

DISCUSSION

T. G. F. Gray¹ (written discussion)—I found Professor Taniuchi's findings extremely interesting and wonder if he has determined the uniaxial lower yield strength of his test material in a *plain* form, that is, in a specimen with no stress concentration present. This value might then be compared with the values obtained with notches. My reason for asking is that some years ago I was faced with a problem of yielding in a cracked tension specimen where it was clear that the effective yield strength of the material in the notched configuration was significantly and consistently higher than the yield strength in a plain specimen. The material type and specimen finish were such that stretcher strain markings were visible, as in Professor Taniuchi's work.

To resolve this problem of disagreement in yield value in the two configurations, I argued that in the plain case, a yield band may form at one spot and continue at that level of load unhindered; whereas in the notched case, yielding is triggered at various stress levels in a broader zone local to the notch. In the latter case, the immediate interaction between dislocations in this zone may lead to a certain elevation of apparent flow strength. My own solution to the problem was to attempt to simulate the dislocation tangling process which I suspected to be occurring in the notch zone by applying a ratchetting strain-controlled program to specimens. The effective yield was then deemed to be the upper envelope of the cyclic load/extension curve. This method produced a significantly higher apparent yield strength (20% approximately) with much less variation from test to test.

One conclusion of this kind of finding might be that the kinds of test we normally do on plain specimens may not be too relevant to real applications where there are stress concentrations. Maybe new standards are required!

K. Taniuchi (author's closure)—The yield strength indicated by the experiments I performed have valid application only to a JIS 13B specimen strip. The specimens were annealed after the machining was completed.

I would also like to mention that Fig. 16 in fact shows the original condition of the specimen prior to when the stretcher strains appear at the location of stress concentration.

I feel that it would be extremely interesting to undertake the investigation that you suggested on the variation of specimen strength according to form, and I plan to prepare an experimental procedure for exploring this sort of variation.

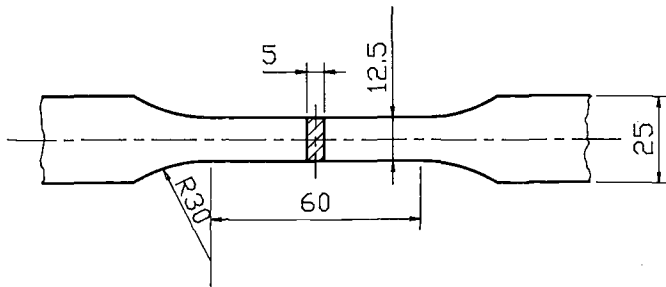
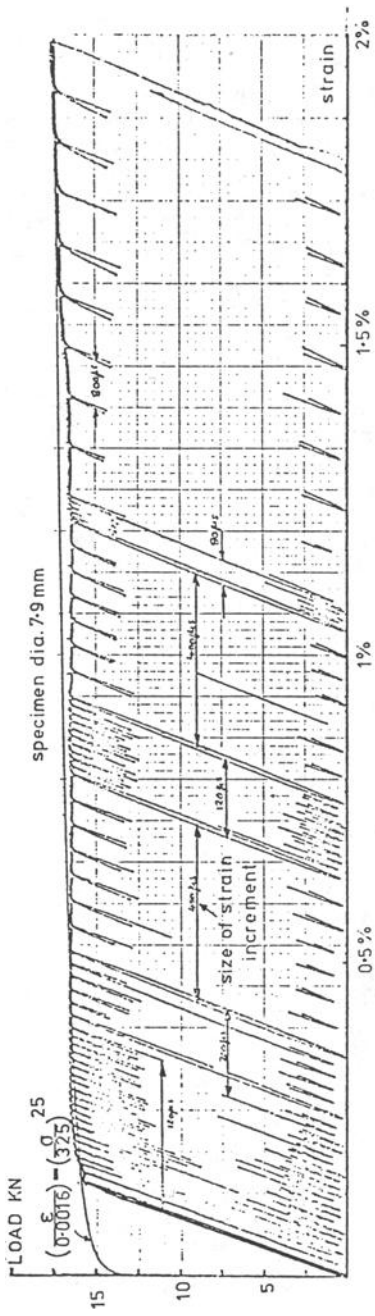


FIG. B—The dimensions of a JIS No. 13B specimen.

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incremental-cyclic test procedure



'monotonic' tensile test

FIG. A—Incremental-cyclic test procedure and monotonic tension test.