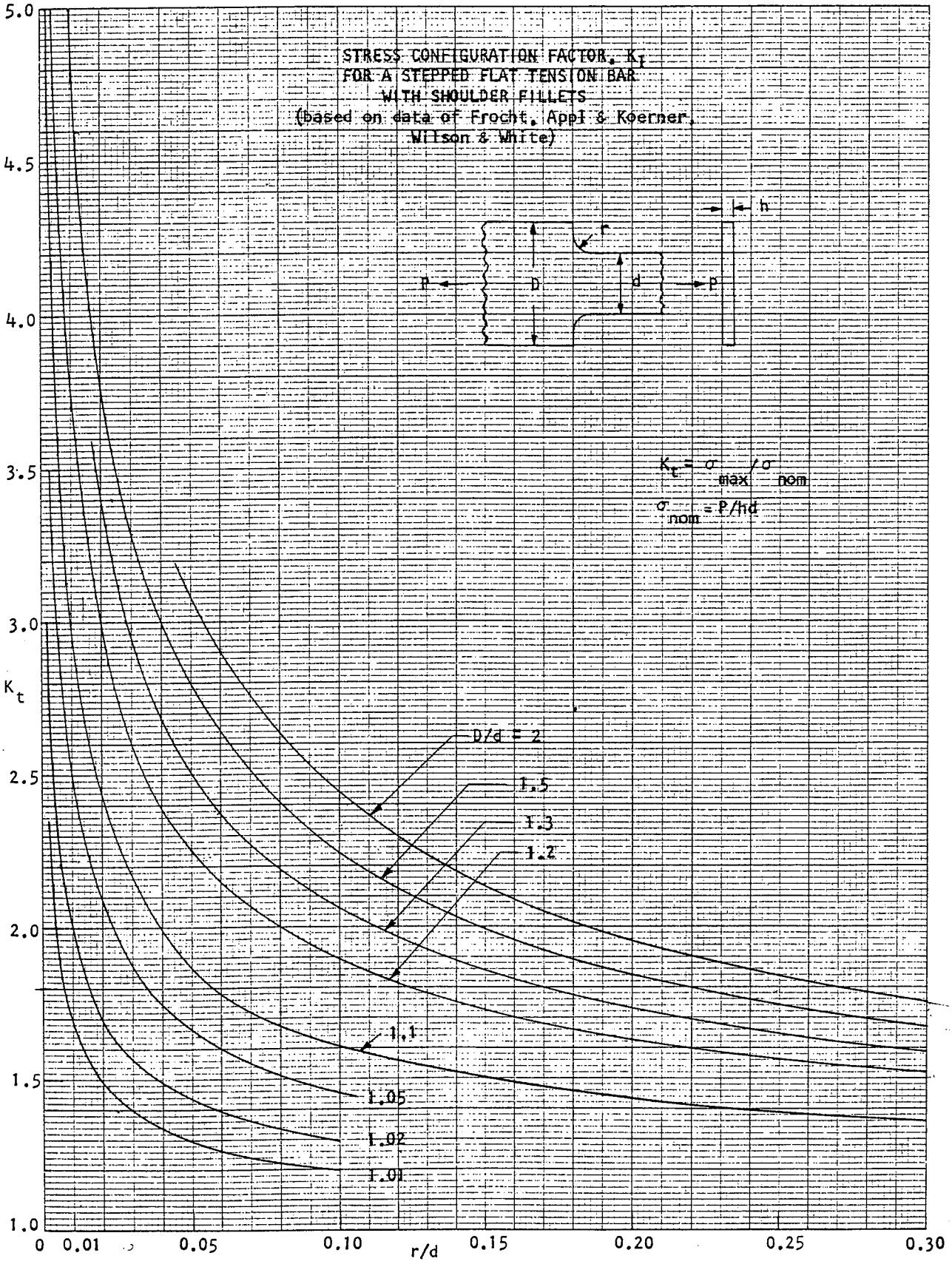
FIG. 65



$D/d = 2 \quad K_t = 1 + .26\sqrt{r/d}$

(A)

