

# UNDERGROUND ITEMS FROM THE TELEVISION AN OCCASIONAL SERIES

by Paul Creswell

“The Fifteen Billion Pound Railway” – BBC2

Broadcast 21.00 to 22.00 on Wednesdays 13 and 20 February 2019.

## **A NOTE BY YOUR REVIEWER:**

*For both programmes, where the names of persons involved were not given in a visual caption, your reviewer has thus had to resort to a 'best guess' at the spelling of them. Apologies are offered to any individual whose name has thus been spelt incorrectly.*

## **FIRST PROGRAMME – WEDNESDAY 13 FEBRUARY 2019**

This project was the most ambitious engineering one in Britain since the time of Brunel. It had taken (so far) some nine years and involved 10,000 workers. In these two programmes, we follow construction workers battling to complete the final stages of the work involved – fitting out the stations, powering up systems and testing the new trains underground. The mounting delays now mean that the scheduled opening, in December 2018, may be postponed.

We joined Daniel O’Connell, Dynamic Testing Manager, for the run of the first test train from Abbey Wood to Paddington. For this to take place, all other workers had to be removed from the railway, as did all engineering trains. There were 619 test runs scheduled, before the line could open. The initial test would be conducted at five miles per hour, with later tests at ten and 23 miles per hour. For this first test (and probably later ones) communications systems had not been completed, so contact with the test trains was somewhat intermittent. The test involved running ‘bang road’<sup>1</sup> through the tunnel section from Whitechapel to Paddington, and was declared a success!

Work still required on the tunnel section of the Elizabeth Line included signalling, lighting, platform cladding, escalators and signage, meaning that there was a large amount of work still to be undertaken. When completed, the line would run from Reading and Heathrow Airport in the west, then under central London to Abbey Wood and Shenfield (Essex) in the east, a total distance of some 120 kilometres. It would provide relief to the existing underground system (especially the Central Line).

The Chief Executive Officer (at the time the programme was made – about March 2018) of the Elizabeth Line (still known as Crossrail at that time) was Simon Wright O.B.E., who had much experience of major projects, including the Olympic Park in 2012. He explained some of the reasons that the line was now some four months behind schedule. These included poor ground conditions and the need to prevent movement of adjacent buildings when tunnelling. Time lost just cannot be recovered. This was the most complicated project in which he had been involved.

Emphasis moved to Tottenham Court Road station in London’s West End – the gateway to shopping, theatre and restaurant venues. The site was extremely difficult when it came to manoeuvring lorries and equipment in to its restricted space. Viewers were introduced to Programme Manager Lih-Ling Highe, who had the overall responsibility for the installation of lighting, cladding, fixtures and fittings at this station. One of her biggest problems was having so many workers all working in the station space and often needing to work at the same locations, and all to a tight schedule.

As access from the surface at each station became either more restricted or completely closed off (for example, some access shafts were filled in), the provision of construction supplies relied more and more on engineering trains. There were two storage depots, one at Westbourne Park in West London and one at Plumstead in South-East London. Up to 18 construction trains a day moved up to 1,300 tons of materials through the tunnels. Once in position, each train was, effectively, imprisoned by the trains in front and to the rear of it. It could only leave site when there was a clear path in at least one direction. If any train could not reach its allocated site, it had to return to depot

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<sup>1</sup> A slang railway term for running in the wrong direction!

with its load still aboard. The scheduling of these trains and their loads was an extremely complex task.

The focus moved back to Tottenham Court Road and to the platform edge doors, which stretch from the platform to the ceiling and are made of bulletproof glass. A total of some four kilometres of these doors are needed over the whole tunnel section of the line. The eastbound platform at Tottenham Court Road was a particularly tricky installation task as the platform curves throughout its length, so as to avoid service mains and other deep level tube lines. This meant that each door had to be placed at a 0.4° angle to the neighbouring one. Work on the shift that viewers visited was not helped by the fact that a previous engineering train was delayed in the platform, so there was a wait until the train carrying the platform doors could stable there. (This, assumedly, causing a 'knock-on' effect to other work at stations along the line). Workers on the platform used hand held remote control devices to control robot arms on the train, to align the platform doors exactly with their anchoring points already fitted to the platform edges. The great care needed was emphasised when we were informed that a small strike with just a spanner could shatter one of these doors, which could then take weeks to replace. A total of 137 platform doors were needed, just at Tottenham Court Road eastbound. It was expected that this station would handle some 30-million people a year when trains started running.

