

# 1. **Rapid Construction System for Concrete Lining**

## **- Full-Scale Construction Experiment Using Tunnel Formwork Carriage**

### **Incorporating Formative Mechanism of Crack-Inducing Joints -**

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For rapid construction systems involving lining concrete, we developed a new system based on a long-span tunnel formwork carriage that extends a single construction span to 18 m or more. To suppress the development of cracks at unexpected locations, we developed a method for forming crack-inducing joints, implemented by placing metal joint plates in the middle of the span of the tunnel formwork before casting, then removing them after concrete hardening.

To confirm the suitability of this method, we performed a full-scale construction experiment in a tunnel with a cross-sectional area of 78 m<sup>2</sup>. As the results, we confirmed that even with joint plates positioned in mid-span, concrete could be reliably filled simultaneously on both sides of the joint plates without placing excessive pressure on the formwork. The joint plates could then be removed by human power or using a lever block. The crack-inducing joints ensured that the cracks occur at specified locations in the early stage after concrete placement, free of adverse effects on quality. We found no cracks after 180 days except at the crack-inducing joints.

**Key words:** concrete lining, long-span tunnel formwork carriage system, crack-inducing joint, full-scale construction experiment