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脆弱な地山における506m^{2}の大断面トンネルの施工

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中央新幹線津久井トンネルほか新設(西工区)工事では，本線と上下線それぞれの回送線が本線トンネル内(土かぶり約170～190m)で分岐する計画となっており，2か所ある分岐大断面をNATMで施工する．斜坑と本線トンネルの一部を掘削した時点で，破砕された頁岩を主体とする脆弱な地質が継続し，大きな変形も発生したため，分岐大断面を掘削するにあたっては，頂設導坑先進工法や多段ベンチカット工法などの掘削工法を併用する計画とした．また，施工にあたっては地山や変形状況に合わせ掘削支保パターンを変更(一部は二重支保工)することで，2026年3月末に下り線の分岐大断面の掘削(最大506m^2)が完了した．本稿においては，分岐大断面の掘削計画検討から頂設導坑掘削までの施工結果を報告する．

Construction of a 506 m^2 Large-Cross-Section Tunnel in Weak Ground
―The Chuo Shinkansen, Tsukui Tunnel (West Lot) ―

By Yuichi Miyazaki, Central Japan Railway Company

The Tsukui Tunnel (West Lot) of the Chuo Shinkansen is planned to include two large branch tubes where the upbound and downbound service tracks diverge from the mainline tube beneath an overburden of approximately 170-190 m. These large branch sections are being excavated using the NATM. During excavation of the inclined shaft and part of the mainline tube, weak ground consisting mainly of highly fractured shale was encountered, accompanied by significant deformation. Consequently, the excavation plan for the large branch sections was revised to employ excavation methods such as the top drift method and the multiple bench cut method. During tunneling, the support patterns were adjusted in accordance with the observed ground conditions and deformation behavior, and double steel support systems were adopted in some sections. As a result, excavation of the downbound branch section, with a maximum cross-sectional area of 506 m^2, was completed by the end of March 2026. This paper presents the construction results from the planning stage through the completion of the top drift excavation.

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高速道路の地下立体交差化を国内最大規模のフルプレキャストカルバートで施工
―成田空港滑走路延伸工事―

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本稿は，成田空港B滑走路延伸に伴い，供用中の東関東自動車道をボックスカルバートにより地下道化し，滑走路と立体交差化する工事について述べるものである．工事では約1.2kmの迂回路供用後，延長約430mのカルバートを約370mの場所打ち区間と60mのプレキャスト区間の組み合わせで構築した．施工にあたっては，温度ひび割れ対策，過密配筋部の3D照査と実物大試験施工，複数業者による施工分担，移動式設備の活用，内空断面約194m^{2}で国内最大規模のフルプレキャストカルバートの製造・組立計画，空頭制限下の揚重管理，迂回路近接部の自動計測などを実施した．本稿では，これら一連の品質・工程・安全確保の取組みと，その施工上の工夫を報告する．

Construction of an Underground Grade Separation on an Expressway Using Japan’s Largest Precast Culvert
―Narita Airport Runway Extension Project―

By Tsukasa Kubo, Narita International Airport Corporation

This paper describes the construction project undertaken to convert the in-service Higashi-Kanto Expressway into an underpass using a box culvert, thereby creating a grade-separated crossing beneath Runway B of Narita International Airport as part of the runway extension project. Following the commissioning of an approximately 1.2 km temporary detour, an approximately 430 m long box culvert was constructed, consisting of a 370 m cast-in-place section and a 60 m precast section. During construction, numerous measures were implemented, including measures to prevent thermal cracking, 3D verification and full-scale trial work for heavily reinforced areas, division of the construction work among multiple contractors, utilization of mobile equipment, a manufacturing and assembly plan for Japan’s largest precast culvert, with an internal cross-sectional area of approximately 194 m^2, lifting management under overhead clearance restrictions, and automated monitoring in areas adjacent to the temporary detour. This paper presents these quality, schedule, and safety management measures together with the construction techniques employed during the project.

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全断面早期閉合の二次元数値解析における応力解放率の検証

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トンネルの安定を二次元数値解析で検討する場合には，本来は三次元現象である問題を疑似的に表現するために応力解放率という概念が用いられている．NEXCOでは，現場計測結果をもとに数値解析マニュアルを整備しており，応力解放率は，それらにもとづき設定している．しかし，近年採用事例が増えてきている補助ベンチ付き全断面工法で早期閉合する場合については，とくに定まったものがないのが現状である．本稿では，全断面早期閉合に対して，二次元数値解析の応力解放率を変化させて，三次元数値解析による地山変位特性曲線との相関により，適切な応力解放率の設定法を提案し，検証を行ったものである．

Verification of Stress Release Rates in 2D Numerical Analysis against Full-Face Method Using Early Closure

By Kazuhiko Maegawa, Central Nippon Expressway Company Limited

In evaluating tunnel stability with two-dimensional numerical analysis, the concept of stress release rate is used to simulate three-dimensional deformation behavior. NEXCO has developed a numerical analysis manual based on field measurement data, and the stress release rates are determined in accordance with this manual. However, no specific guidance exists for the early closure of all sections, which has been increasingly adopted in recent years. Therefore, the authors derived the optimum stress release rate for the early closure of all sections by trial calculations in which the stress release rate in 2D numerical analyses was varied, and the resulting ground displacement characteristic curves were compared with those from 3D numerical analyses.