others longitudinal.

Fig. 2

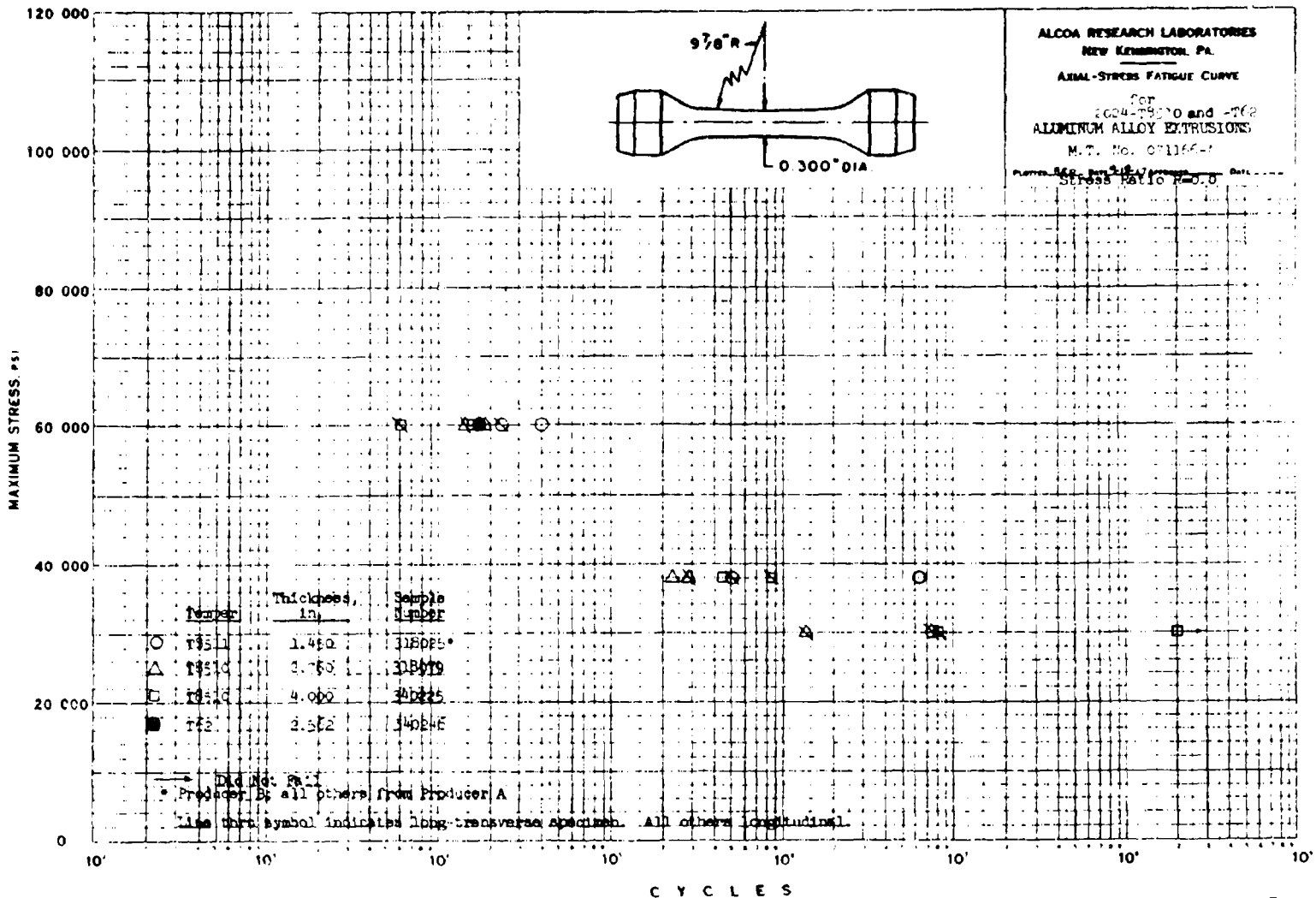

ALCOA RESEARCH LABORATORIES
New Kensington, Pa.
AXIAL-STRESS FATIGUE CURVE
for
2024-T8510 and -T62
ALUMINUM ALLOY EXTRUSIONS
M.T. No. 071166-F
Stress Ratio R=0.0
9⅞"R
0.300"DIA
MAXIMUM STRESS, psi
120 000
100 000
80 000
60 000
40 000
20 000
0
10⁴
10⁵
10⁶
10⁷
CYCLES
Temper
Thickness, in.
Sample Number
T851
1.450
T851
T851
4.000
T62
2.562
Did Not Fail
* Producer B; all others from Producer A
Like this symbol indicates long transverse specimen. All others longitudinal.

