

施工 SENSで掘進中に出現した巨大な岩塊群の撤去

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北海道新幹線羊蹄トンネルは北海道虻田郡ニセコ町から同倶知安町に跨る延長9,735mのトンネルであり、有島工区(起点側)と比羅夫工区(終点方)の2工区に分割し、SENS(シールドを用いた場所打ち支保システム)で施工を進めている。比羅夫工区(延長5,569m)は2019(令和元)年4月から掘進を開始し、2021(令和3)年7月初旬に坑口から約3.4km地点の掘進途中に緻密で硬質かつ巨大な岩塊群にシールドが衝突したことでカッターヘッドが回転不能となり停止した。本稿では、シールドを再発進させるための追加調査と解析、岩塊撤去計画、施工実績および現在の進捗を報告する。

**Removal of Huge Rock Mass Group That Appeared during Excavation with SENS
—The Hokkaido Shinkansen, the Yotei Tunnel (Hirafu) Other Lot—****By Ryo Ogose, Japan Railway, Construction, Transport and Technology Agency**

The Hokkaido Shinkansen Yotei Tunnel has a length of 9,735 m from Niseko Town to Kutchan Town in Abuta County, Hokkaido. The tunnel is divided into two lots, the Arishima lot (starting point side) and the Hirafu lot (end point side). It is being constructed using SENS (Shield-based cast-in-place support system). Excavations in the Hirafu lot (length of 5,569 m) began in April 2019 and stopped in early July 2021 when the cutter head became unable to rotate due to the TBM colliding with a dense, hard, and massive rock mass group during excavation about 3.4 km from the start of the lot. In this paper, the authors report on additional investigations and analyses performed to restart the TBM, the rock removal plan, execution results, and current progress.

施工 剝離性に富む変成岩地山のトンネル掘削における変状と対策

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—中部縦貫自動車道大野油坂道路 新長野トンネル野尻地区工事—

国土交通省 佐久間 昭

大野油坂道路新長野トンネル野尻地区工事では、トンネル掘削開始直後から切羽評価点では地山等級CIIと判定される千枚岩が出現していたが、250mを超える大きい土かぶりや片理面からの剝離性に富んだ千枚岩の特性も相まって地山から想定外の土圧が作用したことで、最大147mmの脚部沈下、最大189mmの内空変位を計測し、掘削完了後の支保にはロックボルトの破断や吹付けコンクリートの剝落などの変状が発生した。A計測結果と変状状況にもとづき、支保パターンの変更と変状対策工の適用をくり返し実施し、最終的にはB計測により支保工内部にかかる応力を定量的に把握したうえで、支保パターンDII、高強度吹付け、高規格鋼製支保工、および、インバートストラットによる早期閉合の対策工を採用、施工することで変状を抑制した。

Deformation and Measures in Tunnel Excavation in Metamorphic Rock with High Tendency to Exfoliation**—The Chubu-Jukan Expressway Ono-Aburasaka Road, the Shin-Nagano Tunnel, Nojiri Area Lot—****By Akira Sakuma, Ministry of Land, Infrastructure, Transport and Tourism**

In the Nojiri area lot of the Shin-Nagano tunnel on the Ono-Aburasaka road, phyllite classified as CII of the ground classification at the face assessment score appeared immediately after the start of the tunnel excavation. Due to the large depth of more than 250 m and the characteristics of the phyllite, which has a high tendency to exfoliation from the schistosity plane, combined with unexpected earth pressure exerted from the ground, a foot settlement up to 147 mm and internal displacement up to 189 mm were measured, and deformations such as fracture of rock bolts and spalling of shotcrete occurred in the supports after the excavation was completed. Based on the results of the A-measurement and the deformation state, the support pattern was changed, and the deformation measures were taken repeatedly. Finally, after quantitatively understanding the stresses applied to the inside of the support structure through the B-measurements, the deformation was controlled by adopting and taking such measures as the support pattern DII, high strength spraying, high standard steel support structure, and early closure with invert struts.

