

# Image Cover Sheet

**CLASSIFICATION**

UNCLASSIFIED

**SYSTEM NUMBER**

507228



**TITLE**

EFFECT OF NOTCH ACUITY ON FRACTURE

**System Number:**

**Patron Number:**

**Requester:**

**Notes:** Paper #25 contained in Parent Sysnum #507203

**DSIS Use only:**

**Deliver to:** DK



# Effect of Notch Acuity on Fracture

by M.N. Bassim\* and J.R. Matthews\*\*

\* Faculty of Engineering, University of Manitoba, Winnipeg, MB

\*\* Defence Research Establishment Atlantic, Dockyard Laboratory,  
Halifax, Nova Scotia

## ABSTRACT

Fracture studies of high strength low alloy steels at very high loading rates were conducted using a special Split Hopkinson Bar system equipped with a swing mechanism. Compact tension specimens were used in the investigation. Notch acuity was investigated by performing the tests on several induced notches ranging from spark erosion (EDM) to fatigue precracking followed by fracture.

Both shear lips and stretch zones were measured on the broken specimens as a function of temperature. The effect of notch acuity on toughness (and toughness transition) was studied from the size of the shear lips.

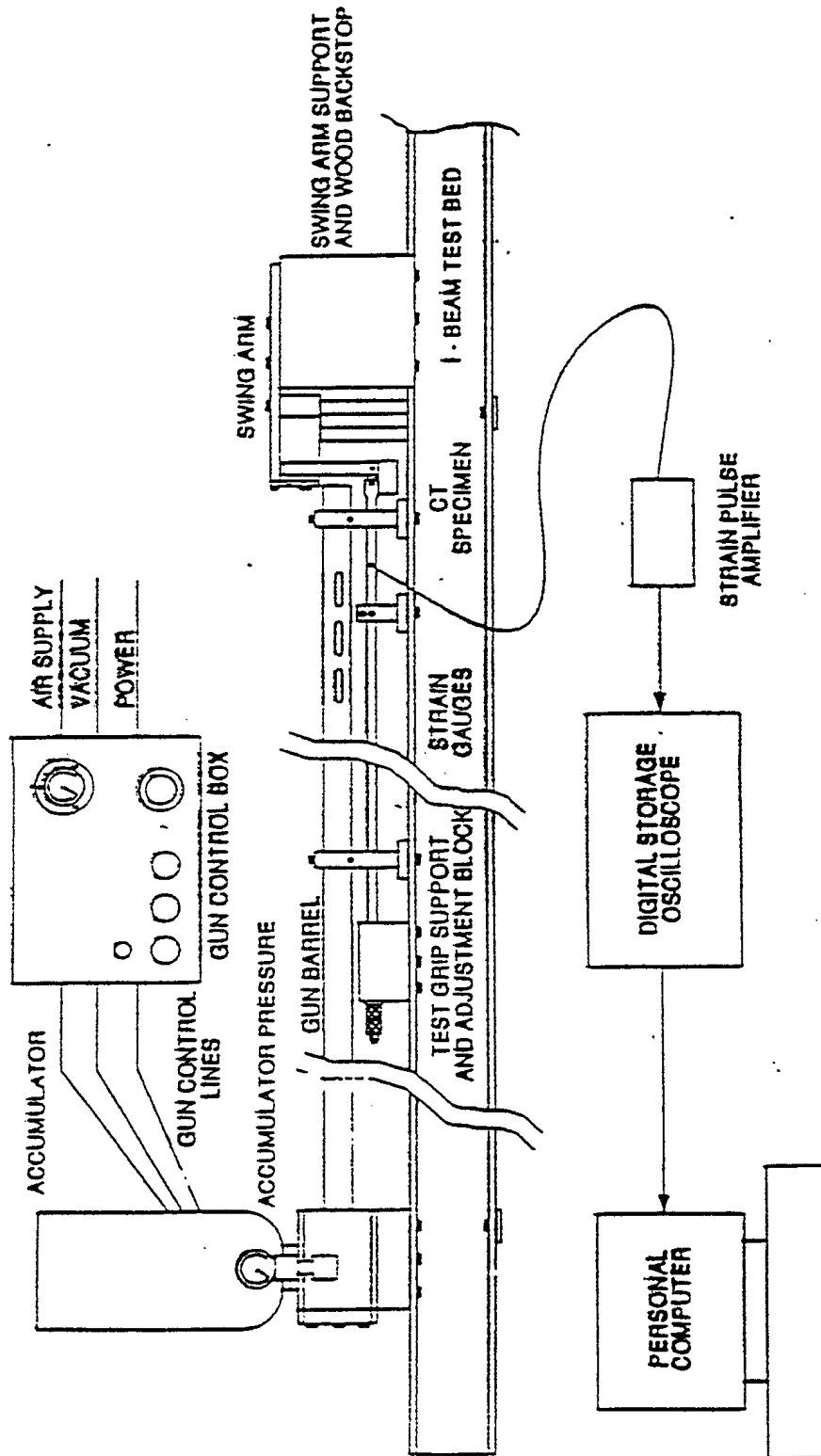


Fig. 2. Split Hopkinson Bar assembly for compact tension (CT) specimen testing.

EFM 4/2-K



Figure 3.6c Gun barrel, pressure bar, oscilloscope, and computer.