Fig. 3

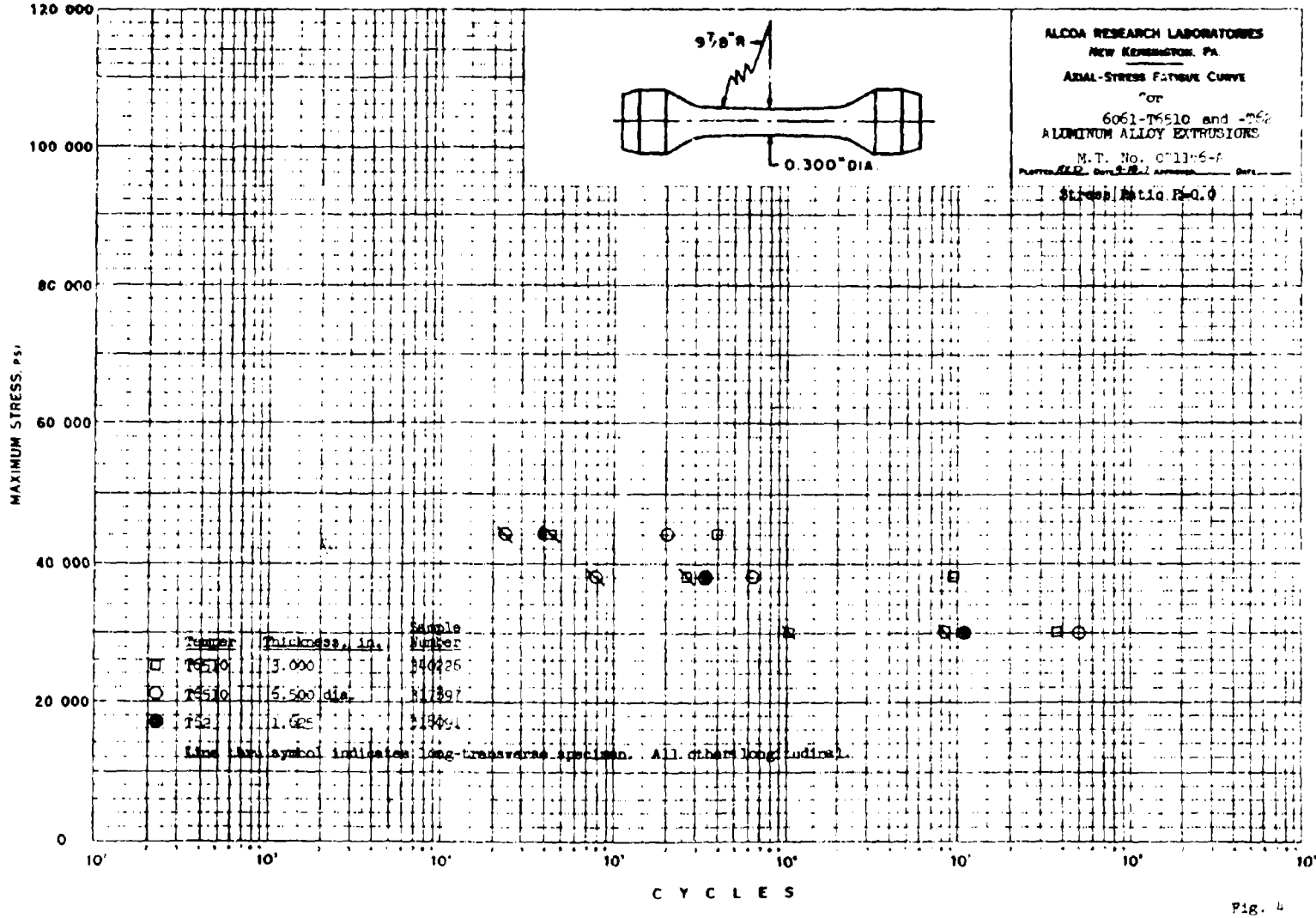

ALCOA RESEARCH LABORATORIES
NEW KENSINGTON, PA.
AXIAL-STRESS FATIGUE CURVE
FOR
6061-T6510 and -T652
ALUMINUM ALLOY EXTRUSIONS
M.T. No. C1146-F
Stress Ratio R=0.0
9 7/8" R
0.300" DIA
MAXIMUM STRESS, PSI
120 000
100 000
80 000
60 000
40 000
20 000
0
10'
10'
10'
10'
10'
10'
10'
CYCLES
Temper | Thickness, in. | Sample Number
T6510 | 3.000 | 21426
T6510 | 5.500 dia. | 21397
T652 | 1.625 | 21404
Like [illegible] symbol indicates long-transverse specimen. All others longitudinal.

