トンネルと地下　VOL.48　No.11　掲載概要

掲載頁 7

中・短尺ボーリングを併用し得られた地質情報で断層破砕帯を施工
―北陸新幹線　新北陸トンネル（大桐工区）―

鉄道・運輸機構　吉森　佑介

北陸新幹線（金沢・敦賀間）の新北陸トンネルは，福井県南越前町～敦賀市に位置する延長約20kmの山岳トンネルである．このうち大桐工区は，南越前町内の工事延長3,605mを担当する．

地山は，砂岩を主体とした硬岩地山と亀裂が発達した砂岩・粘板岩互層が入替り出現するとともに断層が断続的に現れ地質性状の変化が著しく，本坑終点方にかけて柳ヶ瀬断層群を通過することが予想されている．そのため事前に地山状況を把握することで適切に掘削工法を選定しながら工事を進める必要がある．

本稿では，中尺コアボーリングとドリルジャンボによる30mのさぐり削孔を用いた断層破砕帯での施工について報告する．

Tunnelling through a Fault Fracture Zone Based on Geological Information Obtained through Short and Medium Length Boring Survey ―The Hokuriku Shinkansen, the Shin-Hokuriku Tunnel（Ogiri Lot）―

By Yusuke Yoshimori, Japan Railway, Construction, Transport and Technology Agency

The Shin-Hokuriku Tunnel Project on the Hokuriku Shinkansen（between Kanazawa and Tsuruga）is to build a 20km-long mountain tunnel located between Minami-Echizen Town and Tsuruga City in Fukui Prefecture. The Ogiri Lot is a section on this project of 3,605m-long tunnel in Minami-Echizen Town.

Geology of the site consists of hard rock ground mainly composed of sandstone, alternating strata of weathered sandstone and slate and faults which appear alternately. Changes in geological condition are marked; it was anticipated that the tunnel near end portal would pass through Yanagase fault group. For this reason, it is necessary to select appropriate excavation methods by gaining an understanding of the geological condition in advance to progress with works.

This report contains information on construction in fault fracture zones using medium-length core boring survey and exploring drills in with length of 30m bored by and drill jumbo.

写真はコアボーリングの施工位置

掲載頁 15

崩落対策および湧水対策を駆使し強風化花崗岩地山を施工
―鳥取西道路　気高青谷トンネル―

アイサワ工業（株）　庄司　万寿

気高青谷トンネル第1工事では，全長2,132mのうち起点側工区の延長1,021mを施工するものであり，うち540mの区間（TD.230～770m）で注入式長尺鋼管先受け工を主体とした補助工法を採用して掘削を行った．とくに起点側（TD.230～600m）は結晶の粗い花崗岩が深層風化した砂粒状の真砂土地山で切羽が自立しにくい状況で小崩落が頻発した．また終点側は熱水変質作用を受けた風化花崗岩と凝灰角礫岩の層境を掘削することになり，TD.600m付近では突発湧水や路盤の泥濘化に苦慮した．

本稿では，主に施工中に見られた崩落の処置，突発湧水対策などについてその概要を報告する．

Tunnel in Strongly Weathered Granite Making Use of Measures against Collapse and Welling ―The Tottori-Nishi Road, Ketaka Aoya Tunnel―

By Manjyu Shouji, Aisawa Construction Co., Ltd.

The Ketaka Aoya Tunnel Project is a construction of a 2,132m-long tunnel. The Ketaka Aoya Tunnel Lot 1 is one of this project to bore 1,021 meters from starting portal. 540m-section from TD.230m to TD.770m was excavated adopting auxiliary methods mainly involving the grouting type forepiling. In particular, geology from TD.230m to TD.600m consisted of sandy deeply decomposed granite which caused unstable cutting face and frequent instances of small ground collapses. In addition, in the section beyond TD.600m we excavated boundary between weathered granite that had undergone hydrothermal alteration and tuff-breccia and around TD.600m, we struggled with outbreaks of welling water and base course becoming muddy.

This report mainly contains measures against collapse and welling water outbreak observed during construction and their outline.

