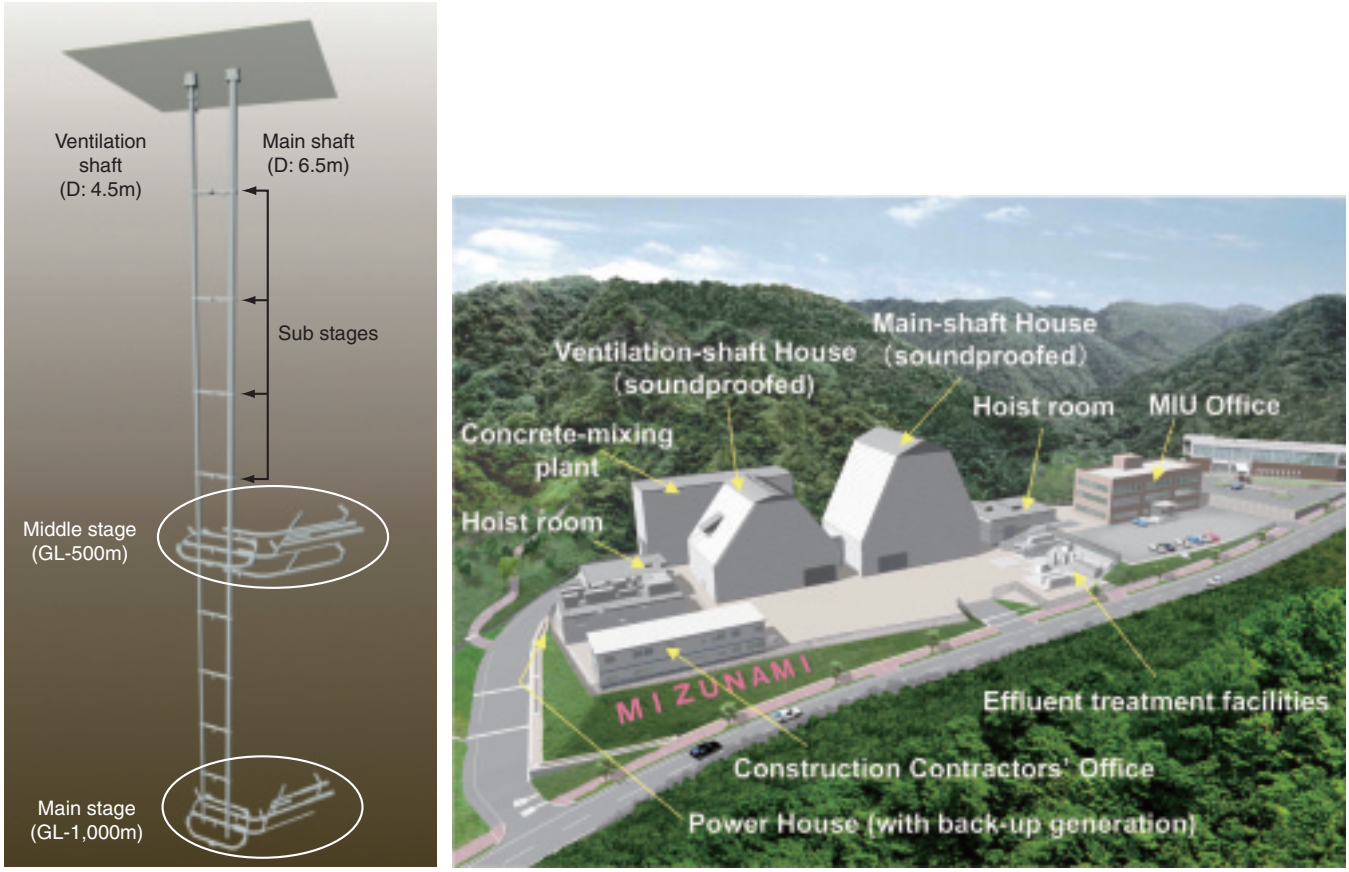
12-8 Construction of an Underground Research Laboratory Fully Underway
—Research and Development of Geological Disposal Technology—



(a) Basic layout of research shafts

(b) Layout of surface facilities

Fig.12-18 Outline of the Mizunami Underground Research Laboratory
The Mizunami Underground Research Laboratory consists of underground facilities (research shafts) and surface facilities. The conceptual design includes two 1,000 m deep shafts, the Main Shaft (6.5m ϕ) and the Ventilation Shaft (4.5m ϕ), and two research stages, the Middle Stage at 500 m depth and the Main Stage at 1,000 m (a). Surface facilities include excavation equipment, head frame, hoists, water-treatment facility, and electrical plant (b).

The Mizunami Underground Research Laboratory, one of the main facilities in Japan for research and development of the technology for high-level radioactive waste disposal, is being constructed in Mizunami City. This facility consists of two shafts to be excavated to a depth of 1,000 m below ground level and horizontal research tunnels at different depths (Fig.12-18). This facility will be used not only as a research laboratory to establish techniques for the investigation, analysis and assessment of deep geological environments and engineering technologies, but will also enable visitors to learn about the deep geological environment. Based on pre-excavation studies, layouts of shafts and research tunnels were designed, and the mechanical stability of openings, earthquake-resistance of shafts and ventilation requirements were analyzed. Construction procedures are planned to reduce shaft excavation cycle time as well as for safety. A double blasting system with two consecutive drill, blast and mucking cycles followed by a shaft-lining step has been adopted.

In February 2005, shaft excavation started using scaffold-mounted drilling and mucking equipment and deep capacity hoists needed for excavation of the shafts at depth. By October 2005, the excavation of the Main and Ventilation Shafts had reached depths of 172m and 191m, respectively. However, shaft sinking was then suspended for about 6 months due to high concentrations of boron and fluorine in the inflow water in the shafts, which exceeded the environmental discharge limits. To resolve this problem, an additional effluent treatment system was adopted, and shaft sinking resumed in April 2006. Scientific investigations during shaft sinking will be performed during the excavation of the Main and Ventilation Shafts down to a planned depth of approximately 1,000 m below ground level.

Reference

Sato, T. et al., Status of Japanese Underground Research Laboratory —Design and Construction of 1000 m-deep Shafts and Research Tunnels—, In Underground Space Use: Analysis of the Past and Lessons for the Future, Erdem & Solak (eds), 2005, p.335-341.