Fig. 4

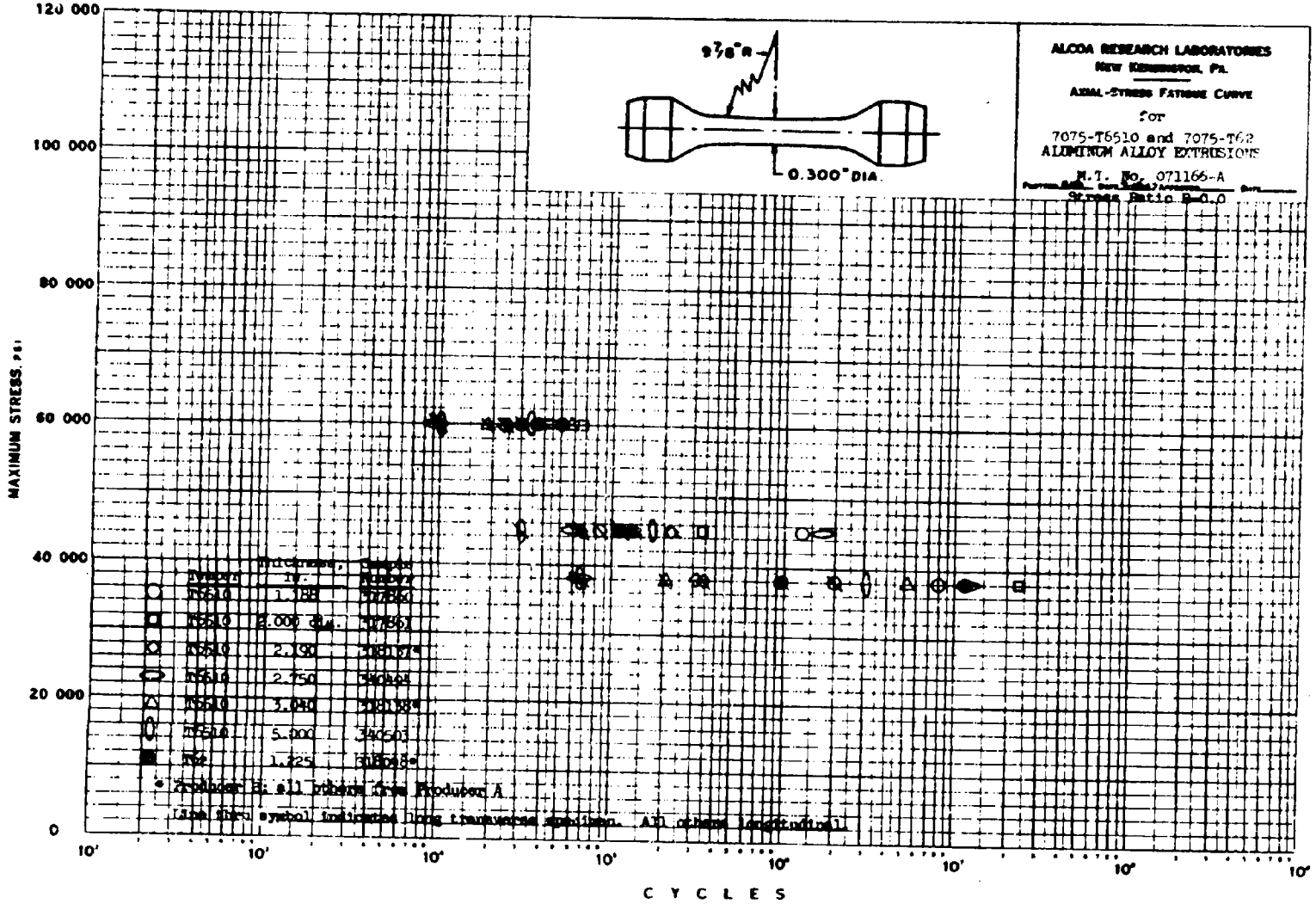

ALCOA RESEARCH LABORATORIES
New Kensington, Pa.
Axial-Stress Fatigue Curve
for
7075-T6510 and 7075-T62
ALUMINUM ALLOY EXTRUSIONS
N.T. No. 071166-A
Stress Ratio R=0.0
9 7/8" R
0.300" DIA.
MAXIMUM STRESS, psi
120 000
100 000
80 000
60 000
40 000
20 000
0
10'
10'
10'
10'
10'
10'
10'
10'
CYCLES

