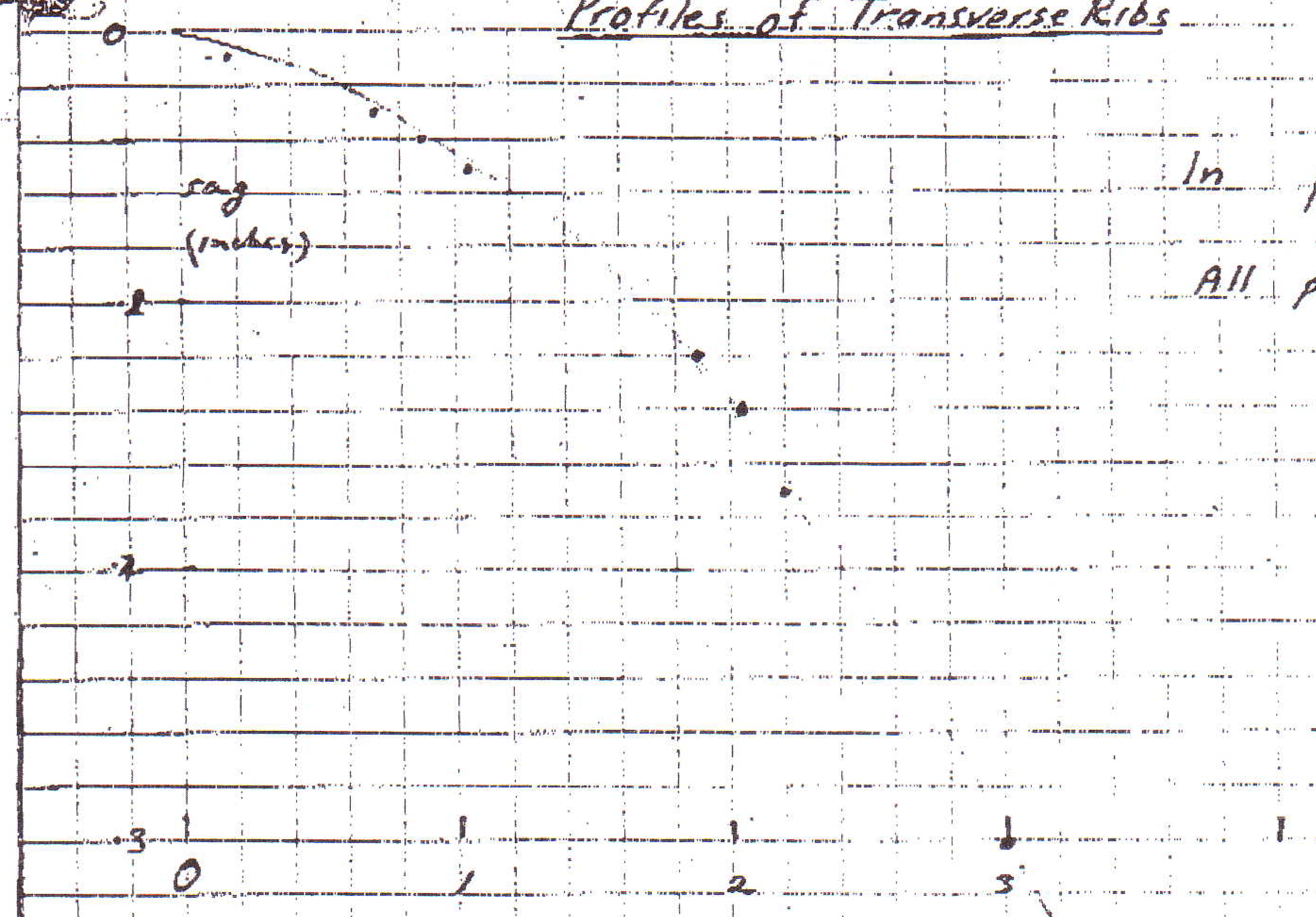
[redacted]

