A massive transformation has taken place at London’s busiest Tube station, resulting in a doubling of capacity and a safer environment for passengers. Managing this complex project, with 50 different stakeholders, three work sites and immovable deadlines, has been the biggest challenge ever undertaken by Balfour Beatty Management. Margo Cole talks to the key players in the delivery of the King’s Cross St Pancras station.

When passengers started using the Northern Ticket Hall at King’s Cross St Pancras Underground station last November it marked the culmination of a 10-year project to double capacity at London Underground’s busiest station, and a triumph for collaborative working. The new ticket hall, taking up the area of a football pitch and the depth of a four-storey building, has been built to a tight deadline and a fixed budget alongside the listed structures of a mainline railway station.

Given those parameters, there was plenty of opportunity for things to go wrong, and certainly for the project to run over time. So it is no wonder that the client, London Underground (LU), the project manager ABBT, led by Balfour Beatty Management, and contractor Balfour Beatty were celebrating when the first passengers started using the Northern Ticket Hall.

“It’s been a great challenge, but from the project management side it’s been an absolutely excellent job by everyone,” says LU head of stations upgrade Mike Crabtree. “In turn, LU had a works agreement with the shadow manager, which was eventually restated at the time Metronet was formed, and then in turn ABBT joined.”

ABBT (a joint venture of Metronet companies Atkins, Balfour Beatty Management and Thames Water) took on the task of project managing delivery of Phase 1, soon after the main elements of construction started. The two elements of Phase 1 were built simultaneously and completed in 2005.

“Foremost in the minds of the team was that we had to do the best job possible in Phase 1 because we wanted to get Phase 2,” says John Hester, who was then Balfour Beatty’s tunnelling operations director.

The Northern Ticket Hall sits beneath the cobbled forecourt of St Pancras International, bordered north and south by listed structures, including the Victorian station façade.

The new underground building improves access to the Circle and Metropolitan lines and houses all the electrical power supply equipment for the station system. One of the trickiest elements was supplying a new link structure over the shallow eastbound Circle and Metropolitan lines. Limited space between the tunnel and the Euston Road meant the only way the new structure would fit in was by reducing the height of the running tunnel.

The crown of a length of 45m of the tunnel was slung off and replaced with a thin concrete roof. Building a new two storey concourse between the Metropolitan and Circle lines running tunnels involved top-down construction, including excavating a section of the Euston Road. Two lanes of traffic had to be maintained throughout the work, so the project team opted to install a temporary bridge to carry the eastbound carriageway while work continued underneath. The bridge was in place for 18 months.

In all there were eight different traffic management phases on the Euston Road to enable contractors to build the new concourse and a new pedestrian subway.
Meeting key milestone dates was the secret to completing the Northern Ticket Hall on time, but that could only be achieved if everyone pulled together.

The Northern Ticket Hall and its associated tunnels did not just present the delivery team with an engineering challenge, but also a programming challenge. Right from the start time was tight:

- London Underground (LU) had contracted with the Department for Transport (DfT) to complete Phase 2 by 2010, but a redesign just before construction began put even more pressure on the programme.
- Building on good relationships developed on Phase 1, LU and the ABBT project management JV adopted a collaborative approach that eventually included both the contractor and the DfT. It paid off, when meeting key milestone dates was the secret to completing the Northern Ticket Hall and more than 1,800,000 man-hours without reportable accident.

In reactivating the project the government set a maximum combined price for both the LU and Network Rail schemes, which meant revisiting the ticket hall design and trying to find efficiencies.

Before the completion date could be reached there were some critical interim stages. One was that the ticket hall would be operational by the end of November 2009, to coincide with the start of high speed domestic services between St Pancras and Kent. The other was to give Network Rail a clean ground slab for its new western concourse development by September 2008.

This slab is, in effect, the roof of the Northern Ticket Hall. Closing the slab with over a year at that point the works became part of the deliverables for the Olympics.

Construction contracts were let to a JV of Morgan Est and Balfour Beatty for the tunnelling, and to Balfour Beatty Major Projects for the ticket hall construction. This created the interesting situation where Balfour Beatty Management (the main player in the ABBT JV) was responsible for delivering a project where its sister company was the main contractor (see overleaf).

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It took charge of all material deliveries and waste handling. Installing the escalators was not only the major critical path item. “The communications and fire systems and the station management systems here are really complicated, and getting those commissioned and working at the end of the day became most critical,” says LU programme manager Graham Sims. Sign-off protocols and procedures at LU can be challenging, but at King’s Cross the paths were smoothed by the close working relationships. “Since the box has been finished the required rate of progress has been remarkable,” says Balfour Beatty Management operations director Elwyn Griffiths. “It certainly couldn’t have happened if we hadn’t had Graham’s [Sims] team integrated with us. And that integration wouldn’t have happened unless all sides were committed to that end goal.”

Hitting the September 2008 deadline for handing over the ground slab “gave everyone the confidence that the work was going to be achieved, but for us it was a matter of pride. It was a good test of everybody from the Department [for Transport] down to the suppliers.”

But, as Eastaugh says, it “wasn’t a foregone conclusion” that the team would hit that first milestone. The Northern Ticket Hall box went through a lot of redesign once Network Rail announced its improvement plans for King’s Cross, to integrate the two schemes as much as possible and make efficiency savings. The main escalator box was moved from the east side of the ticket hall to the west, resulting in a major change to passenger flows around the ticket hall, and a new location was found for the main ventilation shaft from the Tube station.

