Penetrating the Great Fault Line of the World
Aokuzure-Pass Tunnel

A dream come true after 40 years thanks to cutting-edge technology

国土交通省 中部地方整備局
Ministry of Land, Infrastructure, Transport and Tourism Chubu Regional Development Bureau

130 Years & Beyond
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Project Overview

Japan has a long history of successful tunnel projects, including undersea tunnels such as the Kanmon and Seikan Tunnels, and tunnels under heavy earth pressure and with abundant groundwater such as the Daishimizu and Hida Tunnels. In contrast, the Aokuzure-Pass Tunnel, although initiated in 1987, faced extremely fragile geological conditions near the Median Tectonic Line, one of the world's largest fault zones. Excavation was abandoned, and the project was referred to as "a defeat of Japanese tunnel technology." This time, by applying the latest technologies and special construction management to the long-divided national highway, the long-cherished tunnel has been realized after more than 40 years.

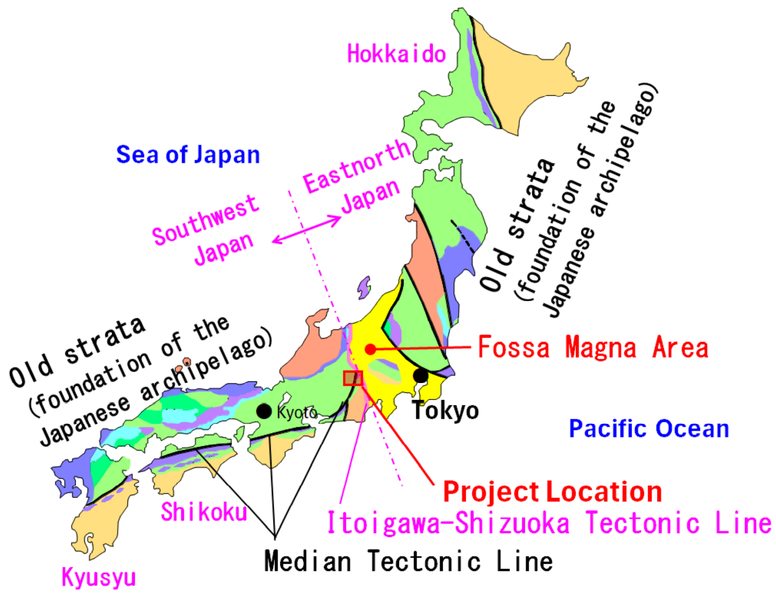

Fig.1 Geological structure of Japan and project location

1.The formation of the Japanese archipelago and geological challenges

The Japanese archipelago is located in one of the world's most prominent plate boundary regions, where four plates - the Eurasian Plate, the North American Plate, the Pacific Plate, and the Philippine Sea Plate - collide and subduct into each other. This activity formed the archipelago over a long geological period, and crustal movement continues to this day. Japan's geological structure is broadly divided by the Median Tectonic Line (MTL), one of the world's largest fault zones that divides southwestern Japan into north and south, and the Fossa Magna, a huge rift valley that separates eastern and western Japan. Aokuzure-Pass occupies a geologically exceptional setting, situated proximate to the Median Tectonic Line and adjacent to the western margin of the Fossa Magna, a region characterized by complexly metamorphosed and fractured strata (**Fig.1**). Furthermore, the project necessitated addressing the substantial earth pressures generated by an overburden exceeding 600 meters in depth (**Fig.2**).