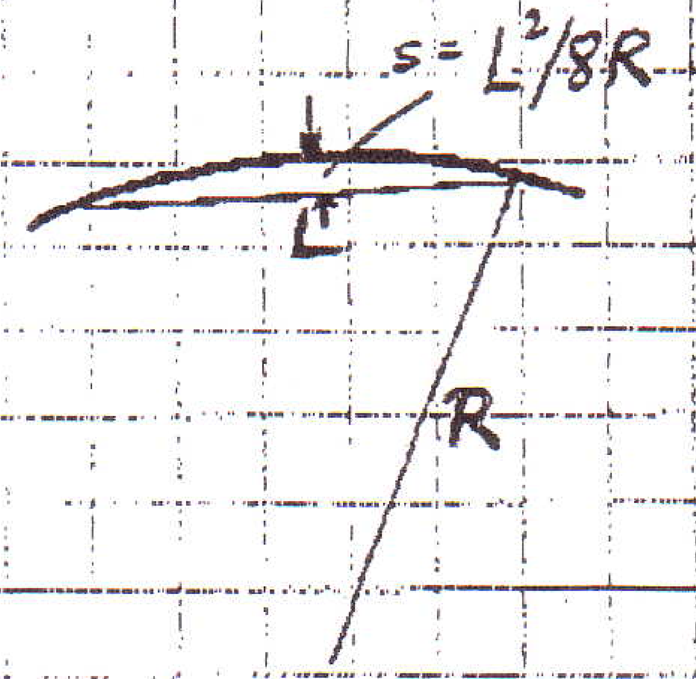
Profiles of Transverse Ribs

10 Mar 1965



In plane perp to $x'z'$ plane

All profiles superimpose roughly in x = const planes



x	Span L	sag s (in)	$\left(\frac{L^2}{8s}\right)12$	CURVT	$\left(\frac{L^2}{8\,CURVT}\right)12$	$(L^2/8\times45)12$
10	1.061	.05	33.8	37.297	.040	.033
20	2.197	.17	42.7	41.134	.18	.16
30	3.333	.35	47.7	46.861	.35	.36

This should equal CURVT since x's const plane is here normal to surface (CURVT = 41.1)

At outer edge, CURVT is 46.861 ft. In the plane x' = const, which is inclined 10.9° to the normal, the r. of c. should be

46.861 sec 10.9° = 47.9, which agrees with the above value (47.7) based on computed span & sag. But the agreement is poor at the inner edge (37.297 sec 13.75 = 38.4 cf. 33.8)

In making the ribs we should use CURVT. However, the discrepancy with calculations of z' vs. x' is only about 0.02 inch.

We could use the same rad. of curv. of 45 ft throughout. This gives agreement to 0.02 inch all over. Better, however, is to ~~[illegible]~~ pick a universal curve that gives correct sag for all spans as given by $L^2/8\,CURVT$. This can be improved also. Final result is

$$y = 131\,y_{feet}^2 + \left\{\begin{matrix} 0 & y=0 \\ 2 & \\ 4 & \\ 5 & \\ 6 & \\ 5 & \end{matrix}\right. \text{ thou.}$$

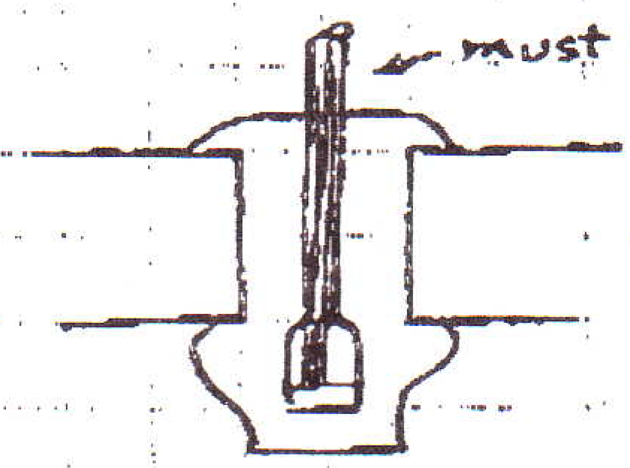
Pop Rivets

10 Mar 1965

Closed end AD 4 2 5 — 5056 Aluminum rivet with 1025 steel mandrel cadmium plated

alum. — domed head — $\frac{4}{32}$ dia — $\frac{2}{16}$ grip — solid-core closed end.

must be snipped



Ultimate strength : Shear 480 lb. tensile 337 lb.