From Reconnaissance and Surveillance Window Design Handbook, W. P. Barnes Air Force Avionics Lab. AFAL/RWI Wright Patterson AFB Ohio, 45433

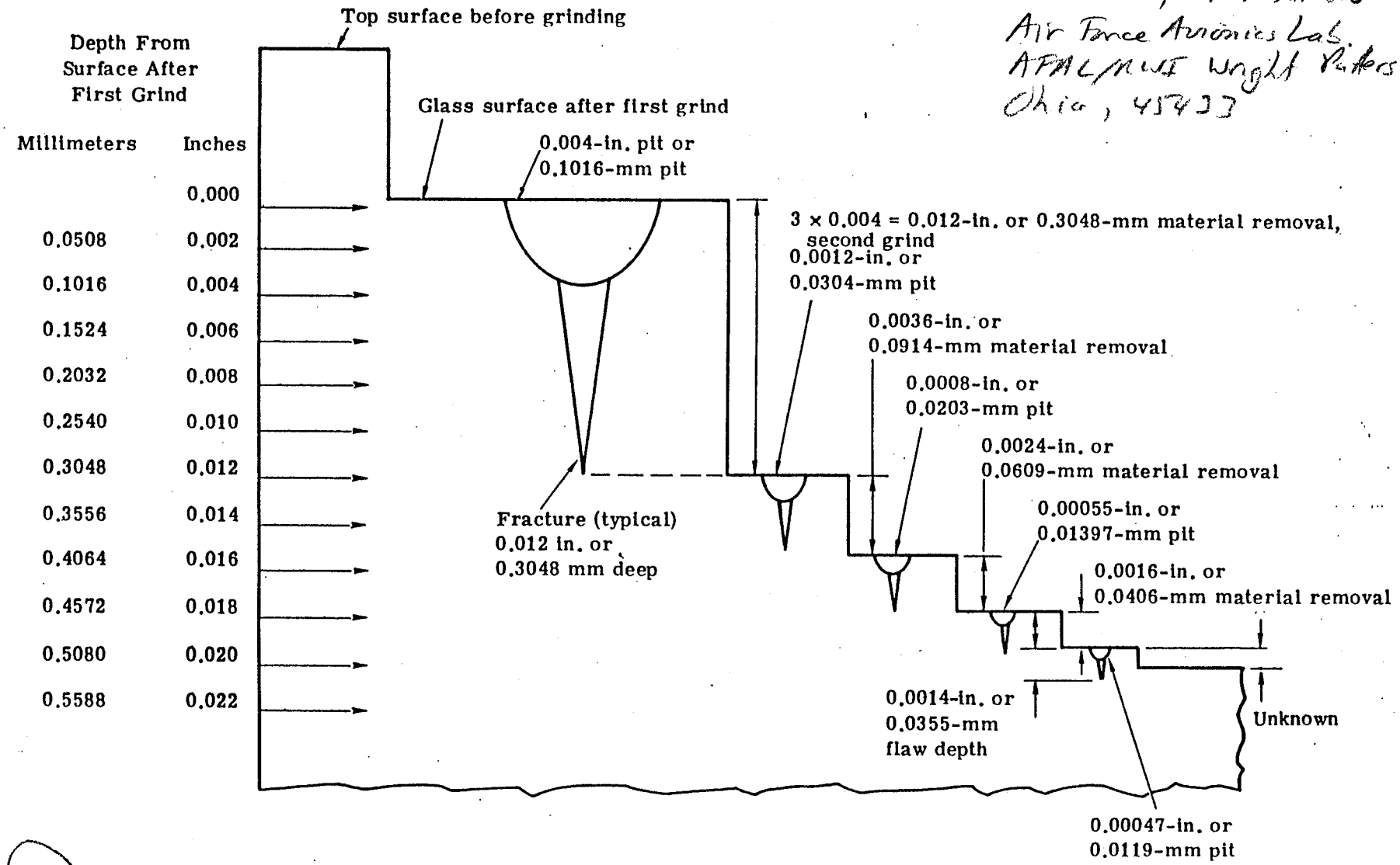


Fig. 7-3 — Schematic of controlled grinding process

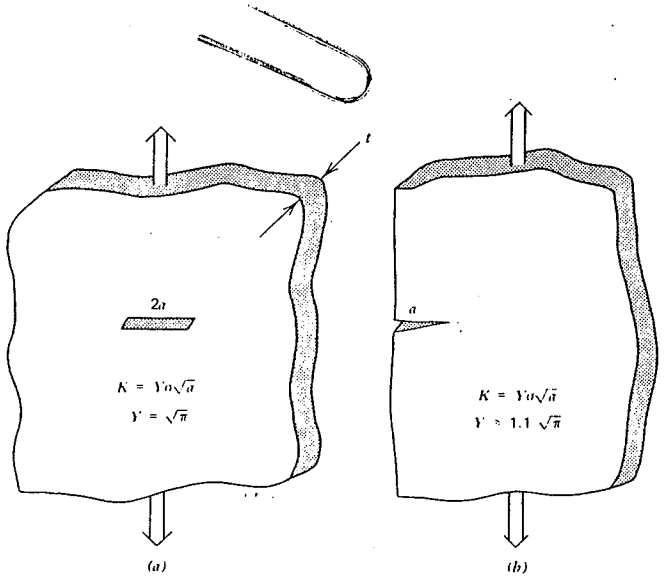
Table 7-5 — Conventional Grinding Sequence

Operation	Abrasive	Average Particle Size		Material Removal*	
		Millimeters	Inches	Millimeters	Inches
Milling	150 grit diamond	0.1016	0.004	—	—
Fine grind	2F aluminum oxide	0.0304	0.0012	0.0381	0.0015
Fine grind	3F aluminum oxide	0.0203	0.0008	0.0177	0.0007
Fine grind	KH aluminum oxide	0.0139	0.00055	0.0127	0.0005
Fine grind	KO aluminum oxide	0.0119	0.00047	0.0076	0.0003
Polish	Barnsite rouge	—	—	—	—

*Although the amount of material to be removed was not specified, the average material removed is included for purposes of comparison.

Table 7-6 — Controlled Grinding Sequence

Operation	Abrasive	Average Particle Size		Material Removal (Specified)	
		Millimeters	Inches	Millimeters	Inches
Milling	150 grit diamond	0.1016	0.004	—	—
Fine grind	2F aluminum oxide	0.0304	0.0012	0.3048	0.012
Fine grind	3F aluminum oxide	0.0203	0.0008	0.0914	0.0036
Fine grind	KH aluminum oxide	0.0139	0.00055	0.0609	0.0024
Fine grind	KO aluminum oxide	0.0119	0.00047	0.0406	0.0016
Polish	Barnsite rouge	—	—	—	—



