

*Key GIRI principles have been applied at every stage of Heathrow's Cargo Tunnel Refurbishment project, contributing to reduced costs, less waste, and cutting 12 months off the projected build programme, says senior project manager Ajoy Dua.*

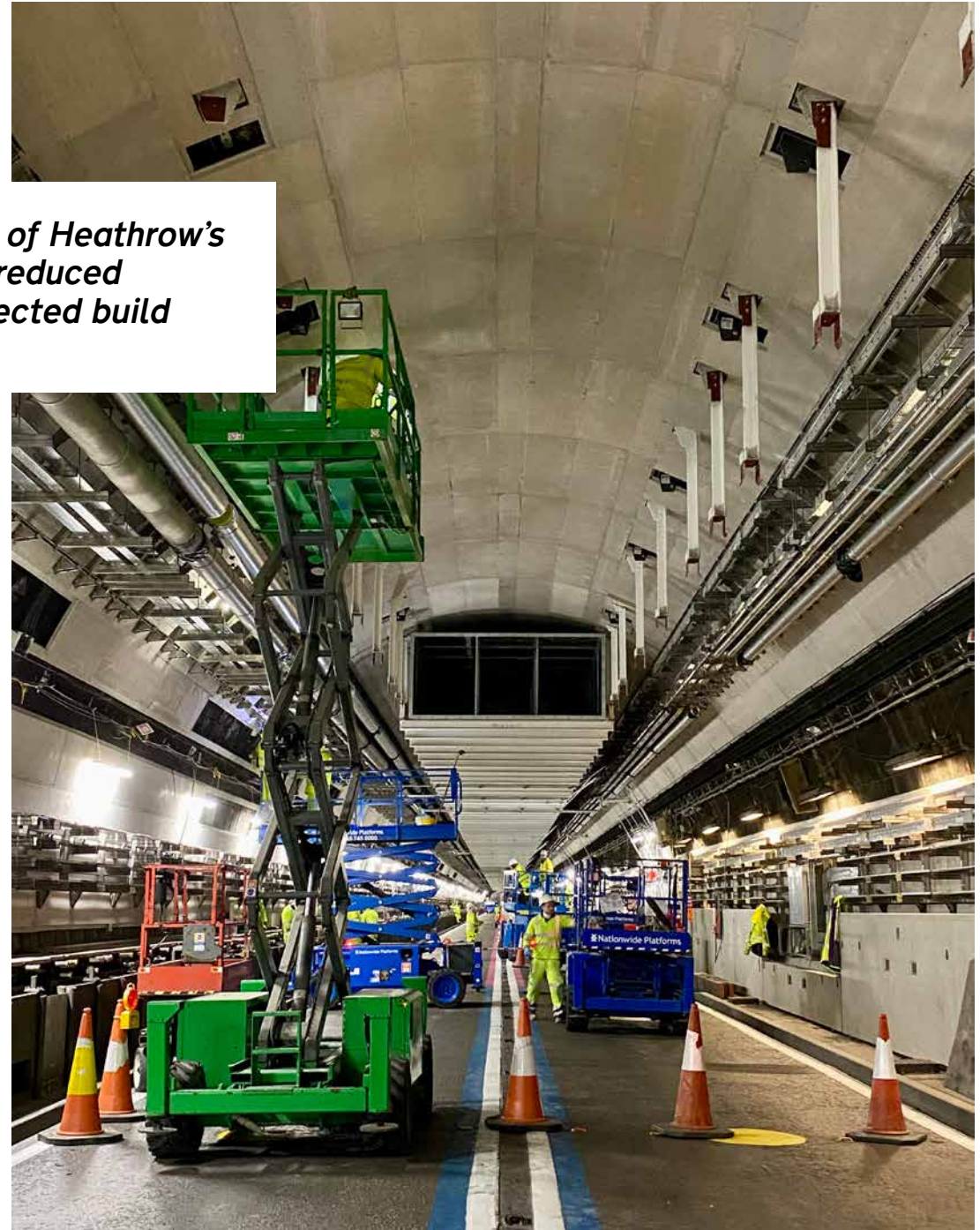
## THE CHALLENGE

The cargo tunnel is an 870m-long, critical subsurface road link between Heathrow's central terminal area and Terminal 4. It was built in the 1960s and had a partial refurbishment in the 1990s. The current scheme involves a major overhaul to replace multiple systems, from ventilation to lighting, and retrofitting a fixed fire suppression system. Work can only take place between 9pm and 5am and the tunnel must be returned to full service every morning.

The objective of the refurbishment is to bring the safety and business risks associated with the operation down to an acceptable level based on the principles of ALARP (as low as reasonably practicable) and in line with relevant legislation, standards, and current best practice.

"Our critical success factors are risk reduction, safe delivery, value for money, and minimal operational impact," explains Ajoy. "This is a very complex project technically. We have a limited working window, a live operational interface, a high degree of risk, and a large number of logistical constraints. But with those challenges come opportunities. How do we maximise the investment we have already made? How do we optimise the design? Where do we innovate? We recognised that we needed to do this project differently."

