

広域道路ネットワーク構築を目的として、福岡県北九州市が都市計画道路汐井町牧山海岸線の整備を進めており、JR鹿児島貨物線との交差部の設計施工をJR九州が受託した。本工事は、既設の下水道シールドと近接しており、一般的な箱型のボックスカルバートを構築することが困難であった。施工方法として非開削で小断面のエレメントを組み合わせるJES工法を採用したが、構造物の断面形状を変更するとともに、線路脇に施工する立坑の計画を見直すことで解決を図った。本稿では、特殊な断面形状の線路下横断構造物に対応するための検討、既設の下水道シールドに対する近接影響予測などの施工計画と施工実績について報告する。

Trenchless Tunneling of a Grade-separated Intersection Structure with a Special Cross Section under Railroad Tracks Close to the Top of a Sewer Tunnel —The Overroad Bridge on the Shioimachi Makiyamakaigan Route between Hamakokura and Kurosaki—

By Nobuhiko Yamada, Tekken Corporation

Kitakyushu City in Fukuoka Prefecture is constructing the Shioimachi Makiyamakaigan Route, an urban planning road, to build a wide-area road network. JR Kyushu contracted to design and construct a grade-separated intersection with the JR Kagoshima Freight Line. The site was located close to an existing sewer tunnel, making it difficult to construct a standard square box culvert. The JES method, which combines small cross-section elements with a trenchless technique was adopted as the construction method. In addition to changing the cross-sectional shape of the structure, the plan for the shaft to be constructed next to the railway tracks was reviewed to solve the problem. In this paper, the authors report on the construction plan and results, including a study about building the intersection with a special cross-sectional shape under the railroad tracks, and a prediction of the proximity impact on the existing sewer tunnel.

本事業は、大分県中津市と日田市を結ぶ地域高規格道路(中津日田道路)を建設し、大分自動車道や東九州自動車道と連結することで、福岡市や北九州市、大分市などを結ぶ循環型ネットワークの形成を目指すものである。本工事は、大分県中津市本耶馬溪町に位置し、中津日田道路における青の洞門・羅漢寺IC～本耶馬溪IC間のトンネル区間 $L=2,355\text{m}$ を東西2工区に分割して施工するうちの、東工区(大分212号跡田トンネル東工区)である。本稿は、跡田トンネル(東工区)で実施した、山岳トンネル工事の安全性と生産性向上を目指した「トンネル掘削における切羽から1m離れて施工可能な作業手順の確立」「トンネル掘削工程の短縮」などの工夫とその効果について報告するものである。

Various Initiatives Aimed to Improve Safety and Productivity of Working at a Face —The National Route 212, the Sanko-Honyabakei Road, the Atoda Tunnel East Lot— By Kentaro Turuta, Ministry of Land, Infrastructure, Transport and Tourism

The goal of this project is to construct the Nakatsu-Hita Road, a regional high-standard road, connecting Nakatsu City and Hita City in Oita Prefecture, and form a circular network connecting Fukuoka City, Kitakyushu City, Oita City, and other cities by connecting it to the Oita Expressway and Higashi-Kyushu Expressway. The construction site is located in Honyabakei-machi, Nakatsu City, Oita Prefecture. It is the east lot (Oita No.212 Atoda tunnel east lot) of the 2,355 m long tunnel between the Ao no Domon and Rakanji Interchange and the Honyabakei Interchange on the Nakatsu-Hita Road, which is divided into two lots, east and west. In this paper, the authors report on the initiatives implemented in tunneling works of the Atoda Tunnel (east lot) to improve the safety and productivity of mountain tunneling, including “the establishment of work procedures that allow tunnel excavation to be performed at a distance of 1 m from the face” and “the shortening of the tunnel excavation process”.

本工事は50年以上前に策定された鉄道延伸計画であったので、その当時とは周辺の土地利用などが大きく変更されて都市開発が促進されてきた。とくに、中間立坑から到達までは、鉄道計画路線上に高層商業施設を含む多くの建築物が建設されたことにより、シールド掘進における切羽圧力や裏込め注入圧などに対して、厳格な管理が課題となった。このため、トライアル施工や建築物のリアルタイムの計測により、切羽圧力、裏込め注入圧力による周辺地盤や近接する建築物の挙動を把握し、厳しい施工管理を実施した。また、事前に影響予測を行うとともに、計測器を配置してモニタリングを行い、シールド掘進管理にフィードバックした。その結果、建築物に影響を及ぼすことなく、シールド掘進を完了することができた。

**Parallel Muddy Soil Pressure Balanced Shield Tunneling for Single-track Railway Passing Directly under Several Buildings Including High-rise Commercial Facilities
—Kita-osaka Kyuko Line Extension Project—**

By Kentaro Hata, Kita-osaka Kyuko Railway Co., Ltd.

This railway extension project was planned more than 50 years ago. The surrounding land use and other factors have changed significantly since that time, and urban development has been promoted. In particular, the construction of many buildings, including high-rise commercial facilities, along the planned railway line from the intermediate shaft to the arrival section made it necessary to strictly control the pressure at a face and grout injection pressure during shield tunneling. Therefore, strict construction management was implemented by understanding how pressure at a face and grout injection pressure affect the behavior of the surrounding ground and adjacent buildings through trial construction and real-time monitoring of the buildings. In addition to the influence prospect, instruments were placed for monitoring, and feedback was provided to the shield tunneling management. As a result, shield tunneling could be completed without affecting the buildings.

近年、臨海部や感潮河川近傍に位置するシールドトンネルでは、RCセグメントに塩害劣化が見られる場合がある。今後、塩害環境下のシールドトンネルを適切に維持管理するためには、塩害による劣化状況や劣化に伴う力学的挙動を把握し、適切に対応していく必要がある。そこで、本検討では腐食促進実験により継手付近における塩化物イオンの浸透状況や鋼材腐食の特徴を把握するとともに、覆工模型の載荷実験により、覆工全体系の力学的挙動に及ぼす影響を評価したので報告する。

Experimental Study on Mechanical Behavior of Shield Tunnels with Steel Corroded by Salt Damage

By Kaho Kinoshita, Railway Technical Research Institute

In recent years, RC segments of shield tunnels located in waterfront areas or near tidal rivers have experienced salt damage. In order to properly maintain and manage shield tunnels in salt-affected environments in the future, it is necessary to understand the deterioration caused by salt damage and the effect of the deterioration on mechanical behavior and to take appropriate measures. In this study, the authors conducted accelerated corrosion tests to understand the penetration of chloride ions near joints and the characteristics of steel corrosion and evaluated the effects of the corrosion on the mechanical behavior of the entire lining system through load testing of the lining model.