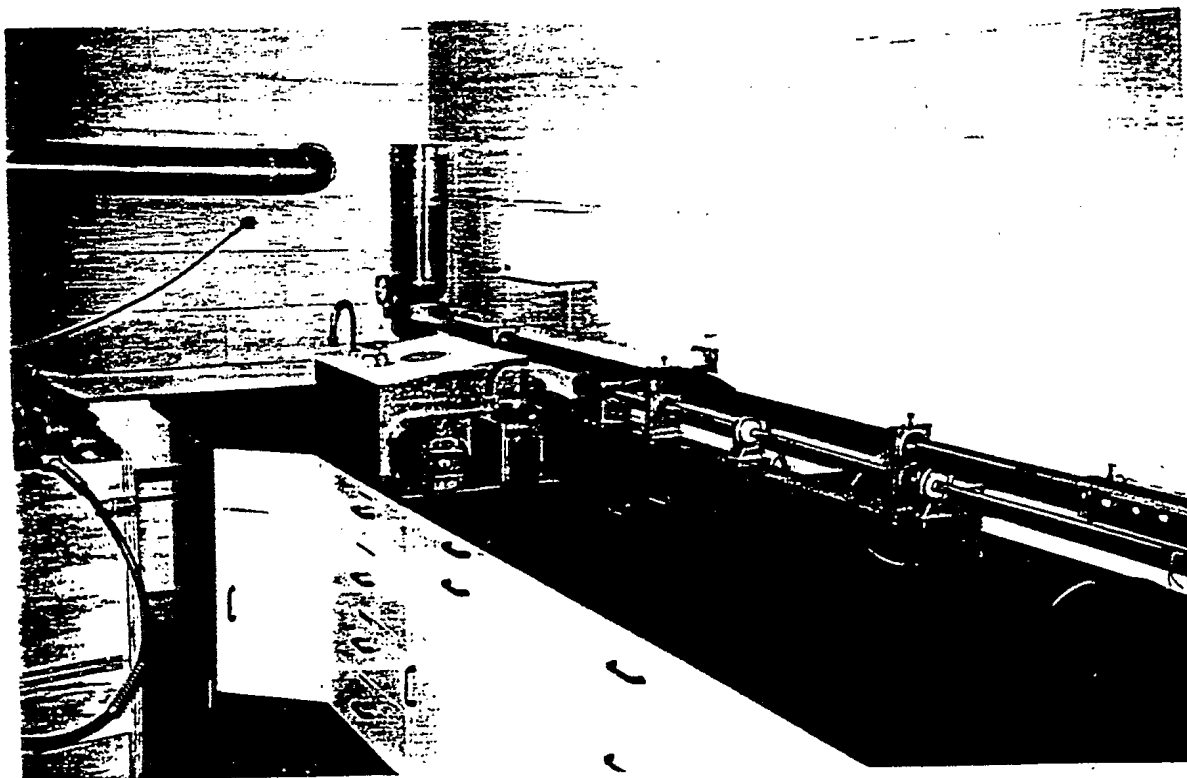
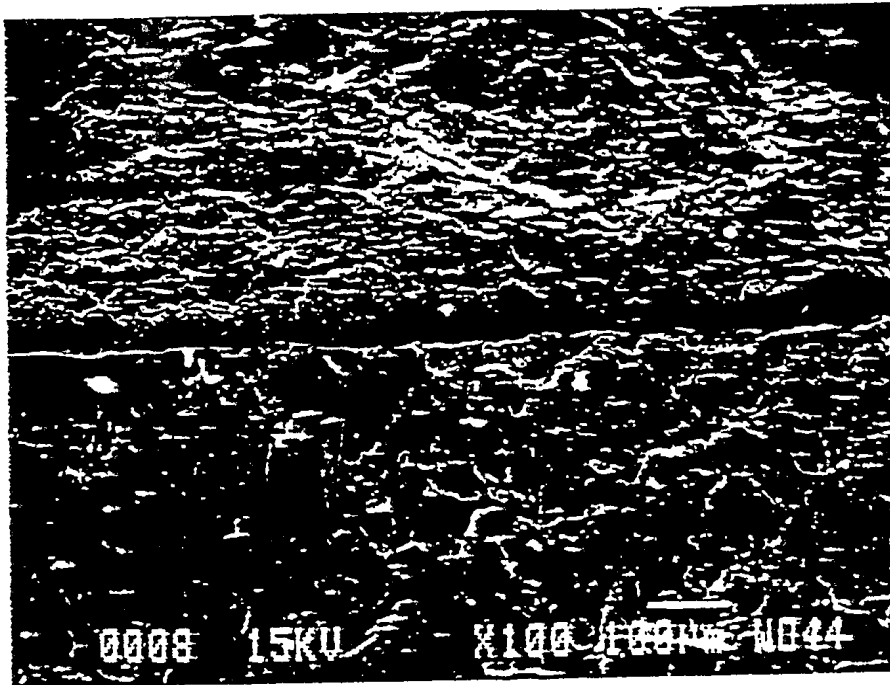