Moving outside the station, viewers were advised that the local area had undergone a dramatic transformation at the expense of some local history. We were introduced to Melvin Benn, who had run one of the most famous local venues, the Astoria theatre, which had been demolished in 2009 to make way for the new station. It had always been associated with the Rolling Stones, amongst many others. The eventual development around the station would, however, include a new theatre. Overall, the Elizabeth Line would generate up to five million square feet of residential and commercial possibilities as a result of its construction.

The focus then moved to Canary Wharf, which will be one of the biggest stations on the line. Just two years ago this site was a disused dock, from which 100-million litres of water had to be pumped out and replaced by 375,000 tonnes of concrete. The station now sits on an island and will eventually serve some 100,000 commuters each day. We met site manager Felix O'Hatty, who is responsible for all mechanical and electrical work at this station. He advised viewers that the station needed to supply some 26 cubic metres of fresh air per hour for each passenger. This required three huge fans at each end of the station. These fans also became vital when the station had to be evacuated in the case of a fire, keeping staff and passengers supplied with fresh air during the evacuation.

Each fan weighed nearly ten tons and they were too large to be delivered by train, so had to be threaded through the local streets on lorry trailers. The slightest knock could damage the fan's intricate control equipment. When manoeuvring the lorry trailer, the team utilised a fork lift truck to exactly position it in place, where the lorry did not have enough room to reposition the trailer by shunting. For part of the time the lorry was reversing its trailer – certainly not easy in the restricted space available. The headroom as the fan entered the station frontage was a mere six centimetres. Once in the station, the next problem would be to lower the fan some ten metres to its resting place. Attention moved back to Daniel O'Connell, Dynamic Testing Manager. His team had only one 48-hour window every fortnight for their work, so as not to interfere too much with the installation work in the tunnels and station areas. Daniel emphasised that they were working to very detailed testing plans, because of the multiple systems involved. Every hour of testing time must be used to advantage.

20,000 men and women had applied to be drivers on the Elizabeth Line, with just 310 selected for training. Adam Spicer, Operations Trainer, led this training. In an intensive course, all had to master the trains themselves, plus the routes and the rules involved. This would lead a salary of up to £60,000 a year. Viewers then joined Rochelle, a trainee, who had attended ten weeks of theoretical training and now was to try her hand at driving, well, on a simulator at first! The simulator can replicate various routes, weather factors and emergencies that drivers might face. The trainer (in a different room to Rochelle) simulated a signal changing from green to red as she approached it and all concerned watched how she coped with this event. This happened on the approach to Romford.

She did well (she was told), but found it 'nerve wracking'! The trainer remarked that the pressure will really start when she has such an experience on a real train!

At Tottenham Court Road, work should be almost complete but was now several weeks behind (as at June 2018). Viewers joined staff completing the last two of the platform edge doors on the curved eastbound platform. Other workers, accessing the track, had to pass through a door adjacent to this work, which, at times, had to be kept closed so that platform edge door installation could continue. The installation of the final two doors depended very much on all the other platform doors having been positioned correctly, so that the space for the final two was correct. The work on the final door took twice as long as earlier ones, due to very restricted working space available. The doors were thus completed, some ten weeks after they were scheduled to have been positioned.

At Canary Wharf, the ventilation fan had now to be lowered several metres and then traversed about seven metres horizontally to its final position over the ventilation shaft. The traverse move was accomplished using four hover pads to support its nearly ten tons weight. These were (each) capable of supporting two double-deck buses and operated at a pressure of 1,000 pounds per square inch. Thus the flooring was protected from any damage. Once the ventilation shaft was reached, the hover pads could no longer be used and the fan was transferred to rails for the last few feet. At this point it jammed (on the rails) and 'brute force' (mainly manpower) was brought in to move it back on track!

## **SECOND PROGRAMME – WEDNESDAY 20 FEBRUARY 2019**

Delays in constructing stations, and installing signalling and power had delayed the final fit-out of stations and the testing of trains. Work was now months behind schedule and over £600m over budget. After nine years of work, just 14 weeks before passenger services were due to start, it was decided that the opening had to be delayed by almost a year. A new opening deadline was thus set for Autumn 2020. Elizabeth Line Chief Executive Officer Simon Wright told viewers that effort would be made to keep Britain's biggest engineering project from slipping further behind and get it 'back on track'. There were various reasons for the delays, and each day's hold up could cost up to three million pounds.

At Tottenham Court Road, the main power supply was now to be installed. Lih-Ling Highe, Project Manager at this station, stated the Elizabeth Line needed 160 megawatts to power the line and its stations. Tottenham Court Road alone would consume the power equal to the supply needed for about six to eight thousand homes.