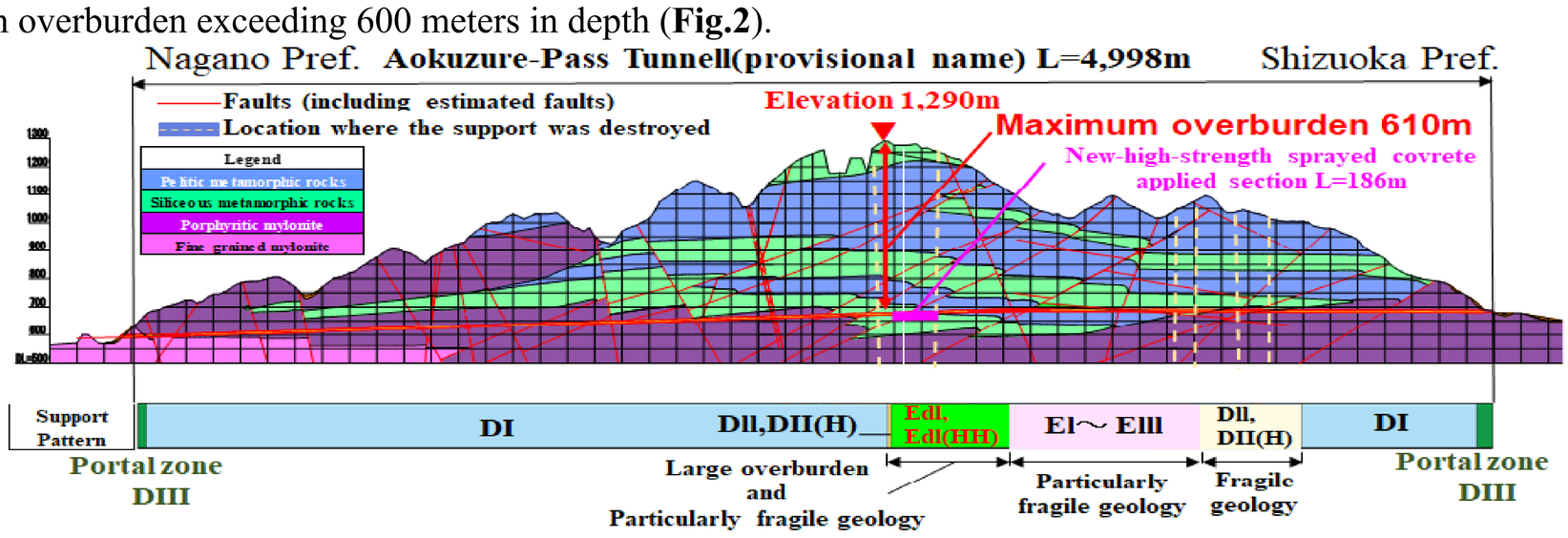

Fig.2 Geological Profile

2.Strategic Construction Management

In this project, a construction review committee (experts, government officials, and engineers) established a PDCA cycle management system, and a flexible planning and design system was established that could quickly respond to unexpected ground conditions. In addition, even in the 610m section of soil cover, advance predictions and real-time analysis were used in combination to achieve progress management and risk reduction .