写真は仮暗渠排水管設置

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ノンコア削孔検層を活用した補助工法要否の判定と小土かぶり部の掘削
―九州横断自動車道　田代第二トンネル―

国土交通省　峰　　潔毅

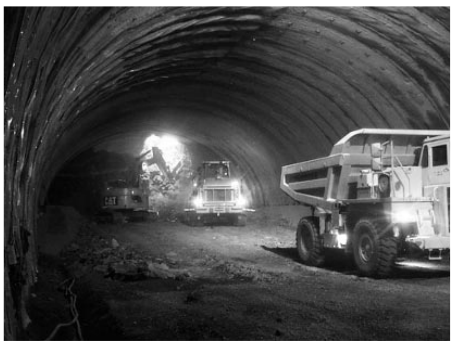
田代第二トンネルは，九州横断自動車道延岡線の嘉島JCT～矢部IC間に位置する延長531mの２車線道路トンネルである．本トンネルでは，脆弱な御船層群の掘削において補助工法の要否を判定するためにノンコア削孔検層を活用した判定基準を構築し，その適用性を確認した．また最小土かぶりが約３ｍとなる小土かぶり区間では，事前にコアボーリングおよび３次元解析による検討を行い，掘削時には計測結果にもとづいて解析を修正し，地表面の安定を図った．一部，大きな地表面沈下が懸念された箇所では支保の補強および仮インバート閉合によって坑内変位を抑制しトンネルおよび地表地山の安定を確保した．

本稿では本トンネルで採用した補助工法の要否の判定基準の適用性と小土かぶり区間の掘削実績について報告する

Decision on the Usage of Auxiliary Methods Utilizing Non-Core Drilling Logging and Excavation under Small Cover ―The Kyushu Odan Expressway, Tashiro 2nd Tunnel―

By Kiyotake Mine, Ministry of Land, Infrastructure, Transport and Tourism

The Tashiro 2nd Tunnel is a two-lane road tunnel of 531m in length located between Kashima Junction and Yabe Interchange on the Nobeoka Line of the Kyushu Odan Expressway. In order to determine whether auxiliary methods are required in excavation of weak Mifune Group, we constructed criteria using non-core drilling logging and checked their adaptability. In addition, in ground with small overburden (minimum cover of approx. 3m), we investigated in advance using core boring and three-dimensional analysis, reviewed analysis based on measurement results at the time of excavation and stabilized the ground surface. We ensured stability of tunnel and surface ground in places where there was concern about large ground surface settlement by controlling deformation of tunnel through reinforcing tunnel supports and temporary closing of tunnel invert.



写真は貫通の様子

This report contains information on the adaptability of standards to determine auxiliary methods used in this construction and excavation results for tunneling under small overburden.

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長距離水中流動充填材の開発によるトンネル内部の汚染水除去と閉塞
―福島第一原子力発電所海水配管トンネル内部閉塞工事―

東京電力ホールディングス(株)　西郡　一雅

福島第一原子力発電所では，東北地方太平洋沖地震に伴い発生した津波により被災し，その後，敷地海側に配置するトンネルおよび立坑に高濃度の汚染水が滞留したことから，この汚染水の除去および内部の閉塞を最優先課題の一つと位置付け，2014年11月より水中で長距離流動可能なセメント系充填材を用いてトンネルおよび立坑の内部閉塞，汚染水の除去を行った．トンネル部は土かぶり約15m，内空幅約４ｍの上半単心円断面である．

本稿では，本工事のために開発した長距離水中流動充填材の性能確認実験，実施工における充填材の品質管理および放射線防護などの，とくに配慮した事項について紹介する

Removal of Contaminated Water from inside Tunnels and Tunnel Filling with the Development of Long-Distance Underwater Flowable Filler ―The Seawater Pipe Filling Project in the Fukushima Daiichi Nuclear Power Plant―

By Kazumasa Nishikouri, Tokyo Electric Power Company Holdings, Inc.

