There is no heat transfer in either the P-3 or P-4 calculations, and their internal and kinetic energies in Fig. 8 are both higher than those of the P-2 calculation with heat transfer. In the P-3 calculation friction converts kinetic energy into internal. The P-4 calculation which uses no friction is seen in Fig. 8 to have larger kinetic energy and smaller internal energy than the P-3 with friction. The P-4 calculation also has a higher shock velocity (Fig. 7) than does P-3.

C. Pressure Histories

Pressure histories were experimentally obtained from quartz gages located at 3, 9, 12, 15, 18, and 21 m from the front surface of the HE cylinder. The gages located at 6 and 24 m provided only TOA results. The pressure-response results have been corrected for the amplification ($\sim$0.95) due to the emitter followers. Insulation from thermal effects was provided with a 0.5-mm ablative coating on the surface of the gage. The KO code[9] calculations indicate a time of only 0.3–0.4 μsec for a pressure pulse to transit the ablative coating, the thin steel diaphragm, and the quartz crystal before conversion to an electrical signal. This slight inherent delay has been ignored in the data presented.

Figures 9(a)–9(c) present the corrected experimental pressure results and the corresponding P-2 calculational results for the above six transducers. The calculational results are based on the venting criteria discussed earlier. The principal effect of the observed venting was to reduce pressures well behind the shock front. This fact is illustrated in Figs. 9(a) and 9(c), which also show the pressure histories at 3 and 18 m for the P-1 (no venting) calculations. These figures also indicate that venting appears to have little influence on the peak pressures in the shock front.

V. DISCUSSION AND CONCLUSIONS

The calculations indicate that in the energy range of this experiment, heat transfer and friction are the predominant factors in attenuating the shock velocity from 1 to 0.2 cm/μsec (over approximately 25 m of propagation). Further, an attempt has been made to identify the rarefaction effects (of the observed venting) on the shock-front and contact-surface TOA, the pressure histories, and the kinetic and internal energies of the shocked air. The principal rarefaction effect for this experiment appears to be limited to the reduction of pressures well behind the shock front.

It is shown that the HE air-shock experiment is capable of accurate numerical simulation with existing finite-difference calculations. It is demonstrated that these calculations provide considerable information not accessible by analytical or purely experimental means.

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