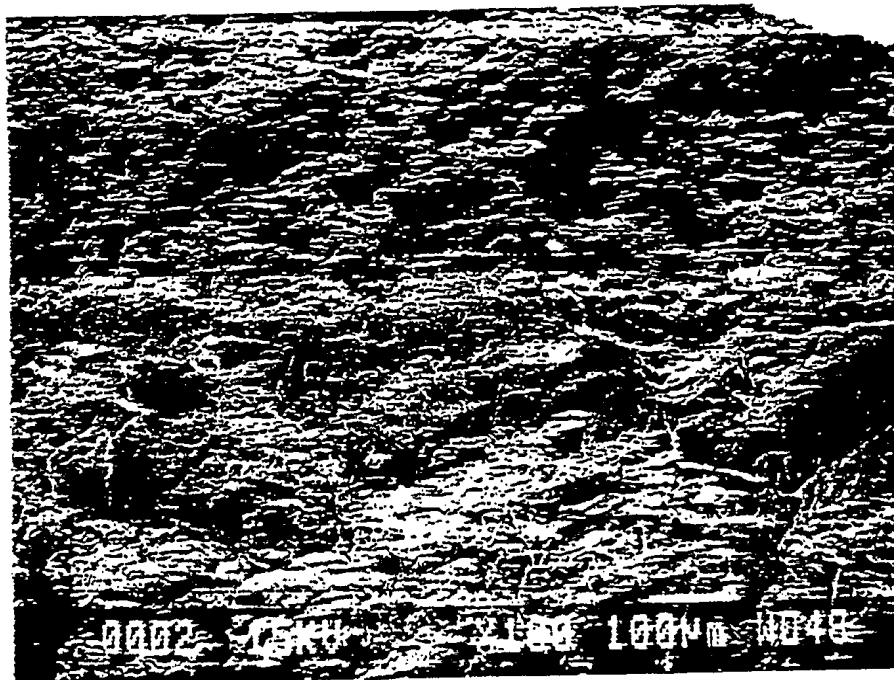