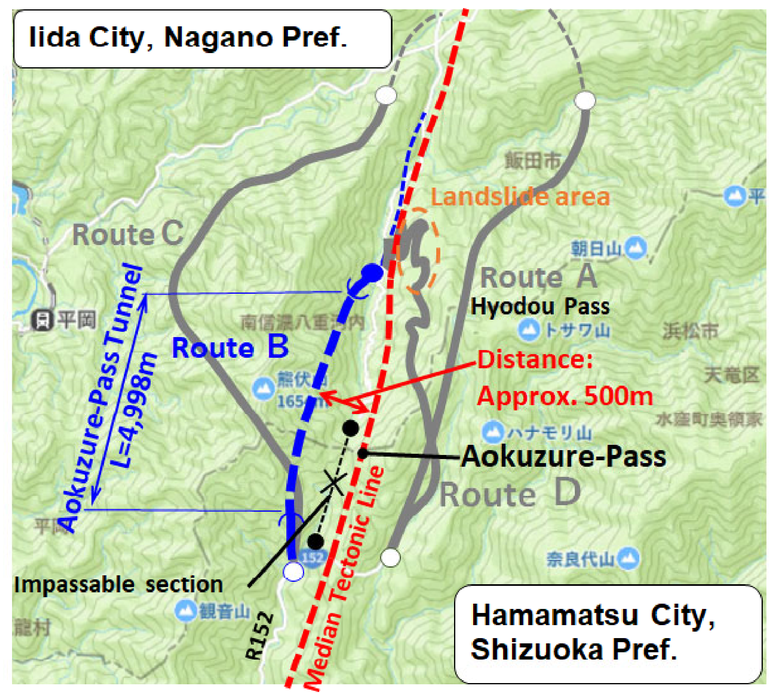

Fig.3 Route Selection Map

3.Innovative Design and Construction

Route B, which was less affected by the Median Tectonic Line, was selected (**Fig.3**). Double support structures were adopted in sections where earth pressure was extremely high (**Fig.4 and 5**). In addition, a new high-strength sprayed concrete, which suppresses early strength development to achieve a "dodging effect (mitigation effect)" while ultimately reaching a compressive strength of 54 N/mm² over the long term, was developed along with a dedicated spraying machine. The application of these technologies successfully realized the long-awaited tunnel (**Fig.6**).