Hollow core	305	337
Open end	220	307

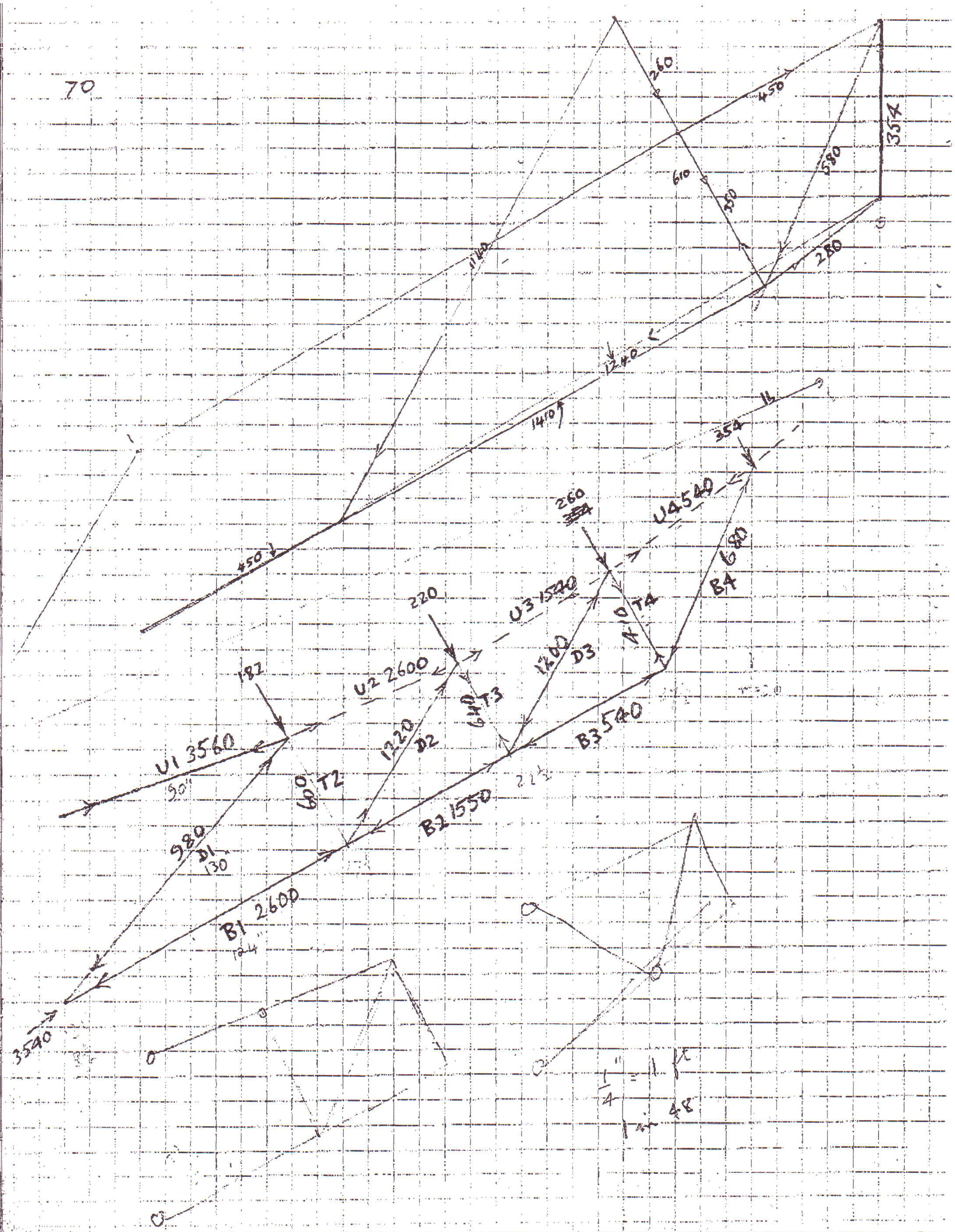
Price: $22.80 per thousand, small quantities

