

OPTIMIZING THE CANADIAN FORCES BATTLE TRENCH FOR IMPROVED BLAST PROTECTION

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The design of the standard Canadian Forces two-soldier battle trench has one fighting bay and one protective shelter bay (an adit) in a straight line. This study was conducted to determine the effect of bay-size and adit location on personnel vulnerability inside the trench. Numerical analyses were run on straight, L-shaped, and T-shaped designs; bay size and adit location were varied. Bowen (Modified?) curves were used to determine personnel vulnerability inside each trench. Most of the numerical analyses were run with a 200 L FAE. A 725 kg TNT charge was used to determine the effect of weapon type.

The numerical results showed that the pressure in the T-shaped trench was slightly less than either the L-shaped or straight trench. Nevertheless, the T-trench hinders communication between soldiers in each bay, requires more excavation than the other designs and is more complicated to construct.

Based on the numerical results, experimental field trials were run with the straight and L-shaped trenches. Field trials were used to confirm the numerical results and to assess the effectiveness of blast blankets covering the adit entrances. During some of the field trials, thoracic rigs were used to determine personnel vulnerability in the adit. The charge for the field trials was 100 kg flaked TNT.

The results showed that increasing adit length always resulted in a pressure reduction inside the adit. Without blast blankets, the position “kneeling in the firing bay” was safer for personnel than either the “standing in the firing bay” or “laying in the adit” positions. When blast blankets were placed over the adit entrance, the safest position was laying in the adit. This effect occurred in both straight and L-shaped trenches, but, overall, the L-shaped trench was safer than the straight trench.