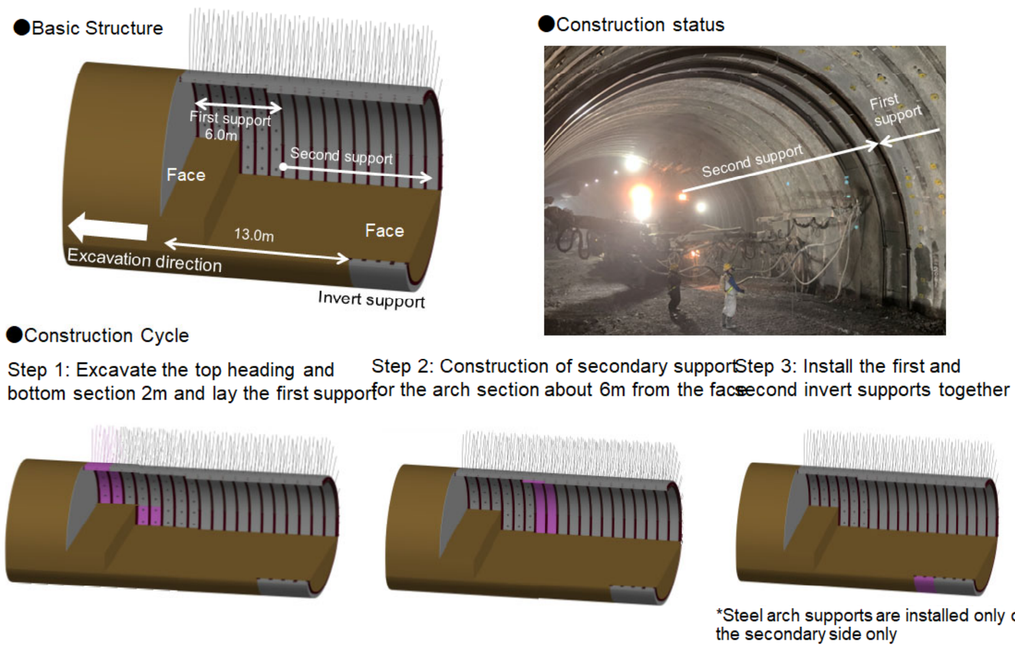

Fig.4 Outline of double support system

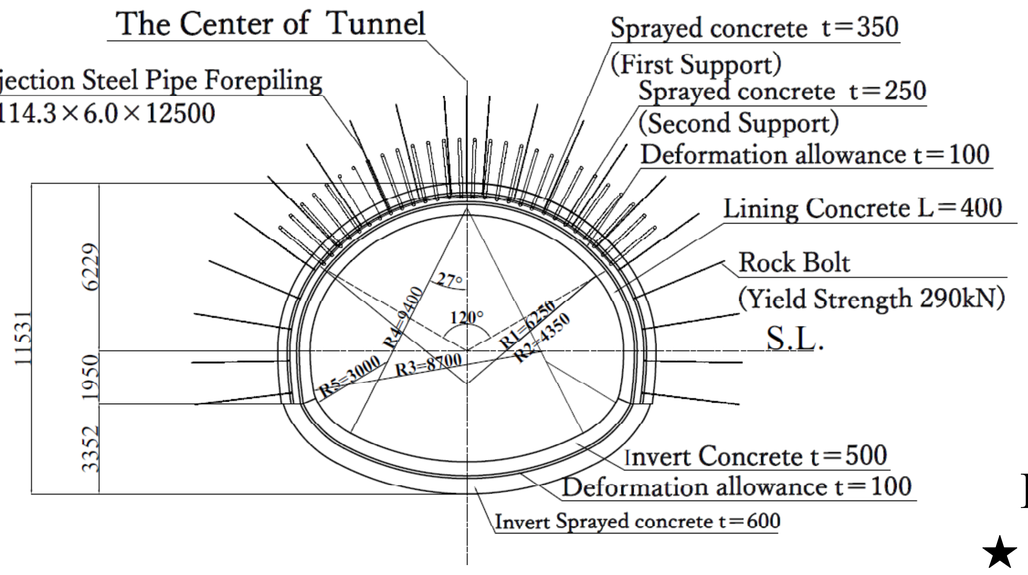

Fig.5 Support pattern

4.Project Impact

The project responded to the local community's expectation of eliminating the impassable section of National Route 152. As a result, a disaster-resilient transportation network was secured, and access to emergency medical facilities was improved, thereby contributing to local safety and security. Additionally, with nearly 100% of the area now within a 60-minute drive of the expressway, the project is expected to promote tourism from outside the region and contribute to the local economy. Furthermore, the tunnel minimized terrain alterations and reduced vehicle exhaust emissions compared to the former mountain pass route, thus helping to reduce environmental impacts.

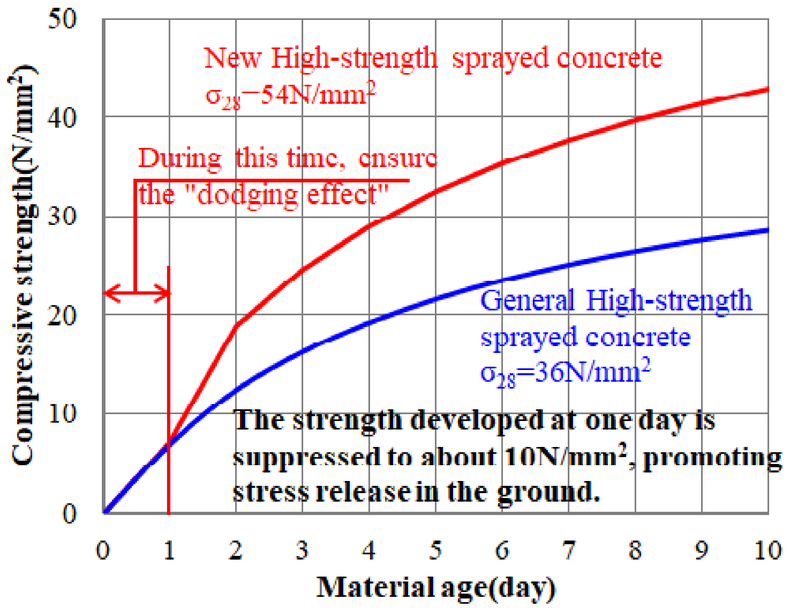

Fig.6 Strength development of New S.C.

★ **In 2025, this project received the Japan Society of Civil Engineers Development Award and the Japan Federation of Construction Contractors Civil Engineering Award.**