Metals Supply 1310 - 65th St Emeryville 8 OL5-1882

We ordered both AD53 S and AD5 S

The shorter is good for 2 thicknesses of .063 matl, ~~fair~~ poor for 3, no good for 4
longer OK good poor

"Poor" means that shear strength is prob OK, but tension dubious


70
260
450
354
610
580
350
280
1140
1240
1410
354
450
260
U4 540
680
B4
U3 1540
220
T4
410
D3
1200
U2 2600
182
T3
640
B3 540
U1 3560
1320
D2
T2
600
B2 1550
980
D1
130
B1 2600
3540
1/4" = 1 ft
1 in 48

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Stress Analysis

11 Mar 1965

Wind load Base on 20 lb/ft^2 (70 mph nominal)

Area of segment shown opposite, 56 in all $\doteq \frac{1}{56} \times .7854 \times 60^2$

$= 50$ ft^2

(More precisely $23.13 \times \frac{1.061 + 3.333}{2} = 50.6$)

Load on segment $= 20 \times 50 = 1000$ lb. This assumes the wind is normal to the segm

Divide load in proportion to areas measured from RC-120

$6.5 \times 1.4 : 5.8 \times 1.9 : 5.2 \times 2.5 : 5.7 \times 3.1$

$= 9.1 : 11.0 : 13.0 : 17.7$ ft^2 $\Sigma =$ 50.

$= 182 : 220 : 260 : 354$ lb $\Sigma = 101$

Diagonals & bottom members are in compression

Since the diagonals are all double the loads may be halve and the same is true of ~~the~~ T2, T3, T4.

The most critical members are B1 and U1 Consider B1

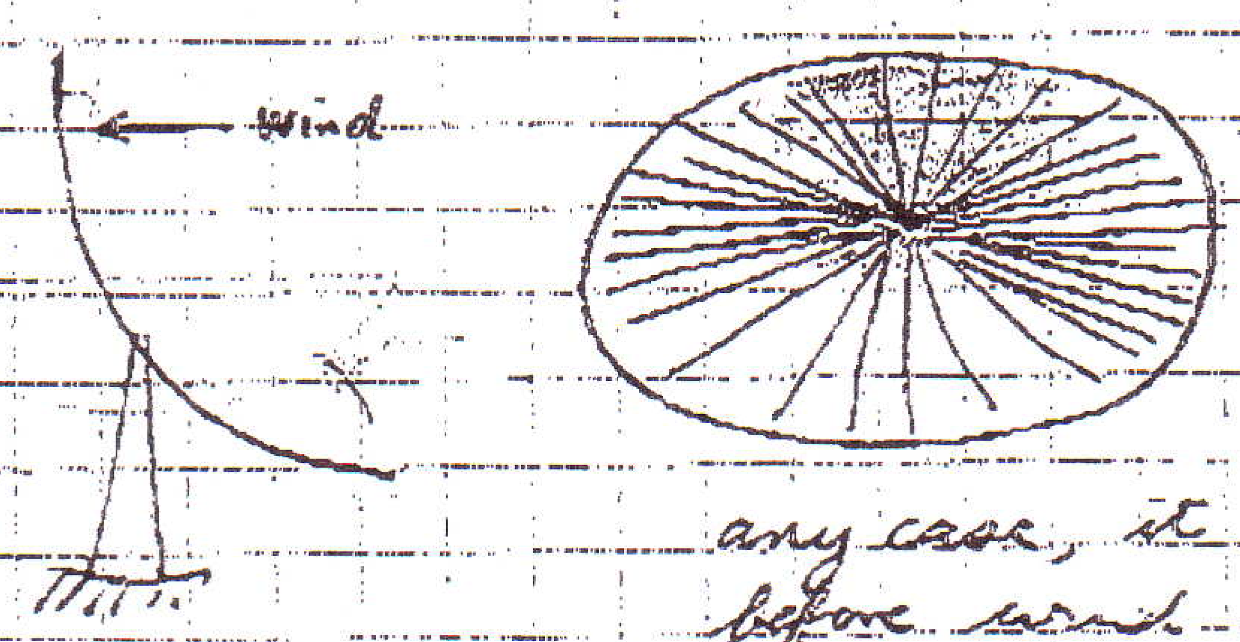
Assume 2" dia $\frac{1}{16}$" wall Area $= 0.38$ in^2 $I = 0.38$ in^4 L=