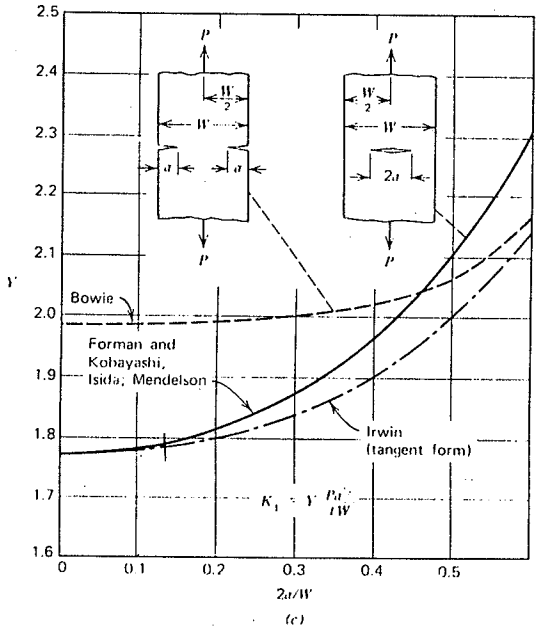
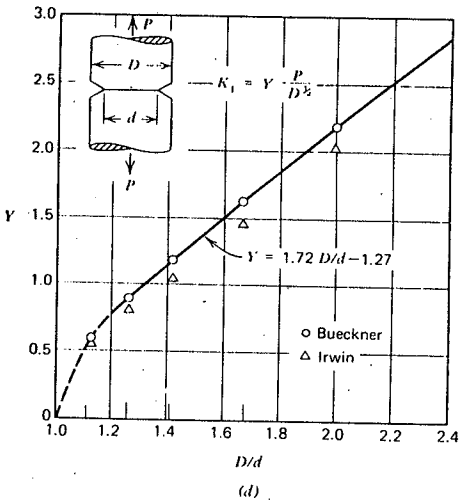
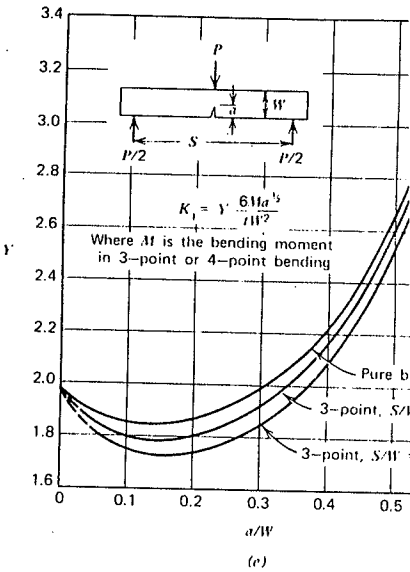
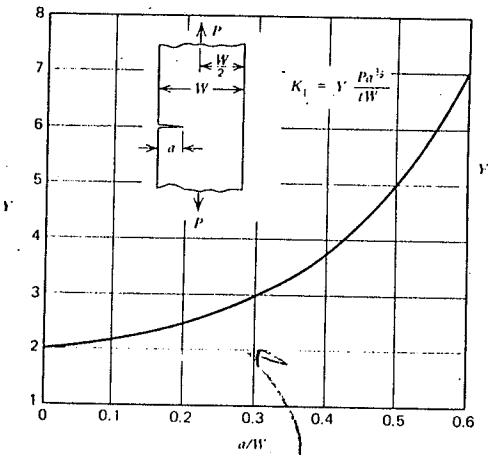


FIGURE 8.7 Stress intensity factor solutions for several specimen configurations.[17] (Reprinted by permission of the American Society for Testing and Materials from copyright material.)







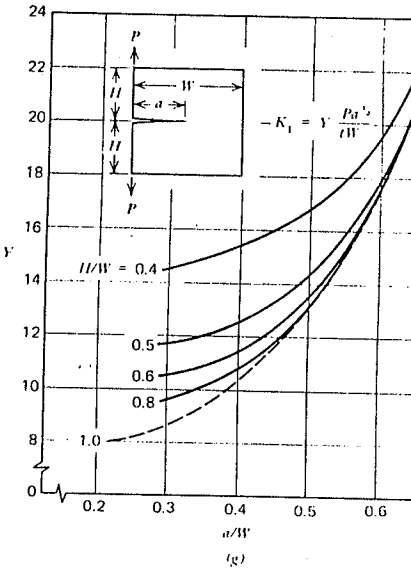


FIGURE 8.7 (*Continued*)

$$Y = \frac{\sqrt{2\tan\left(\frac{\pi a}{2W}\right)}}{\cos\left(\frac{\pi a}{2W}\right)} \times \left\{\frac{.752 + 2.02\frac{a}{W} + .37\left(1 - \sin\left(\frac{\pi a}{2W}\right)\right)^3}{\sqrt{\cos\left(\frac{\pi a}{2W}\right)}}\right\}$$

