measurements, which gives a value of 0.18 ± 0.02 μsec for the rise time. These rise times are used here to evaluate relaxation times from calculated steady shock wave profiles.

Swan, *et al.*[57] have shown that transient effects in shock fronts ultimately decay, leaving a steady shock profile. If it is assumed that measured profiles of the plastic II shock front are steady, and that the locus of states within these shocks lies along the appropriate Rayleigh line, it follows that an estimate of relaxation time can be obtained by comparing measured profiles with calculated steady profiles, assuming that transformation kinetics dominates the shock transition process. Techniques for calculating profiles are described elsewhere.[57,58] The technique used here is described in Appendix D. Values of relaxation time inferred in this way should be greater than true values because effects of viscosity act to increase rise time.

Figure 6.2 shows calculated temperature-independent profiles for $\tau_1 = 0.05$ μsec and $\tau_1 = 0.1$ μsec. The relaxation time, $\tau_1 = 0.05$ μsec, in the rate equation of Eq. (6.4) was required to obtain a wave profile with rise time near 0.2 μsec. Width of the shock wave as used here is defined as rise time times laboratory velocity, $U_2 - u_1 = 3.36$ mm/μsec. A practical definition of 5 percent to 95 percent of maximum stress amplitude was used for rise time and shock width determinations.

### 6.1.3. Metallurgical Data

Residual hardness for iron which has been shocked into the epsilon phase by successive plastic I and plastic II waves

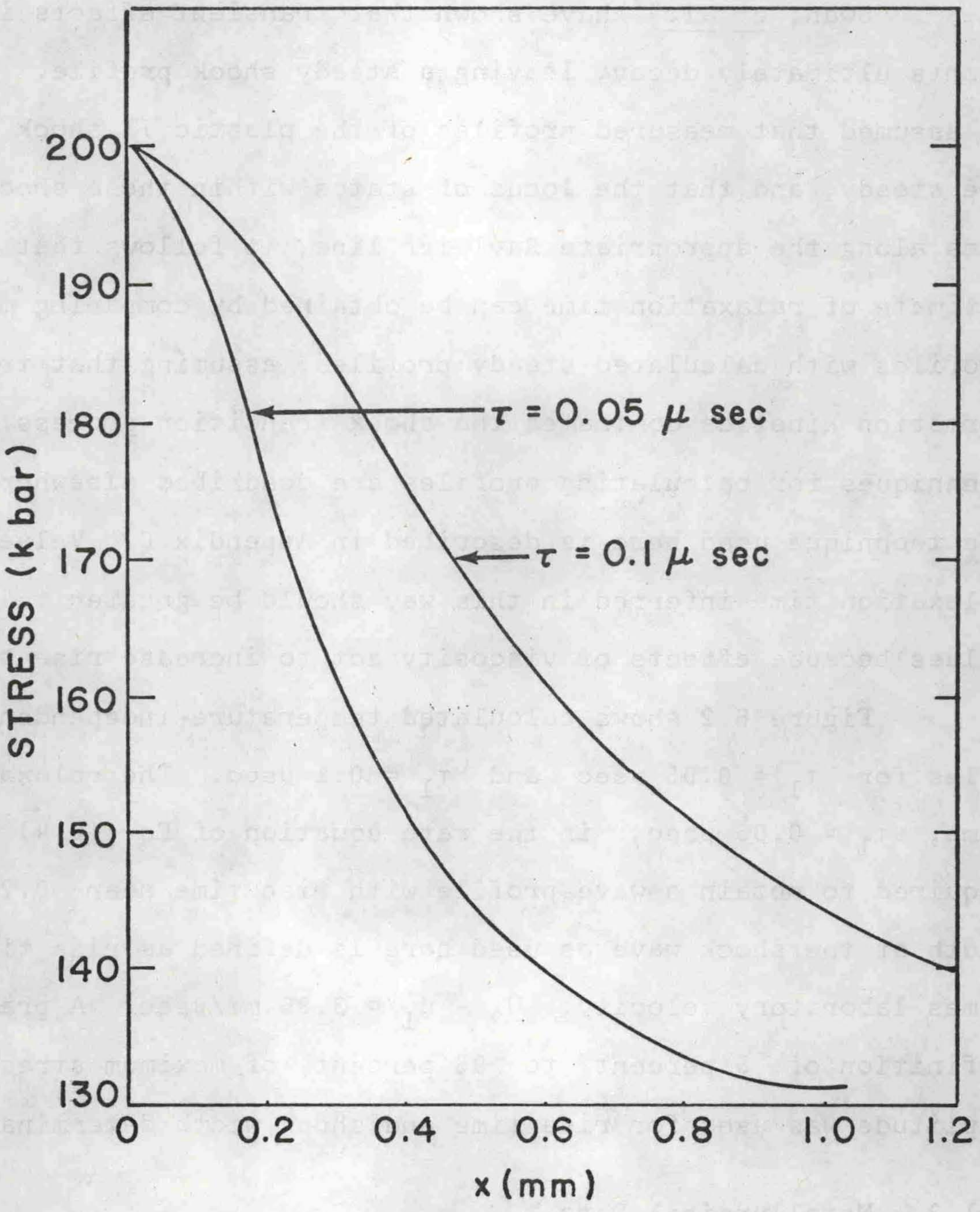

Fig. 6.2.--Temperature-independent steady plastic II shock fronts using Eq. (6.4) and $U_2 - u_1$ = 3.36 mm/μsec.