Photo: The 870m tunnel must be returned to full service every morning.



*“It was central to our strategy to invest more at the beginning. The design process takes longer and costs more than a traditional approach, but this is offset by a reduction in error and outturn cost.”*



## THE SOLUTION

Influenced by various pieces of research, including GIRI's Design Guide, Heathrow adopted a three-point strategy: digital transformation, building a collaborative culture, and adopting a design for manufacturing and assembly (DfMA) approach. GIRI principles, including a focus on collaboration, early-stage investment and planning, and team culture are core to the overall strategy, which aims to reduce risk, deliver the project safely, provide value for money, minimise operational impact, and optimise the programme.

The GIRI Design Guide highlights the need for a clearly defined intent with a focus on outcomes at the start. “This aligns with the Project 13 pillar around the ‘capable owner’ concept,” says Ajoy. “So we began with a consultant-led requirements capture process and brought Atkins in to run workshops and

define the requirements and outcomes from investment.”

The project methodically captured different stakeholder requirements, all of which were mapped to outcomes, benefits, and Heathrow's strategic intent. The process was influenced by GIRI's messages on the importance of the briefing process and defining client expectations. “It took five months to get this nailed down,” says Ajoy. “When we started there were 87 requirements, 58 of which were ‘musts’. After the consolidation exercise, we were down to 39 requirements, and 23 ‘musts’. The process helped us understand what the business wanted to invest in, and enabled testing, prioritisation, and management of the project scope.”

Another key GIRI concept is increased investment in design to reduce error. “This is really important. When you start the project, you have the most influence on project costs, but you are spending the least. It was central to our

Photo: The FFFS Pump Station installation.



strategy to invest more at the beginning. The design process takes longer and costs more than a traditional approach, but this is offset by a reduction in error and outturn cost.”

The project also took on board principles around planning and stakeholder management - “we made sure we had signatures all the way through” - and early contractor involvement. The team brought in technical specialists who had previous knowledge of the tunnel and selected individuals on a ‘best athlete’ approach, including Mace as designated contractor, Bryden Wood for its expertise in off-site construction, and Atkins and Mott MacDonald for tunnels expertise.

A DfMA approach was identified as a key opportunity to improve build efficiency and productivity and Ajoy showed examples of several of the new tunnel systems designed for modular offsite manufacture, saving time and improving quality.

“One of the issues at Heathrow is getting permission for staff to be on site, so if we can move some of that work elsewhere, we save a lot of time and cost. So, for example, we had pre-cast transformer rooms made off-site. These went up in three days. Same with switch rooms. Then our fire suppression pump room was installed in one day. All of which comes with the inherent quality improvement of working in a factory environment, as well as the cost and carbon savings.”

The Cargo Tunnel is also using digital tools including laser scanning to validate existing conditions and minimise design and installation errors, federated 3D BIM models, 4D digital rehearsals, and clash detection to identify issues that needed to be resolved before the project got to site.

Ajoy says that outcomes are backing up the importance of these tools, which have resolved some of the project’s design ‘close calls’. “We had multiple constraints on the design of a hydrant valve chamber, for example. We were able to design and demo it in a 3D environment and secure the necessary approvals prior to manufacture, saving time as well as the cost of on-site remediation works.”

### BENEFITS OF THE GIRI APPROACH

Cost savings  
Reduced waste  
Shorter build programme  
Reduced operational impact

Improved quality  
Risk reduction  
Reduced financial uncertainty



***“We initially had a completion date of 2026. Despite all the challenges, we plan to finish 12 months early. The pre-manufactured value has reached an impressive 88%, with productivity figures far exceeding industry norms.”***

Photo: Impact protection barrier

## THE OUTCOME

By 2021, the project had been awarded to Mace and their designer, WSP, and reached RIBA stage 3, with a full federated BIM model, supply chain coordination and clash detection carried out. “We started on site in January 2022, with a full RIBA stage 4 model, an established ‘design close calls’ process, and early enabling works identified so we could start trying to de-risk the project and get started with the production of our prototype modules.”

The results of the three-part strategy are already being felt. Ajoy says the project has seen real power in early and collaborative decision making and the use of digital technologies to engage with stakeholders and facilitate early decisions. “We have achieved cost savings through reduced waste, and we will see a shorter build programme and ultimately less operational impact,” said Ajoy. “Using controlled factory conditions will give us a better quality of product and we expect better health and safety outcomes because we are moving towards pre-planned and standardised tasks that will improve planning. The digital rehearsals will help everyone understand the process before we begin, and the front-loaded design has achieved risk reduction, better operational availability of the asset, and less financial uncertainty.

“In terms of the delivery outcome, we initially had a completion date of 2026. Despite all the challenges, we plan to finish 12 months early. The pre-manufactured value has reached an impressive 88%, with productivity figures far exceeding industry norms. We have prioritised innovation, leveraging new technology, tools and processes. Underlying our achievements has been a truly collaborative culture which began with the end in mind.”

# Heathrow