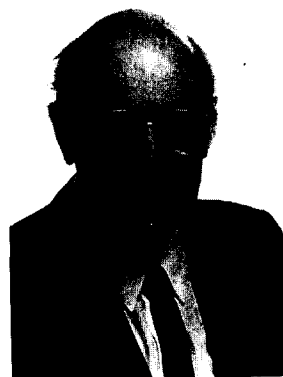


Providing Safe Storage for Non-Nuclear Waste



Prof. Heinz Duddeck

The International Tunnelling Association (ITA) promotes the use of the underground for the sake of mankind, well aware that engineers must provide facilities for traffic, water supply, sewers, and waste, all of which contribute to relieving our congested towns and cleaning up our environment. By depositing non-recyclable waste into the ground, long-term safe protection of the biosphere may be achieved.

After having published its "Guidelines for the Design of Tunnels" (see *T&UST* 3(3), 235–249), the ITA Working Group on Design of Underground Structures decided, with the consent of the ITA Executive Council, to turn its efforts toward design considerations for underground waste repositories.

At the group's first working session on this topic, held in Toronto in 1989, the Canadian hosts delivered an extensive report on the work done so far on underground nuclear waste repositories. Considerable attention has been devoted worldwide to the study of storage for nuclear waste. Therefore, the Working Group decided to restrict its work to non-nuclear waste, including toxic waste in bulk mass, even though the main construction features and methods for safety assessments are rather similar to those for nuclear waste storage. After many discussions and some drafted versions of the Working Group paper at the following meetings in London (1991) and Mexico (1992), the final paper was adopted in Amsterdam (1993) and was approved by the ITA General Assembly in Cairo, Egypt, in 1994.

There is at least one distinct difference between the design of tunnels and the design of underground waste repositories. For tunnels, the excavation is the most crucial phase, whereas for repositories, the design has to assess the long-term safety of the structure and the protection of the environment. In addition, relevant past experiences—including negative experiences—and on-site monitoring are important sources for the tunnel design. For waste repositories, in contrast, we hope that there are no negative

experiences from which to learn. Furthermore, at the time of design of such storage facilities, monitoring is not possible: the design can rely only on numerical analyses that take long-term behaviour into account.

Therefore, one of the main features of the ITA guidelines developed for underground waste repositories is a methodical means of risk assessment. In this respect, the guidelines draw from the basic ideas outlined in the Swiss SIA 260 recommendations on Safety and Serviceability of Structures (1982), where failure scenarios have to be defined in a risk plan and the evaluation of safety must be assessed separately for each of the potential failures.

The Working Group's report covers the different barriers, the possible underground facilities (including abandoned mines), and the required waste properties; and outlines the general approach for design and risk assessments in greater detail. Some literature is cited so that readers may obtain more information on modelling, numerical evaluations, assessment procedures, and case histories for such facilities.

Members of the ITA Working Group who primarily contributed to these guidelines through discussions, written contributions, critical reviewing, etc., are: R. Craig (U.K.), N. Diekmann (Germany), J. Guillaume (France), M. Hudec (Croatia), B. Ladanyi (Canada), K.-H. Lux (Germany), D. Morfeldt (Sweden), J. Peshel (U.S.A.), Birger Schmidt (U.S.A.), Y. Shimizu (Japan), P. Smeallie (U.S.A.). Except for a small nucleus of group members, the sessions of the Working Group at the ITA congresses were attended by different participants each time. Therefore, the above list of members is not complete.

I wish to express my thanks to all those who contributed their ideas to achieve the objective of the Working Group, and to Donna Ahrens for editing the report.

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