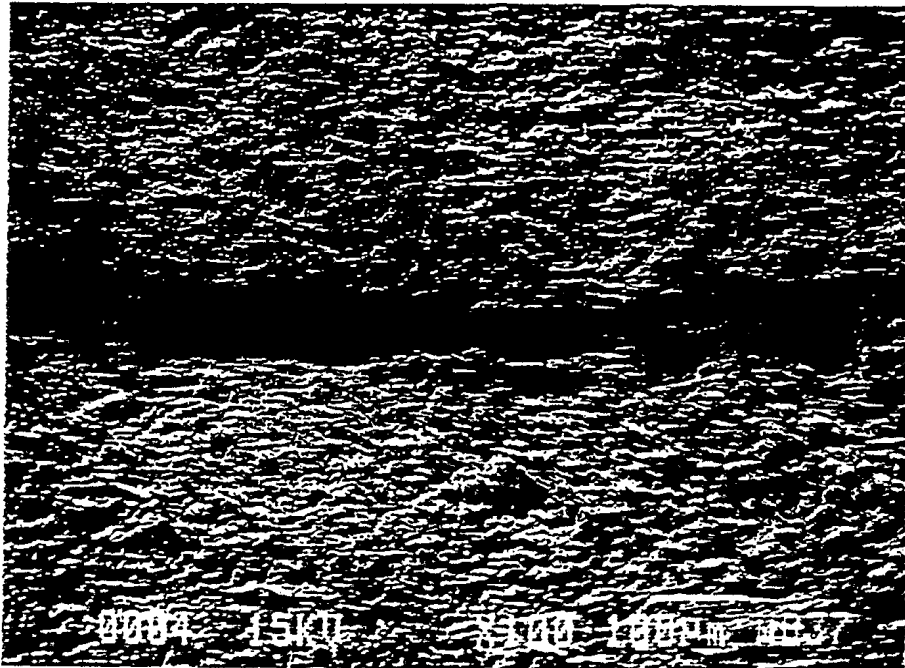
Figure 3.6d Gun barrel, pressure bar, gun control box, and accumulator.



Specimen 15



Specimen 12



Specimen 42

Specimen	Notch	Orientation	Temperature	SZW ( $\mu\text{m}$ )
BPA	Fatigue	T-L	-45	56
BPB	Fatigue	T-L	-30	83
BPC	Fatigue	T-L	-15	97
BPD	Fatigue	T-L	0	175
BPE	Fatigue	T-L	15	600
BTA	Fatigue	L-T	-45	46
BTB	Fatigue	L-T	-30	55
BTC	Fatigue	L-T	-15	69
BTD	Fatigue	L-T	0	140
BTE	Fatigue	L-T	15	500

Table 4.2 Stretch zone width results.

### SZW vs. Temperature

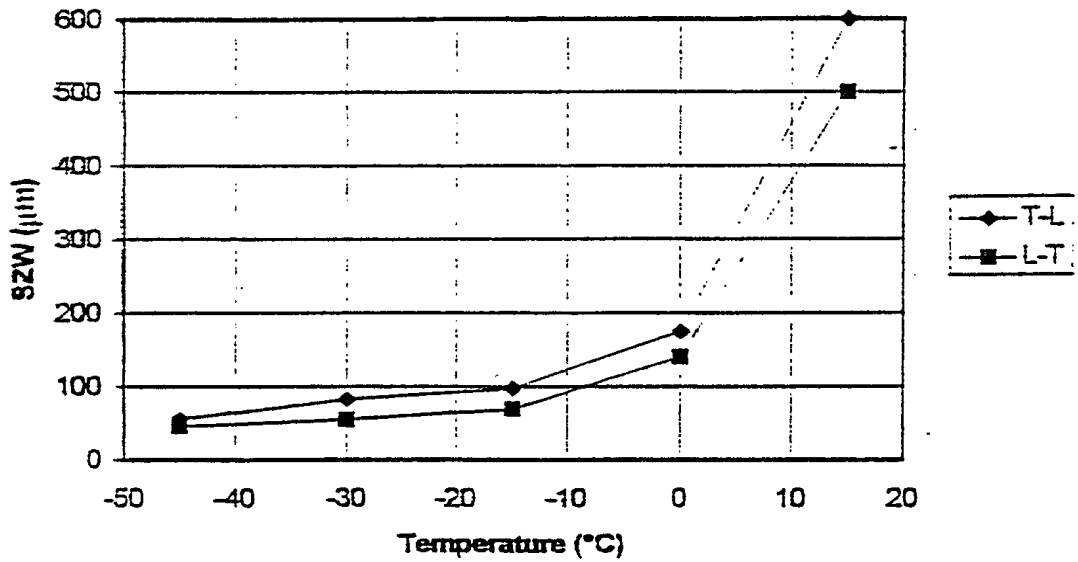


Figure 4.2 Stretch zone width versus temperature.