Compressive stress $= 2600/0.38 = 6900$ lb/in^2 OK

Euler load $= \pi^2 I E / L^2 = 10 \times .38 \times 10^7 / 124^2 = 2500$ lb (hinged

Hence B1 is on the point of buckling Now consider U1,

Compressive stress (each member) $= \frac{1}{2} \times 3560/0.38 = 4700$ lb/in^2 If wind load is reversed, Euler load is $10 \times .76 \times 10^7 / 91^2 = 9200$ lb



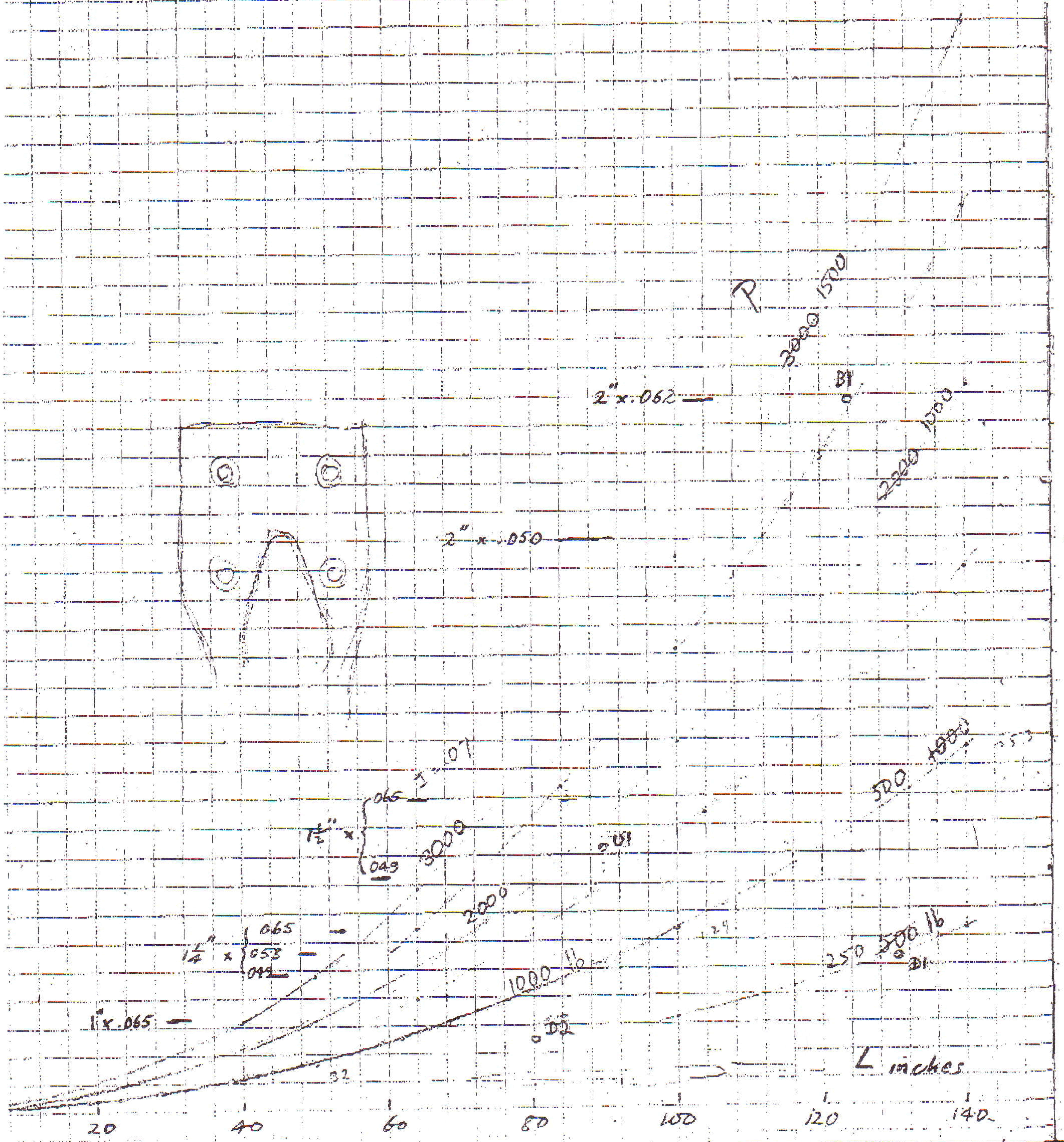
Adjacent sections give support that is calculated here, so the structure prob does not buckle at B1, even if d dish so elevated as to catch the 70 mph wind normally, as assumed. any case, it must be a rule to stow the dish before wind speeds of 70 mph are reached.

