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### Experiments on safety in the use of portable ladders

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#### Abstract

The safety of ladder usage is studied on the basis of accidents that have occurred and of laboratory and work site tests. Ladders are involved in 1â€“2% of occupational accidents in industrialized countries, and roughly one out of each two thousand workers have a ladder accident annually. Some 70% of the serious ladder accidents occur during installation, maintenance and construction operations. About 70% of the serious ladder accidents take place with portable non-self-supporting ladders and the most frequent mechanism is that the ladders slide away from under the user.

In laboratory tests it was noted that the dynamic forces appearing in climbing have a considerable influence from the point of view of load on the ladder. Lateral displacements increase as the pitch angle becomes steeper, whereas gentler angles lead to increased sliding risk. The method developed in the study can be used to determine the safety margin of a ladder with respect to sliding. The safety of the various combinations of anti-skid-medium-base was evaluated with friction measurements. A

rubber anti-skid clearly decreased the sliding risk.

A group workers from a power plant participated in the ladder service tests. The observations made of the climbings and the users' opinions showed that differences exist in both the structural safety features of ladders and the ways in which ladders are used. The pitch angle selected by the users was usually gentler than recommended.

Finally, suggestions are made to further develop the operational safety of ladders, and some ideas of further research are recommended.



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