The techniques used for installing the cables to the station had not changed since Victorian times. In total, more than 100 kilometres of cable were involved. The main power supply cable had to be threaded through the station superstructure for a distance of 93 metres and the cable weighed about two tons. This was carried out by hand and was very physically demanding work. We met Sean Thompson, Electrical Supervisor, an electrician with 22 years in the trade, with the last four years working on the Elizabeth Line. He stated that the power supply cable weighed 18 kilogrammes per metre. For the work of pulling it into place, a team, with experience in this work, had been sourced from Middlesbrough. One of them joked that Londoners were too soft for this type of work! When the team leader shouted 'pull', the whole team, positioned equally along the length of the cable, pulled in unison. The cable 'snagged' a couple of times, and, at one stoppage, a metal bar had to be moved out of the cable's path.

The scene now moved to Paddington. Once work is complete, this will mark the most significant transformation in over a century to this Victorian-era main line station. Six years ago this site had been little more than a 'hole in the ground', held open by many 1,000-ton steel supports. Viewers met Site Manager Cynthia Mynhardt, who emphasised that the construction works were next to a working main line station and surrounded by roads busy with traffic.

Local restaurateur Fernando Pereira Graca was worried about his loss of trade at this time, but hoped that things (i.e. footfall) would increase when the Elizabeth Line was up and running.

Work was now concentrated on 'topping out' the station with a great glass canopy some 120 metres long and 18 metres wide. This, in turn, required 340 tons of prefabricated stainless steel columns and beams and 220 one-ton panes of triple glazed glass – the glass would allow light to permeate right down to platform level. The 4,000-piece structure stood just four inches from Macmillan House,

a listed building. A single scratch or knock could result in heavy penalties to the team. Cynthia joked that an incident could result in a prison sentence.

We then met Rob Ramsell, Lift Supervisor (crane lift, that is) and Eddie Bennan, Banksman. There was need for continual co-operation between the crane driver and ground staff, so as to avoid any mishaps. If anything went wrong, sections of steel column could end up dropping on traffic, or demolishing the finished part of the canopy! With the first six vertical columns in place, the first section of the rafter could be lowered into position. As Cynthia said, just another 130 tons of steel and glass to go! However, her teams had to work day and night if the railway was to stand any chance of opening on time.

The programme now moved to Bond Street, which is Europe's most expensive shopping street and has some 200m visitors each year. The new station is expected to handle about 130,000 passengers each day. Work started in 2010 with the excavation of 300,000 tons of earth and the pouring of 100,000 tons of concrete. Most of the flooring, wall cladding and lighting have been installed, but the work is still up to six months behind schedule. One crucial piece of machinery still missing were the three escalators which will connect the Eastern ticket hall to the platforms, 28 metres below. These are some 65 metres in length. Viewers were introduced to 30-year-old Australian Tim Weißen, Section Engineer, who described some of the challenges involved and emphasised the part escalators played in keeping passengers on the move through the station. The first escalator on the underground had been installed in 1911 at Earl's Court, made of wood. It was then such a novelty that 18,000 people came on its first day of operation to try it out. It was a great success, even though there were some torn dresses and pinched fingers!

The escalators that Tim was responsible for were too large to be installed as one section. Each arrived in 13 pieces, to be joined together on site. Getting them to site (on lorries) was a problem in itself, in an area with many luxury apartments and boutique businesses. A nearby hair salon owner, Neil Cornelius, mentioned the prevention of parking outside his salon during deliveries and the dust and pollution – none of which assisted in retaining customers.

The first section, weighing some seven tons, arrived. Although on its own (small) wheels, it still needed a number of staff to manoeuvre it around and place it at the top of the 30° incline of the escalator shaft, down which it had to be lowered. Any delay in lowering it could mean that later deliveries of its companion parts might be turned back and delay the whole programme. Viewers saw it winched slowly down the shaft and the effort that had to be applied to recover it when the wheels jammed in the track provided for their descent. When the second section was lowered down, it did not meet exactly with the first section. Tim explained that the escalator had been designed and built over a year ago. Alterations had since been made to the floor level to suit drainage requirements and thus efforts had to be made by his team to correct the alignment of the two escalator pieces. Finally, all was well, with just 11 more sections to go!

At Tottenham Court Road, another cable jam required the use of a roller to ease the cable round a tight corner. There were now just a few more (smaller) cables to be run before the station could be switched on to the new supply.