Fig. 5

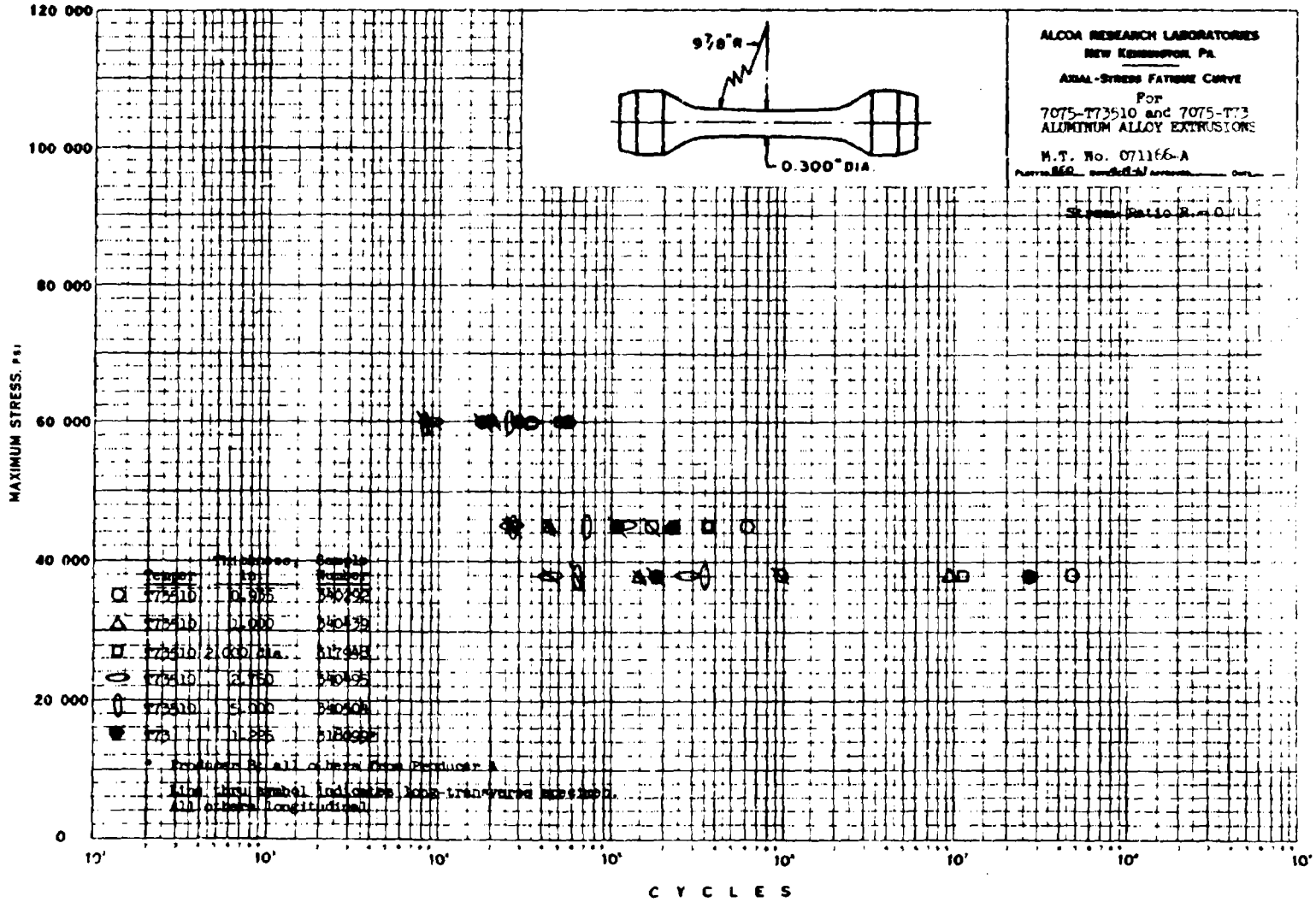

ALCOA RESEARCH LABORATORIES
NEW KENSINGTON, PA.
AXIAL-STRESS FATIGUE CURVE
For
7075-T73510 and 7075-T73
ALUMINUM ALLOY EXTRUSIONS
M.T. No. 071166-A
Stress Ratio R = 0
9 7/8" R
0.300" DIA.
MAXIMUM STRESS, PSI
120 000
100 000
80 000
60 000
40 000
20 000
0
10⁴
10⁵
10⁶
10⁷
CYCLES