桂町トンネルは、都市計画道路上郷公田線の路線端部に位置し上下線が並走する延長331mのめがねトンネルである。本トンネルは住宅地域に位置し、トンネル掘削線から50cm外側が官民境界であるとともに、土かぶりが平均10m程度であることから、騒音・振動や掘削による挙動に細心の注意を払いながらの施工となった。地質は、トンネル全長の4割が風化岩と関東ローム層からなり、その柔らかい地質に対応するため、当初、中央導坑方式を全線で採用していた。しかし、安定した地質である上総層群大船層・新鮮部では、設計を見直し、無導坑方式を採用して、工程短縮およびコスト削減を図ることができた。本稿は、無導坑・中央導坑方式による掘削の特徴と小土かぶり部の対応について経緯を述べる。

Construction of a Twin Tunnel Using a Combination of No-Drift and Central Drift Methods

—Yokohama City-Planned Road Kamigo-Kuden Line, the Katsuramachi Tunnel—
By Kei Takahashi, Yokohama City

The Katsuramachi Tunnel is a 331-m-long twin tunnel located at the end of the city-planned road Kamigo-Kuden line, with the inbound and outbound lanes running parallel to each other. The tunnel is located in a residential area, with the boundary between the public and private sector located 50 cm outside the tunnel excavation line and an average soil cover of about 10 m. The tunnel was constructed while paying close attention to noise, vibration, and behavior resulting from excavation. The ground consists of weathered rock and Kanto loam for 40 % of the total length of the tunnel. To cope with the soft ground, a central drift method was initially planned for the entire line. However, after encountering the stable soil of the Ofuna formation of the Kazusa group in the fresh part, the design was reviewed, and a no-drift method was adopted to reduce the process and costs. In this paper, the authors describe the characteristics of excavation using both no-drift and central drift methods and the history of dealing with small earth cover sections.

東海環状自動車道柿田トンネルは、岐阜県東部、土岐JCT～可児御高IC間に位置する延長1,600m³のⅡ期線トンネルであり、2020(令和2)年10月にトンネル掘削に着手し、2023(令和5)年1月に貫通した。本トンネルは、掘削断面積約80m²の2車線トンネルであり、補助ベンチ付き全断面掘削工法で施工した。本稿では、東海環状自動車道の概況に加え、トンネル上部に出現した亜炭採掘坑を本坑掘削前に切羽から空洞充填する対策、掘削土に含まれる重金属含有土(ヒ素)の対策、およびⅠ期線への影響に対する計測結果について報告する。

Construction of Phase II Line While Filling Cavities from the Face into the Lignite Mine above the Tunnel

—The Tokai-Kanjo Expressway, the Kakida Tunnel—
By Toshikazu Obayashi, Central Nippon Expressway Company Limited

The Kakida Tunnel on the Tokai-Kanjo Expressway is a 1,600-m-long Phase II tunnel located between Toki JCT and Kani Mitake IC in eastern Gifu Prefecture. The tunnel excavation began in October 2020 and was penetrated in January 2023. This tunnel is a 2-lane tunnel with an excavated cross-sectional area of approximately 80 m². It was constructed using the full face method with auxiliary bench. In addition to an overview of the Tokai-Kanjo Expressway. In this paper, the authors report on the measures taken to fill cavities from the lignite mines appearing above the tunnel from the face before excavating the main tunnel, measures taken to deal with the heavy metals (arsenic) contained in the muck, and the results of measurements on the effects on the Phase I line.

第49回国際トンネル協会(ITA)の総会が、2023年5月12~18日にギリシャのアテネにおいて開催された。また、併催された2023年世界トンネル会議(WTC)は、5月15日から3日間「Expanding Underground-Knowledge & Passion to Make a Positive Impact on the World-」のテーマのもとで、日本からは、ITA総会、作業部会(WG)の担当者およびWTCの論文発表者などを含め、約40名が参加した。本稿では、ITA総会およびWTCにおける内容のうち、ITAの全体的な動向およびWGなどの活動の概要を報告する。

49th ITA General Assembly and World Tunnel Congress (Athens) Report

By Japan Tunnelling Association

The International Tunnelling and Underground Space Association (ITA-AITES) held its 49th meeting in Athens, Greece from 12th to 18th May 2023. The World Tunnel Congress (WTC) 2023 which was held in conjunction with the meeting had 40 participants from Japan, including those in charge of the ITA General Assembly and Working Groups (WGs), and presenters at the WTC with the theme of "Expanding Underground-Knowledge & Passion to Make a Positive Impact on the World" for 3 days from 15th May. This report outlines overall ITA trends and technical activities of Working Groups at the ITA General Assembly and the WTC.