### Shear Lip vs. Temperature for Pressed Notch

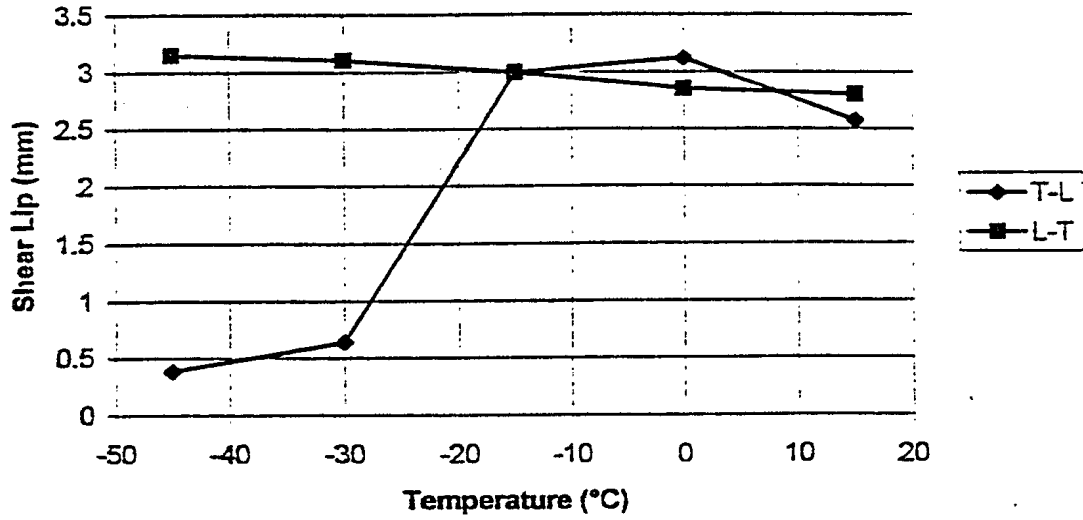


Figure 4.1a Shear lip versus temperature for pressed notch.

### Shear Lip vs. Temperature for Fatigue Precrack

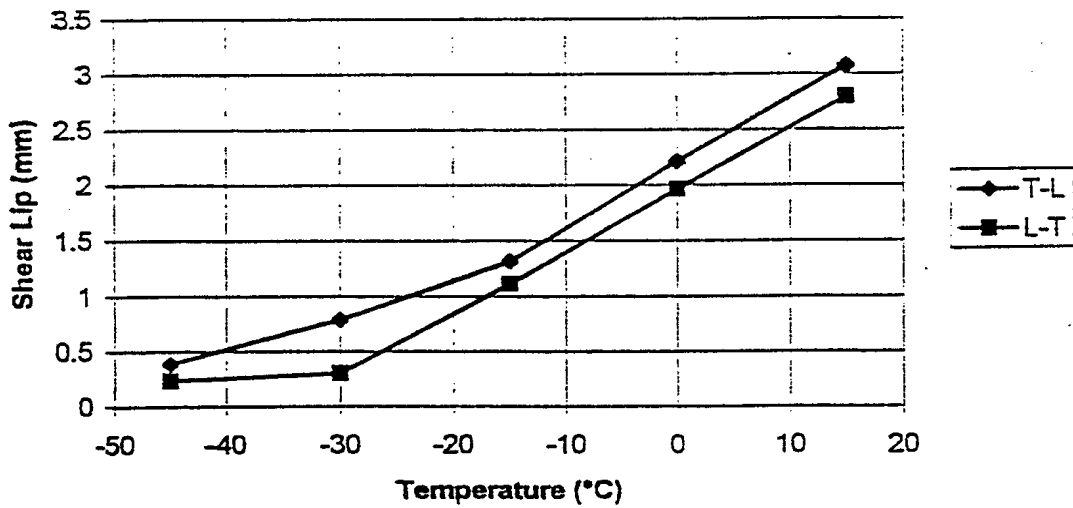


Figure 4.1b Shear Lip versus temperature for fatigue precrack.

