施工

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大規模活断層を先進ボーリングと高剛性支保工で突破

―足羽川ダム　水海川導水トンネル2期工事―

国土交通省　川端　知憲

足羽川ダム建設事業では，足羽川下流域の位置する福井市などにおける洪水被害の軽減を目的として，洪水調整専用のダムと分水施設(分水堰・導水トンネル)を整備している．本事業の一環で整備を進めている水海川導水トンネルは，足羽川の支川の水海川の洪水を，同じく足羽川の支川の部子川に構築する足羽川ダムに導水するものである．水海川導水トンネルの中央部では，岩盤形成時に自らの流動で破砕された自破砕状安山岩質溶岩が風化変質を受けた区間や，温見断層による大規模な断層破砕を受けた区間といった，施工が困難な地質に遭遇した．本稿では，自破砕状溶岩区間の施工を述べるとともに，トンネル最難関となった温見断層の地山性状および断層突破時のトンネル対策工について述べる．

Breaking Through a Large-Scale Active Fault Using Advanced Boring and High Stiffness Supports

―The Asuwa River Dam, Mizuumi River Headrace Tunnel Phase 2―

By Tomonori Kawabata, Ministry of Land, Infrastructure, Transport and Tourism

The Asuwa River Dam Project aims to reduce flood damage in Fukui City and other areas located in the lower basin of the Asuwa River by constructing a dam and diversion facilities（diversion weirs and headrace tunnels）for flood control. The Mizuumi River Headrace Tunnel, which is being constructed as part of this project, will direct flood water from the Mizuumi River, a tributary of the Asuwa River, to the Asuwa River Dam constructed on the Heko River, also a tributary of the Asuwa River. In the central part of the Mizuumi River water tunnel, there were geological features that hindered the construction, such as a section where autobrecciated andesitic lava, which was fractured by its own flow during rock mass formation, underwent weathering and alteration, and a section where a large-scale fault fracture was caused by the Nukumi Fault. In this paper, we describe the construction in the autobrecciated lava section and also describe the geological properties of the Nukumi fault, which was the most difficult part of the tunneling, and the measures performed when the fault was penetrated.

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10か所の踏切を除却する相模鉄道本線（鶴ヶ峰駅付近）連続立体交差事業

相模鉄道（株）　山西　雄大

現在，相模鉄道では横浜市の都市計画事業の一環として，鉄道の地下化を進めており，西谷駅～二俣川駅間において合計10か所の踏切を除却する「相模鉄道本線（鶴ヶ峰駅付近）連続立体交差事業」に取り組んでいる．本事業は，駅前後のランニングトンネルを複線シールドトンネル，鶴ヶ峰駅部を開削トンネル，2か所の営業線直下の工事桁による取付部をU形擁壁と開削トンネルによって，道路と立体交差する計画である．本事業の工事区域は横浜周辺地域特有の，起伏に富んだ地形となっている．また複線シールドトンネルは用地の条件により大部分が営業線の直下でかつ，既設埋設物の条件により小土かぶりでの施工を計画している．本稿では，事業概要，路線・構造および施工計画について述べる．

Sagami Railway Main Line (Near Tsurugamine Station) Continuous Elevated Crossing Project for Removal of a Total of 10 Level Crossings

By Yuta Yamanishi, Sagami Railway Co., Ltd.

Currently, the Sagami Railway Corporation has been advancing the undergrounding of the railway as part of an urban planning project in Yokohama City. The section extends between Nishiya Station and Futamatagawa Station, with the removal of a total of 10 level crossings. It is doing so as the “Sagami Railway Main Line（near Tsurugamine Station）Continuous Elevated Crossing Project”. This project consisted of a cut-and-cover tunnel for the Tsurugamine Station section and two attachment points by work girders just below the operational railway with U-shaped retaining walls and a cut-and-cover tunnel. The plan is for the running tunnels before and after the station to intersect roads using double-track shield tunnels. The construction area features the undulating topography specific to the Yokohama region. Most of the double-track shield tunnels will be located directly beneath the operational railway line due to land conditions. Additionally, construction is conducted with shallow depth due to the presence of underground installation. In this article, we will provide an overview of the project, the route and structures, and the construction plan.

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矢板工法トンネルの覆工補強における対策手法の検討

中日本高速道路（株）　前川　和彦

矢板工法で建設されたトンネルはほぼ40年以上が経過し，老朽化の進行とともに点検や補修などにより覆工補強がしばしば行われるようになってきた．その補強対策には標準的な設計手法はなく，現場ごとで個々に検討されている．本研究では，数値解析を主として巻厚不足に着目した最小巻厚，平均巻厚，縦断方向巻厚の３つの指標を設けて検討を行った．その結果，巻厚不足の程度に応じた標準的な覆工対策手法の選定方法の提案をした．

Investigation of Measures for Reinforcement of Tunnel Lining Built Using the Timbering Support Method

By Kazuhiko Maegawa, Central Nippon Expressway Company Limited

Tunnels constructed using the timbering support method are now more than 40 years old, and as they age, lining reinforcement is often performed after inspection and repair. There is no standard design method for reinforcement measures, and each case is considered on an individual basis. The numerical analysis conducted in this study focused on insufficient lining thickness. It established and examined three indicators: minimum lining thickness, average lining thickness, and longitudinal lining thickness. As a result, we proposed a method for selecting standard lining measures depending on the degree of insufficient lining thickness.

報告
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山岳トンネルの支保メカニズムにかかわる新技術（2）
―掘削時の変状リスク評価編―

日本トンネル技術協会

JTA山岳工法小委員会支保ワーキングでは，山岳トンネルの支保にかかわる課題などについて，調査研究を実施している．現在は「山岳トンネルの支保メカニズムにかかわる新技術」に関する事例研究を行っており，その成果を2回に分けて報告する．第2回目では，AIを伴わず種々の技術を組み合わせて切羽評価（切羽前方探査）を行った事例について報告する．

New Techniques Related to the Support Mechanism for Mountain Tunnels（2）
―Deformation Risk Assessment during Excavation―

By Japan Tunnelling Association

The JTA Subcommittee on Mountain Construction Methods Working Group is researching issues related to the support of mountain tunnels. Currently, the subcommittee is conducting a case study on “New Technologies Related to the Support Mechanisms for Mountain Tunnels”, the results of which will be reported in two parts. In the second part of the report, we report on a case study of face assessment（probing ahead of face）using a combination of various techniques without AI.