Euler Load (hinged ends) 14 Mar 1965

$$P = \frac{\pi^2 I E}{L^2} \qquad I = \frac{1}{2}\pi D t \cdot \frac{D^2}{4}$$

t in⁴

$$D^3 t = \frac{2P}{7.77\times10^7} L^2$$



Weight estimate

12 Mar 1965

Assume	B1 B2 B3	2" dia $\frac{1}{2}$ lb/ft	23 ft	12
	U1	" "	15.2	8
	D1 D2 D3 ~~B4~~ T2 T3 T4 B4, 1" dia $\frac{1}{4}$ lb/ft		92 ft	23
	2 sheets 12' x 4' x .14" @ 42 lb			84
				127 lb

56 x 127 = 7100 lb.

Sheet @ 60¢/lb.
Tube @ 120/lb
Av. 80¢/lb. Cost \$5600 of aluminum

+ Ribs 14lb: 127 + 14 = 141 lb.

Cost See p. 61

Consider 1" dia x $\frac{1}{16}$" al. tube for D2. Length = 80 in.

$r = \frac{1}{2}$" $L/R = 160$ (unsupported length, allowing for flange on panel is 63", $L/r = 126$). Load: 610 lb. Area $= \frac{3}{16}$ in^2

Stress $= 610/\frac{3}{16} = 3200$ lb/in^2

Euler load: $I = \frac{3}{16}\left(\frac{1}{2}\right)^2 = \frac{3}{64}$ in^4 $\pi^2 IE/L^2 = 10 \times \frac{3}{64} \times 10^7 / 80^2 = 730$ lb

Using unsupported length of 63", 1180 lb. Conclusion: D2 is in better shape than B1

Now consider D1. $L = 130$" (100" unsupported) Load = 490 lb Stress = 2600#/in^2

Revised ~~14~~ 16 Mar. '65

Reduce lengths of U1, D1, B1, &c by about 2 ft. and increase B4 ~~[illegible]~~ by about ~~two~~ foot.

Try Alcoa construction tube 2" OD x .050" in a 20' length for B1-2-3. .360 lb/ft Pac: Metal p. 72. and 1½" x .049 for everything else. .216 lb/ft