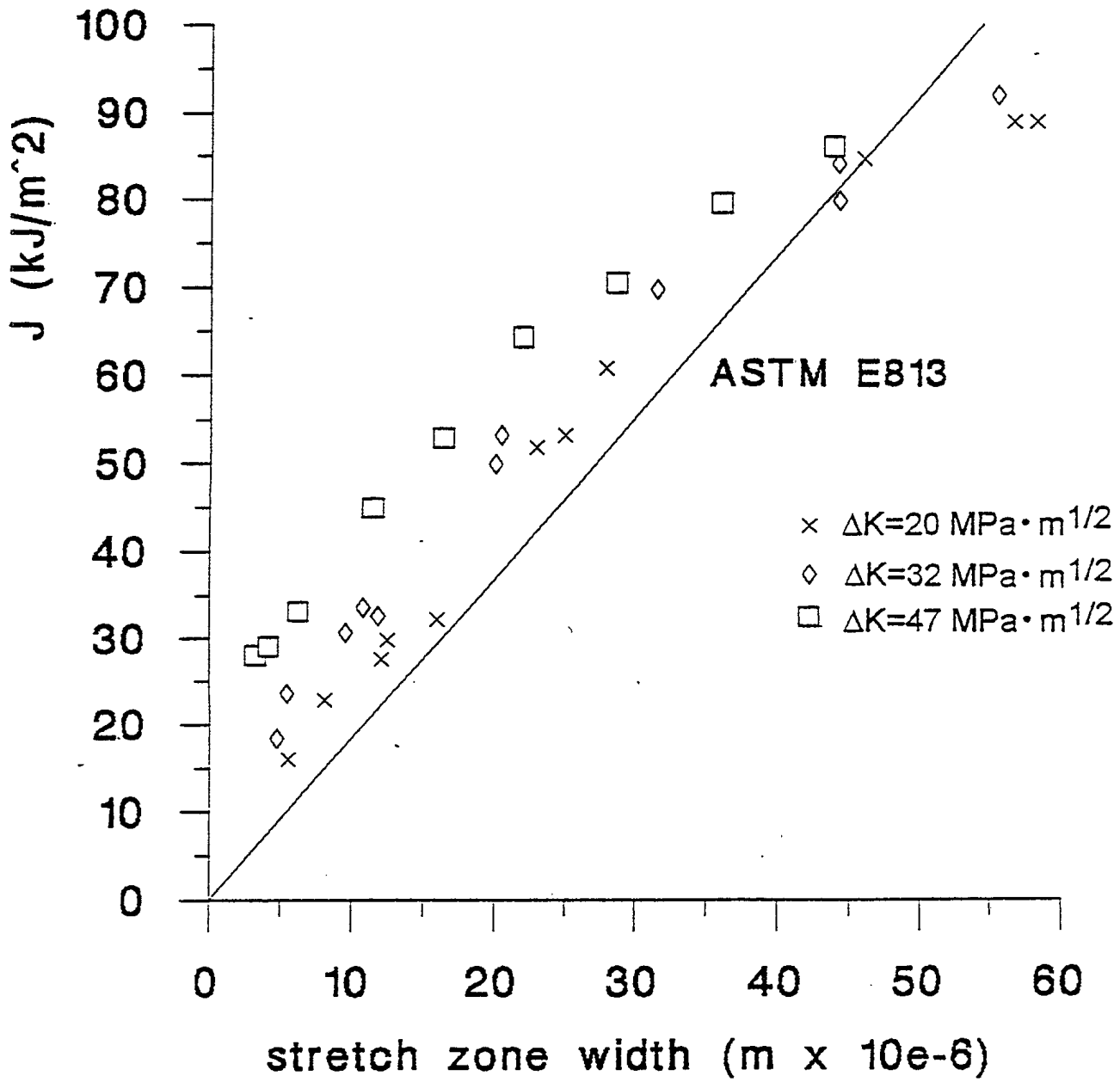


Figure 4.8: Plot of J vs. SZW data for 3 precracking  $\Delta K$  levels.

