Air raid shelters for the civilian population are often constructed in the basements of residential buildings. The loads which airraid shelters can be acted upon by, in conjunction with militaryaction, are blast and fragments from bombs and the load which the shelter may be exposed to when the building, which may consist of a number of storeys, is damaged so badly that collapse occurs andthe debris falls on the roof of the shelter.

The object has been to find if buildings can be classified in different categories which, depending on the design of the building, give rise to collapse loads of different magnitudes, and if so how this classification can be carried out.

This thesis shows the way in which the kinetic energy of the debris, which the roof of the air raid shelter must absorb, can be described as a function of the mass of the building, the position of this mass in the vertical direction, and the quantity of energy that is dissipated when the building disintegrates during collapse.

The work has mainly concentrated on a study of the energy that isrequired to cause the failure of the concrete floor slabs whichare hit by falling debris. This is obvious since it is primarilythe ability of the floor slabs to retard collapse which determines the speed at which the debris hits the roof of the air raid shelter. A study has been made of the way in which the support conditions and reinforcement of the slabs affect the energy dissipation.

In order to determine the energy dissipation experimentally, falling weights were dropped onto concrete slabs from different heights. The entire sequence was filmed with a high speed camera. With help of the films, the positions and speeds of the slabfalling weight system at different times were determined. Since the masses of the bodies were known, the potential and kinetic energies of the system were also calculated. A comparison of the energies before impact and after the loadbearing capacity of the slabs had been reached gave the energy dissipated. ...

The conclusion that can be drawn regarding the magnitude of the load due to a building collapse onto an air raid shelter in the basement is that it should be possible to classify buildings in atleast two categories: One with a lower collapse load if catenary(or membrane) action can be demonstrated in the slabs, and one with a higher collapse load when this effect cannot be shown to exist. The choice of reinforcing steel is also of significance with regard to the catenary action. The greatest energy dissipation is obtained with plain bars, and the least with mesh reinforcement. Another important conclusion is that an impact process can be satisfactorily described by a simple massspring systemproviding that the parameters are appropriately chosen.