

CHILTERN TUNNEL (C1) – HS2

South East • UK • 2026

112,000
precast tunnel
lining segments

THE PROJECT

The Chiltern Tunnel is a 16.04km twin-bore tunnel on HS2's Central 1 route, integrating large-scale on-site precast segment manufacture with complex in-situ works beneath the Chiltern Hills Area of Outstanding Natural Beauty.

The project combined large-scale precast manufacturing with complex in-situ construction, including 38 cross passages and five deep ventilation and service shafts. More than 112,000 precast tunnel lining segments, installed in around 16,000 rings, were produced on site using a fully automated manufacturing process operating continuously for almost three years.

From the earliest stages, Chryso worked in close collaboration with Tarmac, Align JV (Bouygues Travaux Publics, Sir Robert McAlpine and VolkerFitzpatrick) and HS2 Ltd, providing bespoke admixture solutions that enabled innovation, productivity and consistent concrete performance across every element of the works.

THE CHALLENGE

The Chiltern Tunnel placed exceptional demands on concrete performance:

- Early demoulding within 6–8 hours to support high-output precast production
- Full compliance with HS2 durability and fire resistance requirements

An innovative lidless mould system used in segment manufacture introduced further complexity. The concrete needed precise rheology control remaining workable during placement, then rapidly stiffening to hold its shape immediately after compaction.

Beyond precast production, the project required robust and reliable mixes for:

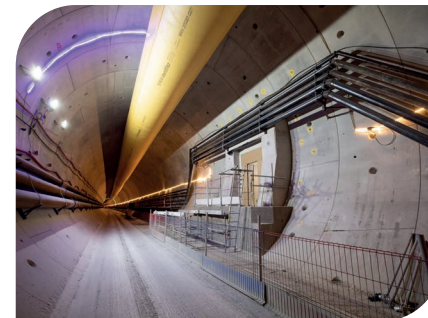
- Deep diaphragm walls up to 78m with large single pours
- Slipformed shafts, demanding predictable setting and strength development
- Secondary linings for cross passages, delivering long open times and high post-cracking capacity without traditional reinforcement

PRODUCT SOLUTIONS

- **Superplasticizer**
Chryso®Optima 100
Chryso®Optima 234
Chryso®Tera 488
- **Plasticizer**
Chryso®Omega 178R
- **Admixture**
Chryso®AB 42

KEY STAKEHOLDERS

- **Client**
HS2 Ltd
- **Contractor**
Align JV (Bouygues Travaux Publics, VolkerFitzpatrick, Sir Robert McAlpine)
- **Concrete producer**
Tarmac Ltd



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200
concrete segments
produced per day

THE SOLUTION

Through early contractor involvement, Chryso supported extensive laboratory testing, full-scale trials and performance validation ahead of on-site production.

For tunnel lining segments, Chryso developed a bespoke accelerating superplasticiser system based on Chryso Optima and Chryso Omega technologies. Tailored specifically for the lidless mould process, the solution delivered:

- Controlled workability during batching and placement
- Rapid early-age stiffening for immediate shape retention
- Excellent surface finish and repeatable early strength performance

The system was enhanced with Chryso Xel early strength technologies, enabling fast demoulding and handling without compromising long-term durability or structural performance.

Fully integrated into an automated production environment, Chryso admixtures supported output of up to 200 segments per day, using approximately 700m³ of concrete, while reducing waste through re-use and digital tracking of every segment within the project BIM model.

Across in-situ construction, Chryso delivered tailored admixture solutions for each application:

- Extended consistency retention and controlled heat evolution for deep diaphragm walls
- Stable rheology and predictable setting for slipform operations, even in high summer temperatures

Chryso admixture technologies played a key role in enabling new construction methods at scale, improving productivity, reducing material use and delivering the consistent, durable concrete performance demanded by HS2.

The Chiltern Tunnel demonstrates how Chryso helps transform ambitious engineering concepts into buildable, efficient and resilient infrastructure solutions.