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全区間小土かぶり火山灰質土地山での補助工法適用を初期天端沈下量で管理
―北海道新幹線　ニセコトンネル―

鉄道・運輸機構　梅主　大和

北海道新幹線ニセコトンネルは，延長2,250mの山岳トンネルで，全区間にわたって土かぶり 2*D*未満の小土かぶりトンネルである．ニセコアンヌプリの火山活動由来の火山灰質砂質土が主体の未固結砂地山であり，*N*値が最大で30程度しかない．そのため，トンネル天端沈下量とスプリングライン(S.L.)沈下量がほぼ一致する「共下がり現象」が確認された．2018(平成30)年７月の掘削開始以降，掘削補助工法の採用などによって，慎重に掘削を進め，2022(令和４)年４月に貫通を迎えることができた．本稿では，掘削補助工法適用の判断を早期かつ適切に行うために採用した，「掘削初期の天端沈下量に着目した施工管理手法」について報告する．

Management of Application of Auxiliary Methods under Small Covering of Volcanic Soil Ground through Monitoring Initial Crown Settlement
―The Hokkaido Shinkansen, the Niseko Tunnel―

By Yamato Umezu, Japan Railway, Construction, Transport and Technology Agency

The Niseko Tunnel on the Hokkaido Shinkansen is a 2,250-m-long mountain tunnel with a small covering of less than 2*D* over the entire length of the tunnel. The unconsolidated ground is mainly composed of volcanic sandy soil produced by volcanic activity of the Niseko Annupuri volcano, with a maximum *N* value of only about 30. Therefore, the “accompanied settlement phenomenon” was confirmed, in which the amount of tunnel crown settlement and the amount of spring line (S.L.) settlement were almost the same. Since the beginning of excavation in July 2018, the excavation has been carefully carried out with the use of auxiliary methods, and the breaking-through was achieved in April 2022. In this paper, the authors report on the “construction management method focusing on the amount of crown settlement in the initial stage of excavation” that was adopted to make an early and appropriate decision on the application of the auxiliary methods.

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名古屋城外堀および道路下に小土かぶり・急曲線シールドを施工
―中央新幹線　名城変電所電気洞道―

東海旅客鉄道(株)　齋藤　力哉

現在，建設を進めている中央新幹線では，沿線に20～40km程度の間隔で変電所を設置する計画であり，名城変電所はもっとも名古屋駅寄りの非常口となる名城非常口の周辺に建設される．名城変電所電気洞道は，この名城変電所と名城非常口を結ぶ延長378mのシールドトンネルで，中央新幹線本線へ引き込む電力・通信ケーブルが敷設される．シールド工法は，適切な施工を行えば安全に工事を遂行できる工法であるが，2020(令和２)年には，地表面に影響を与える事故が発生している．本工事はとくに，小土かぶり，急曲線といった点に留意を要する施工であったが，無事に施工が完了した．ここに，切羽土圧，取込み土量，裏込め注入などの掘進管理，および地表面変位の監視などに主眼を置き，その結果を報告する．

Shield TBM Boring Shallow and Steep Tunnel under the Outer Moat of Nagoya Castle and Road
―The Chuo Shinkansen, Meijo Substation Service Tunnel―

By Rikiya Saito, Central Japan Railway Company

For the Chuo Shinkansen, which is currently under construction, transformer substations are planned at intervals of 20 to 40 km along the line, and the Meijo substation will be constructed near the Meijo emergency exit, which is the closest emergency exit to the Nagoya station. The Meijo substation service tunnel is a 378-m-long shield tunnel connecting the Meijo substation and the Meijo emergency exit. Power and communication cables for the Chuo Shinkansen main line will be laid in this tunnel. Although the shield tunneling method allows to carry out construction works safely if properly executed, an accident affecting the ground surface occurred in 2020. This project required particular attention to thin covering and sharp curves, but it was safely completed. In this paper, the authors focus on the excavation management issues such as earth pressure at a face, amount of soil intake, backfill grouting, as well as ground surface settlement monitoring.

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50年以上経過した矢板工法トンネルの覆工補強工事

―第二神明道路　高倉山トンネル―

西日本高速道路(株)　黒田　正人

高倉山トンネルは第二神明道路須磨～名谷間に位置する延長545mの矢板工法で掘削されたトンネルである．1970(昭和45)年に上下線２チューブを建設され50年以上が経過しており，交通量の増加に伴い1983(昭和58)年に下り線１チューブを追加で建設されたことから，現在は上り線を２チューブで運用している．トンネル詳細点検の結果，覆工コンクリートの巻き厚不足や浮きなどが広範囲に判明されたため技術検討会を設け，健全性の把握と補強方法を検討した．その結果，炭素繊維シートによる補強が決定した．また，工事中の安全性と経済性の観点から，上り線の左右各々のトンネルを閉鎖して工事する計画とした．本稿では，覆工補強の検討概要，工事内容および施工時での粉じん対策の効果について報告する．

Reinforcement of Lining in an over 50 Years Old Tunnel Built with the Timbering Support Method

―Daini Shinmei Road, Takakurayama Tunnel―

By Masato Kuroda, West Nippon Expressway Company Limited

The Takakurayama Tunnel is a 545-m-long tunnel excavated with the timbering support method, located between Suma and Naya on the Daini Shinmei Road. More than 50 years have passed since the two-tube inbound and outbound lines were constructed in 1970, and an additional one-tube outbound line was constructed in 1983 due to increased traffic volume. Currently, the two-tube inbound line is in operation. As a result of a detailed inspection of the tunnel, it was found that lack of lining thickness and peeling over a wide area, so a technical review committee was established to ascertain the soundness of the tunnel and to study reinforcement methods. As a result, it was decided to use carbon fiber sheets for reinforcement. For safety and economy during construction, the plan was to close both the right and left tunnels of the inbound line. In this paper, the authors present an overview of the study of lining reinforcement, the details of the construction work, and the effectiveness of dust control measures during construction.

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港の見える丘公園直下のみなとみらい21線車両留置場計画

横浜高速鉄道(株)　髙木　一行

本工事は，みなとみらい21線の終点駅である元町・中華街駅から先に，横浜高速鉄道(株)が所有する車両を留置するための鉄道施設を山岳工法により観光地と住宅地の直下に建設する計画である．本工事は，厳しい施工条件を踏まえ，ECI方式を参考にした設計手法を適用し，工程遅延のリスクを反映したうえで，計画，設計を実施することとした．2030年度の供用開始を目標として，2018年11月に公告し，2019年３月に技術協力業務を契約し，１年の業務期間を経て2020年３月末に工事契約を締結し，2022年３月から工事に着手したところである．本稿では，みなとみらい21線車両留置場建設工事の事業計画について紹介する．

Railcar Storage Facility Project on the Minatomirai 21 Line Directly Under the Harbor View Park

By Kazuyuki Takagi, Yokohama Minatomirai Railway Company

In this project, the construction of a storage facility for railcars owned by Yokohama Minatomirai Railway Company is planned directly under the tourist and residential areas beyond Motomachi-Chukagai Station, the terminal station of the Minatomirai 21 Line, using the conventional tunneling method. Considering severe construction conditions, the design method for this project was based on the ECI method, and the risk of process delays was reflected in the planning and design. To put the facility into service in 2030, public notification was made in November 2018, a contract for technical cooperation work was signed in March 2019, and after a one-year work period, a construction contract was signed at the end of March 2020. The construction works started in March 2022. In this paper, the authors introduce the project plan for the construction of the railcar storage facility on the Minatomirai 21 Line.