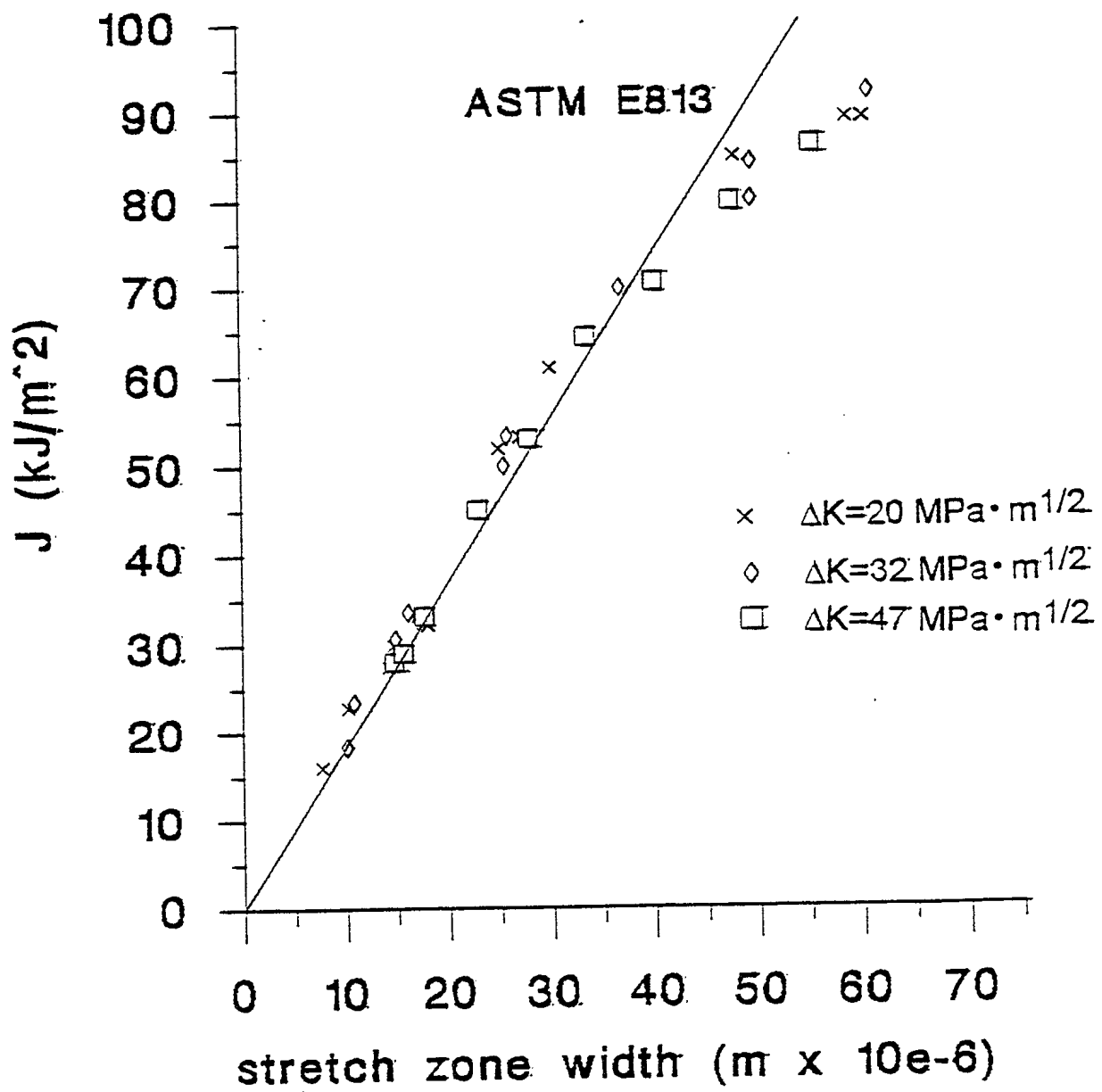


Figure 5.2: Experimental data adjusted to account for fatigue precracking.