Fig. 6

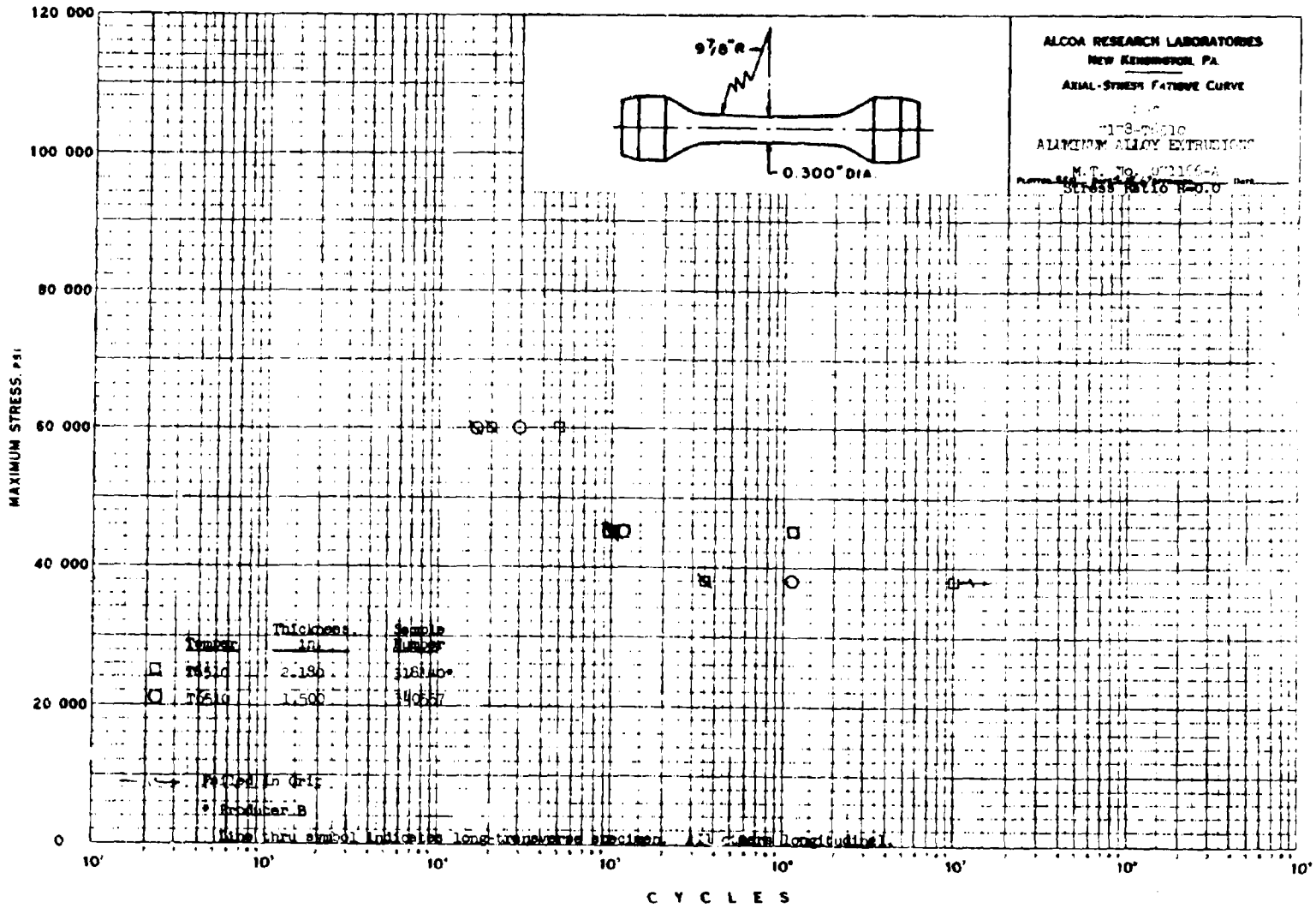

ALCOA RESEARCH LABORATORIES
NEW KENSINGTON PA.
AXIAL-STRESS FATIGUE CURVE
ALUMINUM ALLOY EXTRUSIONS
Stress Ratio R=0.0
9 7/8" R
0.300" DIA
MAXIMUM STRESS, PSI
120 000
100 000
80 000
60 000
40 000
20 000
0
10'
10'
10'
10'
10'
10'
10'
10'
CYCLES
Temper
Thickness, In.
Sample Number
T651
2.180
T651
1.500
Failed in Grip
Producer B
Nine thru symbol indicates long-transverse specimen. All others longitudinal.

Fig. 7