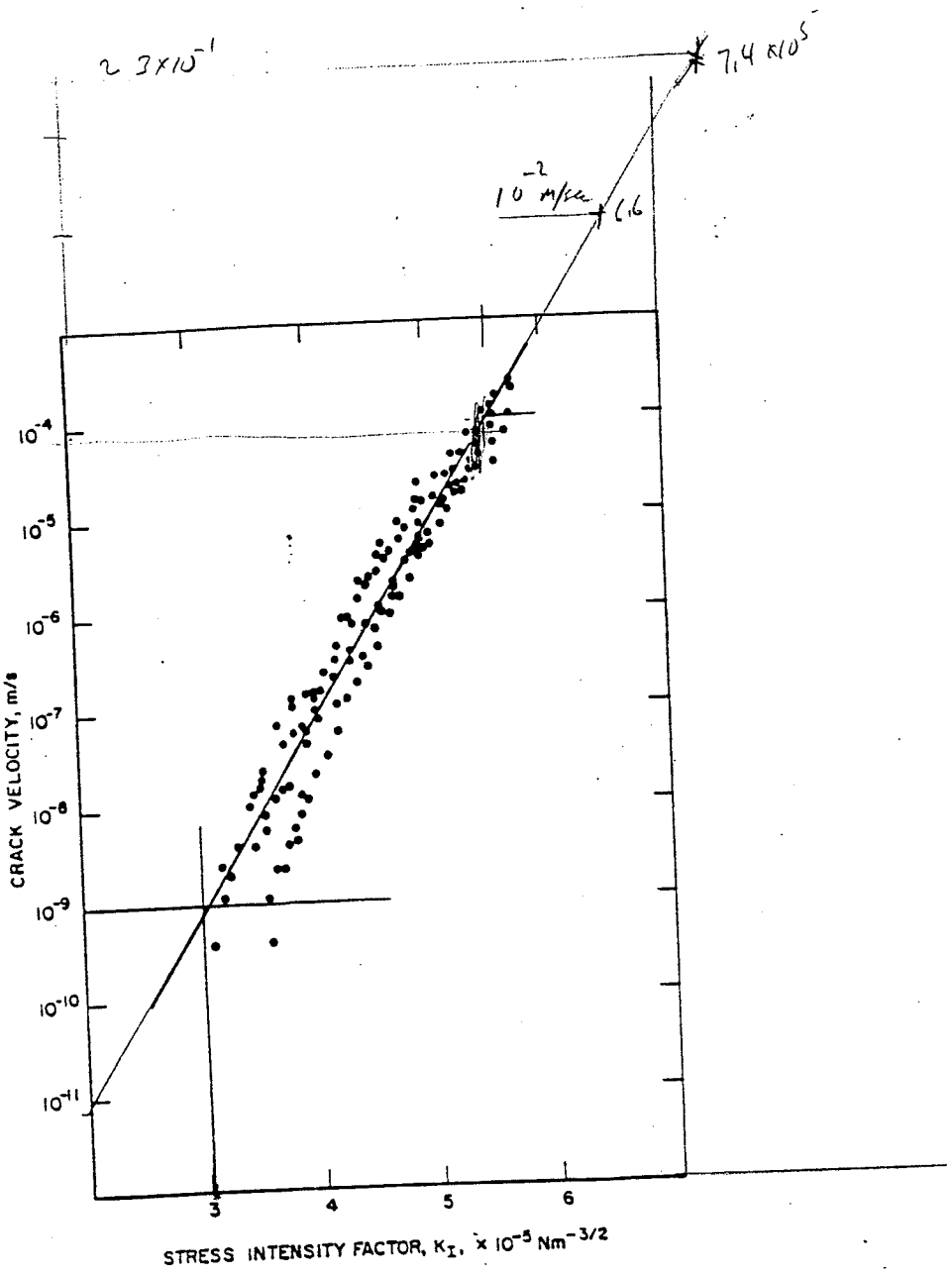


Fig. 8. Borosilicate Crown I, BK7, air, 100% RH.