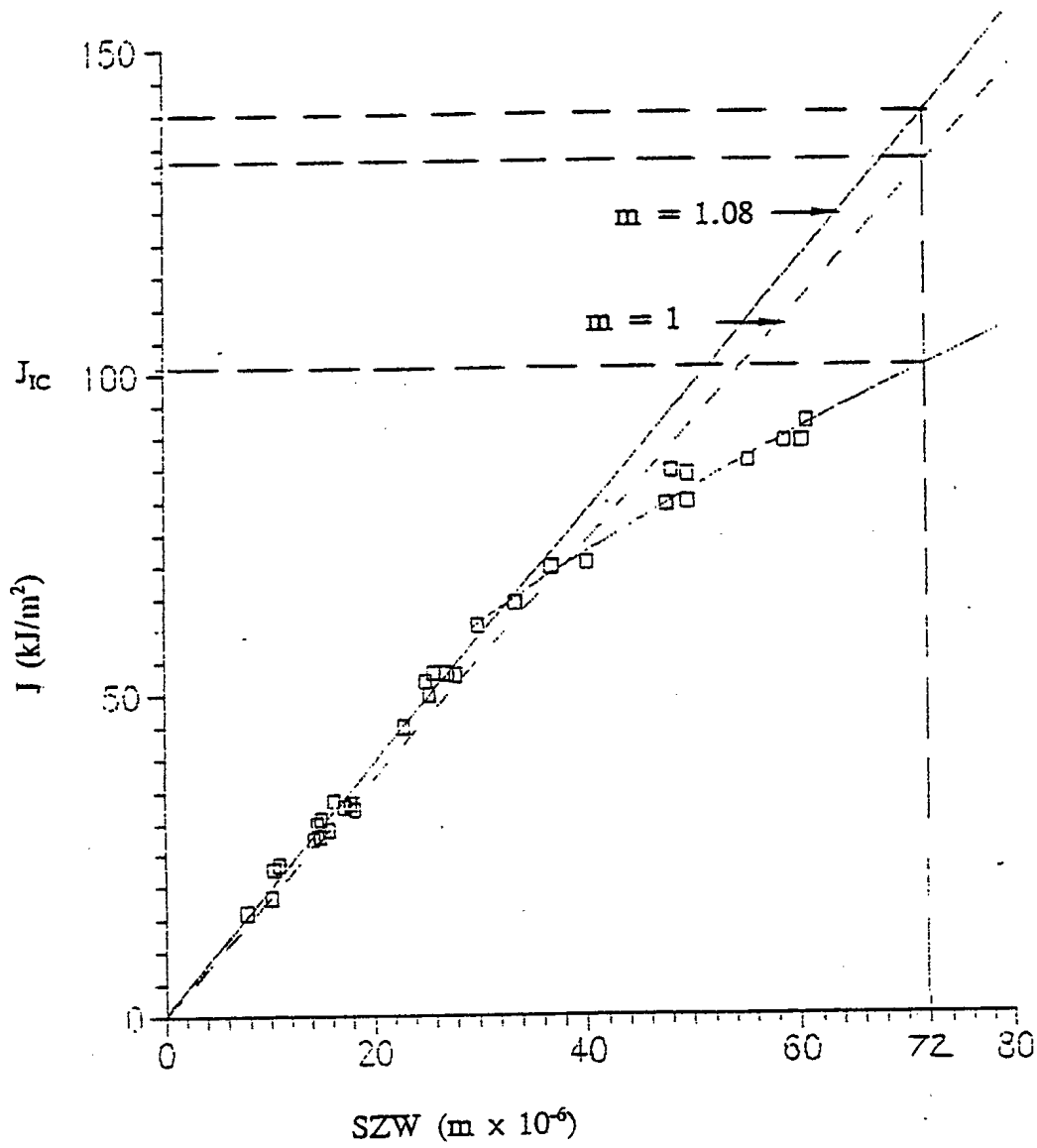


Figure 5.3: Extrapolation from corrected data to  $J_{IC}$ .