Since the tsunami that occurred in conjunction with the Tohoku Earthquake, as highly-concentrated polluted water has accumulated in tunnels and vertical shafts located on the sea side of the Fukushima Daiichi Nuclear Power Plant, the removal of this pollution and fill in tunnel were positioned as a priority issue and since November 2014, we have been removing polluted water from tunnels and filling in tunnel and vertical shafts using cement filler that can flow over long distances underwater. The tunnel has cross-section of top heading formed a simple circle of 4m in width and overburden of 15 m.

写真は充填材の打込み状況

This report contains information on experiments to confirm the performance of long-distance underwater flowable filler developed for these tasks and items that required particular situation such as quality management of filler during construction and protection against radiation.

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東京都心部を縦断する大深度・長距離シールドの設計
―東京下水道　千代田幹線―

東京都　毛利　光夫

東京下水道は，神田下水の整備から約130年が経過しており再構築を進めている．都心部を流れる飯田橋幹線，中段幹線，高段幹線などは，老朽化が著しく再構築が必要であるが，平常水位が高く再構築工事を行うことが困難なため，代替幹線である千代田幹線を整備し，既設幹線の水位を低下させ，再構築工事を行う計画である

千代田幹線整備事業は，JR飯田橋駅近傍から，東京都下水道局芝浦水再生センターまでの延長約8.7kmの幹線を，シールド外径5.5m（内径4.9m），土かぶり約50mで布設するものであり，東京下水道における幹線整備事業の中でも最大級の巨大プロジェクトである

本稿では，その設計（当初計画）において検討した課題などについて報告する

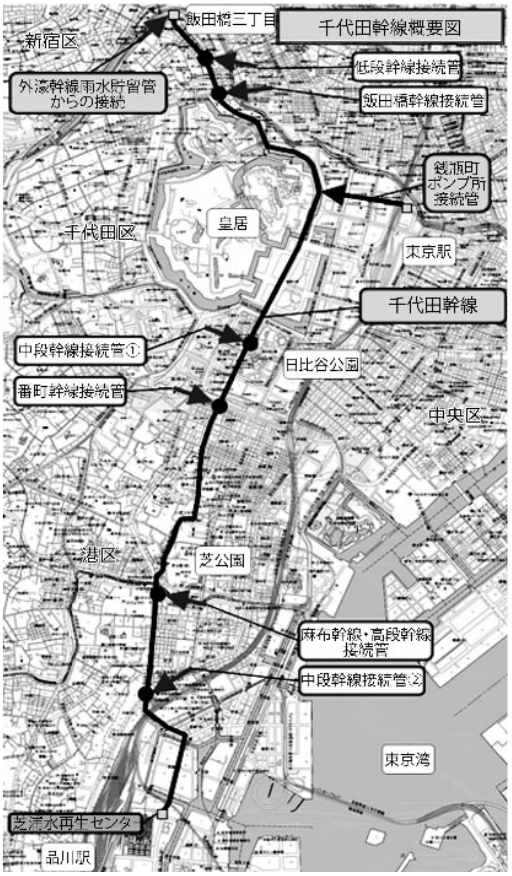
Design of Shield TBM Which Traverses the Central Tokyo in Great-Depth for Long-Distance ―The Bureau of Sewerage, Tokyo Metropolitan Government, Chiyoda Sewer Main―

By Mitsuo Mouri, Tokyo Metropolitan Government

As sewerage system in Tokyo has been in place for approximately 130 years since sewer was first built in Kanda, The Tokyo Metropolitan Government Bureau of Sewerage is rebuilding sewerage infrastructure. Reconstruction due to deterioration is particularly necessary for the Iidabashi, Chudan and Koudan sewers main that flow through Tokyo but as their average water level are high and it is difficult to reconstruct, we made a project is to build the Chiyoda sewer main which is alternatively used as those existing sewer pipes in order to reduce the water level of them to allow to conduct reconstruction.

The Chiyoda sewer main Project consists of the laying of an 8.7km pipe from near JR Iidabashi Station to Tokyo Metropolitan Government Bureau of Sewerage Shibaura Water Regeneration Plant using a shield TBM with an outer diameter of 5.5m（inner diameter: 4.9m）which drills under approximately 50m. It is one of the largest project in the Bureau of Sewerage.

This report contains information on issues investigated during design（original design）.



図は計画平面図