E

TABLE C1, Face Plate (0.787") With Long Surface Crack

CRACK GROWTH PARAMETERS; A = 524.00 B = 10.82
CRITICAL STRESS INTENSITY = 555.0 psi

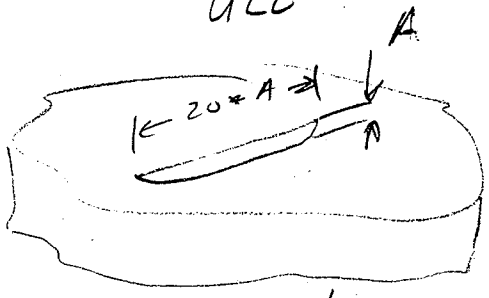
Residual Stress (transparent) = 45.000

GEOMETRIC STRESS INTENSITY FACTOR TABLE

A	Y
0.000E+00	2.9400
0.157E-01	2.9400
0.266E-01	3.0220
0.106	3.1300
0.160	3.3100
0.315	5.3200
0.532	14.2900

↑ crack depth

ULE



crack geometry

Maximum initial flaw size inches

STRESS psi	L-crit	1 min	1 hour	1 day	50 years
2000.	0.0085	0.0042	0.0033	0.0026	0.0011
1975.	0.0087	0.0043	0.0034	0.0027	0.0011
1950.	0.0090	0.0044	0.0034	0.0028	0.0011
1925.	0.0092	0.0045	0.0035	0.0028	0.0012
1900.	0.0094	0.0047	0.0036	0.0029	0.0012
1875.	0.0097	0.0048	0.0037	0.0030	0.0012
1850.	0.0099	0.0049	0.0038	0.0031	0.0013
1825.	0.0102	0.0051	0.0040	0.0032	0.0013
1800.	0.0105	0.0052	0.0041	0.0033	0.0014
1775.	0.0108	0.0054	0.0042	0.0034	0.0014
1750.	0.0111	0.0055	0.0043	0.0035	0.0014
1725.	0.0114	0.0057	0.0044	0.0036	0.0015
1700.	0.0117	0.0059	0.0046	0.0037	0.0015
1675.	0.0120	0.0061	0.0047	0.0038	0.0016
1650.	0.0124	0.0062	0.0049	0.0039	0.0016
1625.	0.0128	0.0064	0.0050	0.0041	0.0017
1600.	0.0132	0.0066	0.0052	0.0042	0.0018
1575.	0.0136	0.0069	0.0054	0.0043	0.0018
1550.	0.0140	0.0071	0.0056	0.0045	0.0019
1525.	0.0145	0.0073	0.0057	0.0046	0.0019
1500.	0.0149	0.0076	0.0059	0.0048	0.0020
1475.	0.0154	0.0079	0.0062	0.0050	0.0021

ex.
an 0.036" flaw will grow to failure in 1 day at 1725 psi

an 0.015" flaw will grow to failure in 50 years at 1725 psi

F

Material is ULE, ~ 8" thick
stress psi
flaw size inches

Table A1 Maximum Permissible Flaw Size Verses Time to Failure at Stress

Flaw geometry is a long surface flaw (length = 20*depth) in a semi-infinite solid. Flaw size is the depth of the flaw.

Stress psi	Critical Flaw Size, Inches	Maximum Initial Flaw Size, Inches		
		1 day exposure	1 year exposure	50 year exposure
1800	.0246	.0083	.0052	.0035
1600	.0312	.0106	.0067	.0046
1400	.0407	.0142	.0090	.0061
1200	.0554	.0197	.0125	.0086
1000	.0798	.0291	.0186	.0129
900	.0986	.0364	.0234	.0163
800	.1248	.0468	.0302	.0211
750	.1420	.0537	.0347	.0243
700	.1630	.0622	.0403	.0283
650	.1890	.0729	.0473	.0333
600	.2218	.0864	.0563	.0397
550	.2639	.1040	.0679	.0481
500	.3194	.1275	.0835	.0592
450	.3942	.1595	.1048	.0746
400	.4990	.2049	.1351	.0966
350	.6517	.2722	.1802	.1293
300	.8871	.3777	.2512	.1811
250	1.2774	.5564	.3720	.2695
200	1.9965	.8934	.6010	.4380
150	3.5488	1.6443	1.1148	.8186
100	7.9829	3.8808	2.6588	1.9719
50	31.9397	16.8011	11.7026	8.8154

