BLAST IN A TUNNEL SEGMENT - PRESSURE LOADS AT THE END WALL

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On the last symposium in 2002 we presented test data for blast loads due to the detonation of charges in front of a tunnel entrance. In a continuation of these tests we have performed a series of small-scale tests revisiting the problem of blast propagation in a tunnel segment. The tunnel segment was modeled by a square steel tube with an inner height and width of 8 cm and a length of 300 cm. At one end the tunnel was closed by a steel plate (end wall), the other end (tunnel entrance) was either open or also closed by a steel wall. Spherical charges of 0.5 g or 1 g PETN were detonated inside the tunnel in various distances from the entrance ranging from 0 to 2500 mm. One side wall and the end wall of the tunnel were instrumented with piezo-electric pressure gages.

Our main interest focused on the pressure loads onto the end wall of the tunnel segment. The peak overpressure values measured in the reflection of the primary blast wave at the end wall essentially only depend on the stand-off distance between the charge and the end wall. Effects due to an open tunnel entrance are only found when the charge is very close to the entrance. In contrast, the duration of the overpressure phase T_+ and the overpressure impulse I_+ are affected by rarefaction waves from the open end. The strongest blast loads of the end wall in terms of overpressure impulse and duration of the overpressure phase were found when the charge is located about a third of the tunnel segment length down from the entrance.