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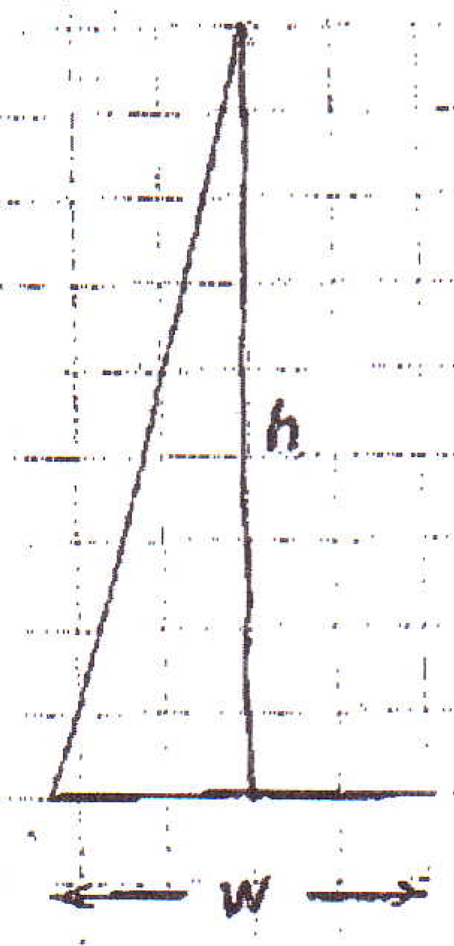
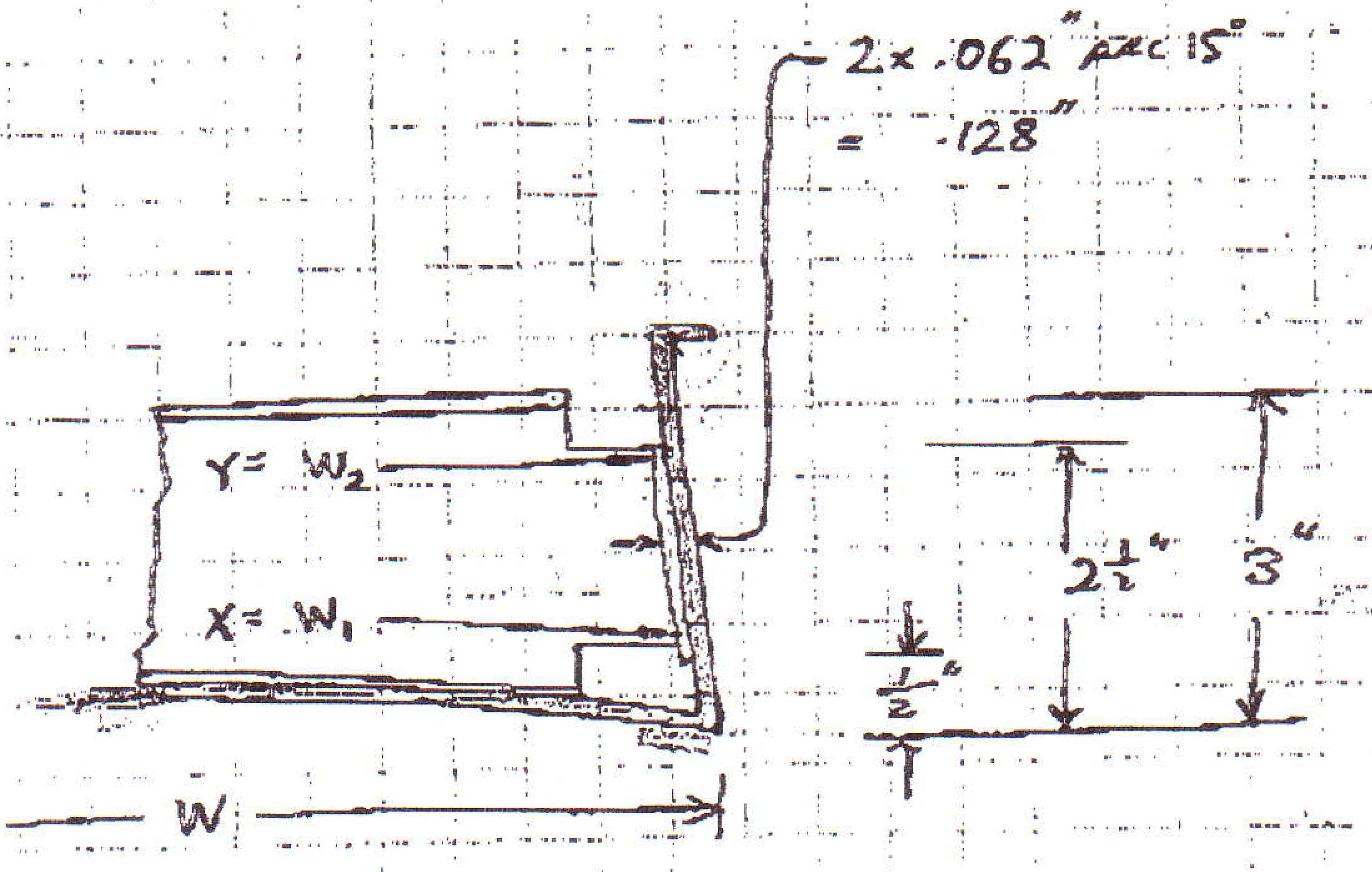