“All of these issues and redesigns and interfaces with Network Rail delayed the start of getting on with those works,” recalls LU King’s Cross sponsor Mike Crabtree.

Under traditional contractual arrangements that delay could have been enough to push back the completion date by quite a few months. But rather than square up over claims for extension of time, LU, ABBT and BBCEL took a collaborative approach, agreed that it was best for all parties if the end date was achieved, and negotiated a deal that incentivised that result.

“We agreed what the cost to make that date would be,” says Wilson. “Having made that commitment, and showed the client what he wanted to see, that cut out all the contractual nonsense.”

A collaborative approach between the main parties started during Phase 1, but became a fundamental part of the way Phase 2 was managed. LU, ABBT and the contractor were all co-located, along with the DfT’s representative, MPG, a joint venture of Mott MacDonald, Parsons Brinckerhoff and Gibb.

“In Phase 1 they were more there to police and oversight and challenge,” says Eastaugh. “But as we moved out of Phase 1 and into Phase 2 there was a conscious effort to work in a more collaborative way.

“If we had delivered it in any other way we wouldn’t have delivered on time,” says Balfour Beatty Management managing director David James. “With the collaboration there was a good mix of thinking that meant the solutions we found were very often generated by people you wouldn’t expect. We worked it out by contractors not being contractors and consultants, but being consultants.”

Atkins regional manager Ben Dunlop adds: “It’s been a challenging job but it would have been a lot more challenging if we hadn’t got that integrated approach.

**TUNNELS**

Both phases of the King’s Cross station improvement involved an element of tunnelling, but the largest chunk fell within Phase 2, when new pedestrian routes were built to link the three ticket halls and take passengers from new concourses to the tube lines.

“Tunnelling was a major concern,” says Balfour Beatty former tunneling operations director John Hester. “We were below a listed building with big trains and we were going to build tunnels only 7m below the track and 11m in diameter. Failure was not an option.”

The team’s approach was to “do risk” the tunnelling activities as much as possible, redesigning where necessary to find safe ways of doing the work that would prevent any chance of settlement. “You can’t put an estimate on the cost of having a train drop six feet into a tunnel,” says Hester. “We could not allow anything to go wrong underneath King’s Cross.”

It also sent an important signal to the project’s financial backer – the government – that the scheme would not be delayed.

“When we set those targets the first major test was that 1 September 2008 date,” says LU head of stations upgrade programme Andy Eastaugh. “Really nobody thought that was going to be achieved, but for us it was a matter of pride. It was a good test of everybody from the Department [for Transport] down to the suppliers.”

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**BALFOUR BEATTY – PROJECT MANAGER AND CONTRACTOR**

With Balfour Beatty Management staff making up a large proportion of the ABBT project management team, eyebrows were bound to be raised when Balfour Beatty Major Projects won the contract to build the Northern Ticket Hall.

“Phase 2 was competitively tendered,” explains Balfour Beatty Management commercial director Paul Pethica. “Balfour Beatty won the contract for the ticket hall and Morgan Est got the tunnels.”

Before awarding the contract ABBT had to get London Underground’s approval to use one of its group companies. “I think it was a good test for us,” says Balfour Beatty Management managing director David James. “If we suspected Balfour Beatty’s team would say we were over-zealous.”

“Iain” is Balfour Beatty Major Projects operations director Iain Wilson, who says: “I’ve been with Balfour Beatty for 28 years, so there were already established working relationships.”

Although the two Balfour Beatty group companies maintained a professional distance, the collaborative approach eventually led to people from the ABBT project management team working within the contractor’s organisation to help with delivery.

**KING’S CROSS ST PANCRAS: MANAGEMENT**
MAJOR PROJECT
KING’S CROSS UNDERGROUND TICKET HALLS

22|04|10

TUBE PROJECT COMPLETES
THE NORTHERN TICKET HALL
IS THE FINAL STAGE IN AN
£800M SCHEME TO DOUBLE
PASSENGER CAPACITY
Kings Cross: InfoGraphic

Connect Three

Three new ticket halls will allow 105,000 passengers a day through the station.

Major Project
Kings Cross Underground Ticket Halls

The £800m scheme to double capacity at the Kings Cross St Pancras Underground station consists of three separate elements: extending the existing ticket hall and building two completely new ticket halls. All three structures are entirely below ground, and the station has remained open throughout the project. With the opening of the Northern Ticket Hall to passengers last December, the three elements of the station became linked together for the first time.

When the project started 10 years ago, 55,000 passengers an hour used the station during peak hours. Numbers have since risen to 80,000, and the new station can cope with more than 100,000.

Western Ticket Hall, phase 1 works, completed in 2007. This interchange structure sits beneath St Pancras station forecourt and predominantly serves changes to and from St Pancras rail services, linking street, station and tube network.

Northern ticket hall, phase 2 works, completed in 2010. This interchange structure sits subsurface just south of King’s Cross Station.

Western Ticket Hall

Western Ticket Hall, phase 1 works, completed in 2007. This interchange structure sits beneath St Pancras station forecourt and predominantly serves changes to and from St Pancras rail services, linking street, station and tube network.

Northern Ticket Hall

Northern ticket hall, phase 2 works, completed in 2010. This interchange structure sits subsurface between King’s Cross and St. Pancras Stations 5m below ground.

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1. Excavation and top down construction
2. Lower levels constructed
3. Ground level roof

The entire structure has been built inside a contiguous bored piled box with piles reaching depths of 37m.