Returning to Bond Street, Tim Weißen advised viewers that the first escalator (from the Eastern booking hall to platform level) was now complete. In order to make space to install the second escalator in the same shaft, the first escalator now needed to be 'slid across' to one side of the shaft. This was achieved by having a team at the top and another at the bottom, working in unison and with radio communication, to winch the first escalator to one side. If the top and bottom did not move exactly together, stress would be placed upon the escalator and this might bend, or even break, the framework. As we watched, the top moved more slowly than the bottom and movement was halted whilst matters were corrected. The three units weighed some 45 tons in total and the last two had taken six days to position.

The final work was the trickiest, with the motors and drive cogs to be fitted. The process was probably identical to that used many years ago, involving winches, hoists and manpower. There were only ten millimetres between the escalator frame and the concrete shaft wall. It now took a further 12 weeks to install all 771 steps for the three escalators.

The station was now getting closer to being finished, with the flooring, ticket halls and platforms still to go. It would be some time before the first commuters could be welcomed. The opening date, of Autumn 2019, now appeared to be slipping away.

Attention turned back to Daniel O'Connell, Dynamic Testing Manager, whose technicians are battling to complete the testing of signalling, communications, platform screen doors and power – with much complex work involved – at least the delay to the opening date had given them more time for this testing. However, they were still limited to a 48-hour window every fortnight, so the maximum possible testing was crammed into each window. They were also still limited to a single train in either the westbound or eastbound tunnel, running at five miles per hour. The fundamental testing involved signalling – about three quarters of the total work involved. The tests would gradually increase in complexity, building up to 24trains per hour at a frequency of 2½ minutes.

It was predicted that half a million passengers a day would be using the Elizabeth Line.

Some 310 drivers were being recruited to operate the service. We met, once again, Rochelle, who was now 30 weeks into her intensive training course and had passed a series of simulated and real train manoeuvres. Today, she would be carrying passengers for the first time, from Shenfield to Liverpool Street. (*Your reviewer noted that the map shown on screen included Whitechapel, which she clearly would not serve this day!*) The trip would have up to 1,300 passengers on board and would involve passing 73 signals and 16 speed restrictions. Rochelle thought her nerves might 'kick in'! Her trainer warned her about watching for passengers standing near the edge of the platforms and also about those running to board at the last second. She had to report a signalling malfunction to the signaller, but it had already been reported by the train in front of hers. Viewers saw her driving through the junction with the Elizabeth Line and taking the existing main line towards Liverpool Street. Her trainer said she did well. Only another 170 hours more training and she would become one of the first drivers on the line, when it finally opened.

Attention now focussed on Paddington, where we again met Site Manager Cynthia Mynhardt, who was now concentrating on the installation of 220 panes of bespoke glass into the framework of the station's entrance canopy. Each pane weighs about a ton and costs about £5,000. A suction powered vacuum lifter was being utilised to position each pane into position. This operation was very weather dependent – rain could cause the suction to fail and strong winds could blow the panes around like kites. This meant the team had to watch each pane 'like hawks'! Each pane had to be in exactly the correct position, as the overall effect was to be of clouds, making this one of London's largest ever pieces of art. If a pane was broken, it would take weeks to be re-manufactured. Bad weather than threatened to hold up the work, but this eventually ceased and the panes began to be put in place. At times, these panes were lowered at an angle, to reduce the possible effects of wind upon them. Cynthia was confident that the finished canopy would be popular with both visitors and travellers.

We now returned to Tottenham Court Road (in November 2018), where Lih-Linge Highe, Project Manager and Sean Thompson, Electrical Supervisor, were preparing to switch on the permanent power supply to the station, after vital safety tests had been performed. The station required the same power as a small town and there was a back-up supply available, so that there should never be a time without electricity. All went well at the switch on. Lih-Linge told viewers that it had been like a race – the finishing post was now in site, but there was still much to be done. She also said that, although the station was now about 95 per cent complete, the final five per cent of the work would be much more intensive than the first five per cent.

By the day on which the line should have opened (9 December 2018), work on the railway was far from complete. Still outstanding were the fit out of all ten stations and the testing of multiple trains when running simultaneously and at high speed. Even the plan to open the railway in Autumn 2019 was now considered 'over ambitious' with the need to ensure that the line was safe to operate before being opened to the public. This, of course, was yet another blow to commuters and other intending passengers, some of whom voiced their disapproval. The cost was now expected to rise from £15-billion to £17-billion.

*Your reviewer considered that these programmes, from Windfall Films and dated 2019, were interesting and probably quite accurate. His pessimistic side also wondered how much of what we had seen, both positive and negative in nature, was generated especially for the cameras?*