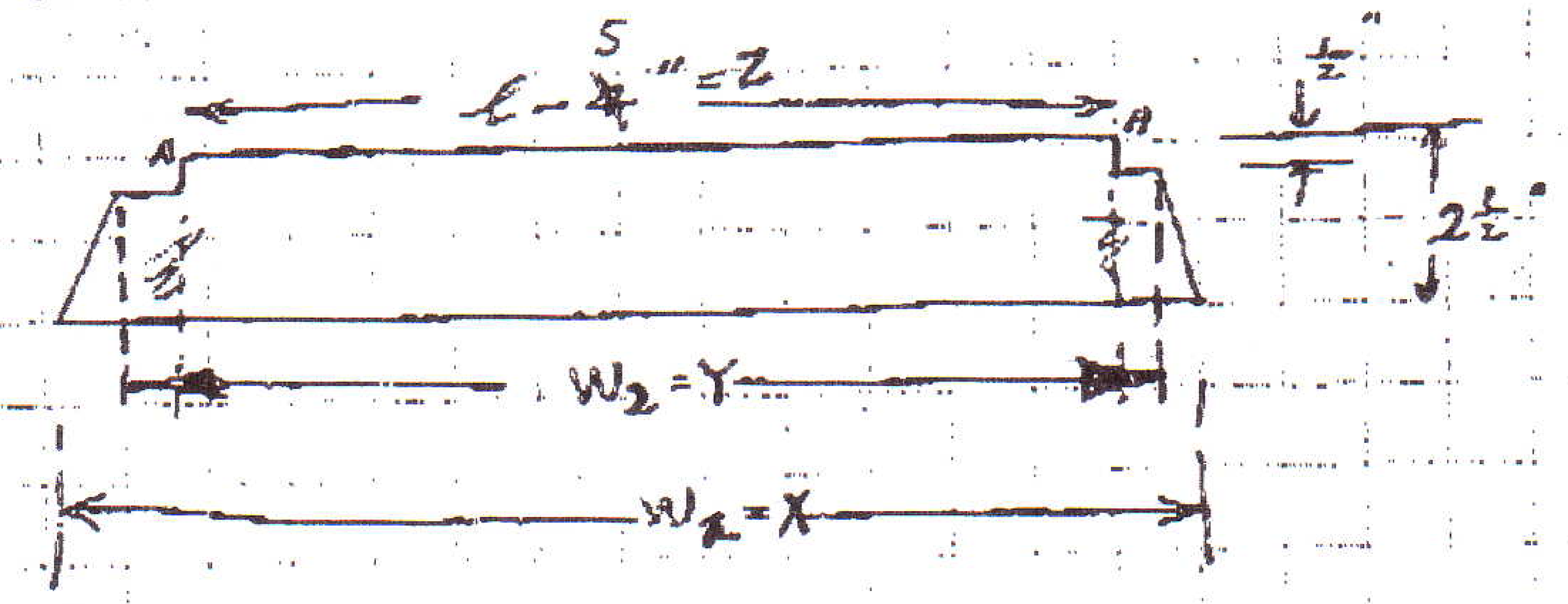
$$X = W_1 = W - \frac{1/2''}{h} \cdot W - .256''$$

$$Y = W_2 = W - \frac{2\frac{1}{2}''}{h} \cdot W - .256''$$

$\frac{1}{2}'' = .0417$ ft

$2\frac{1}{2}'' = .2083$ ft

Template for marking for bending end lugs on ribs



Edge AA is to be placed against straight flange of pressed rib

& In feet:

$$X = W - \frac{.0417}{h} W - .021$$

$$Y = W - \frac{.2083}{h} W - .021$$

$$\cancel{Z = l - .333 = W - 0.\overset{.167}{\cancel{.380}}}$$

$$Z = l - \frac{5}{12} = W - 0.250$$

Apr 12: The dimension X should be increased a little, in the case of the shorter ribs because the dimension taken as ½" is really < ½.