G

UNITS

Multiply By
$\cdot 10^{-10}$
13×10^{5}
$\cdot 10^{5}$
184
$= t_C + 273.15$
$= (t_F - 32)/1.8$
$= t_R / 1.8$
$< 10^{-5}$
$< 10^{-7}$
$\cdot 10^{-1}$
02×10^{-19}
$: 10^{-7}$
-3
48×10^{-1}
356
807×10^{4}

SELECTED CONVERSION FACTORS TO STANDARD INTERNATIONAL UNITS

To Convert From	To	Multiply By
inch	meter (m)	2.54×10^{-2}
inch^2	meter^2 (m^2)	6.452×10^{-4}
inch of mercury (32F)	pascal (Pa)	3.386×10^{3}
kilocalorie	joule (J)	4.184×10^{3}
kilogram-force	newton (N)	9.807
kilogram-force-meter	newton-meter (N-m)	9.807
kilogram-force/centimeter^2	pascal (Pa)	9.807×10^{4}
kilogram-force/meter^2	pascal (Pa)	9.807
kilogram-force/millimeter^2	pascal (Pa)	9.807×10^{6}
kip (1000 pounds)	newton (N)	4.448×10^{3}
kip/inch^2 (ksi)	pascal (Pa)	6.895×10^{6}
kip/inch$^2 \cdot \sqrt{\text{inch}}$ (ksi$\sqrt{\text{in.}}$)	pascal$\cdot \sqrt{\text{m}}$ (Pa$\sqrt{\text{m}}$)	1.099×10^{6}
mil	meter (m)	2.54×10^{-5}
millimeter of mercury (mm Hg)	pascal (Pa)	1.333×10^{2}
poise	pascal-second (Pa-s)	1×10^{-1}
pound-force	newton (N)	4.448
pound-force/inch^2(psi)	pascal (Pa)	6.895×10^{3}
pound-force/inch$^2 \cdot \sqrt{\text{inch}}$ (psi$\sqrt{\text{in.}}$)	pascal$\cdot \sqrt{\text{m}}$ (Pa$\sqrt{\text{m}}$)	1.099×10^{3}
torr [mm Hg, (0 C)]	pascal (Pa)	1.333×10^{2}

$1\ N/m^{3/2} = .0009477\ psi\sqrt{in}$

$1\ Pa = 1\ N/m^2$

H

TABLE 7. Strength Data, Soda-Lime Silicate Glass Discs 12 inches x 0.5 inches

Sample	Fracture Pressure psi	Time Minutes	Distance of Origin from Center Inches	Stress psi	Comments
1	50	1	2.8	6,850	As received, loaded rapidly
2	40	1	3.0	5,100	As received, loaded rapidly
3	30	1	1.4	4,920	As received, loaded rapidly
4	28	-	2.0	4,220	As received, broke on increasing load
5	28	5	2.7	3,820	As received
6	20	7	0.1	3,480	Center scratched
7	26	3	0.1	4,520	Center scratched
8	16	2	0.0	2,790	Center scratched
9	18	1	0.3	3,120	Center scratched
10	18	8	0.3	3,120	Center scratched
11	24	12	1.3	3,980	As received
12	29	720	2.3	4,260	As received
13	27	11	2.4	3,640	As received
14	20	5	1.0	3,390	As received
15	24	6	1.2	4,000	As received
16	33	13	3.4	3,770	As received
17	10	8	0.0	1,740	Elliptical crack at failure 1 inch x 0.2 inches
18	8	5	0.0	1,390	Elliptical crack at failure 2 inches x 0.26 inches
19	5	7,800	0.0	870	Elliptical crack at failure 2.31 inches x 0.34 inches