Case Study:
Station Capacity Planning at the London Bridge Station Redevelopment

The challenge

London Bridge station has been the cornerstone of the £7bn government sponsored Thameslink Programme. The station in its original state was a major bottleneck for the delivery of additional Thameslink services from a rail network capacity point of view as well as a very crowded station from the point of view of passenger handling capacity. Without the reconfiguration of the track and platform layout at London Bridge, up to 80% of the Thameslink Programme benefits could not be delivered. The old station had a single concourse near the bus deck and it served nine platforms. There were six through platforms which didn't really have a concourse and were subject to frequent crowding in the peaks. The station had no real street presence, with only the narrow Joiner Street access to the London Underground and the two sides of the station were connected via a footbridge that become very congested with passengers interchanging between through and terminating services.

Drivers for the change at London Bridge station

1. Train performance
   Inconsistent train performance on the through tracks and absent or minimal Thameslink service due to conflicting train paths.

2. Congestion
   Inadequate passenger handling capacity and frequent crowding experienced in the concourse, on platforms and on the overbridge.
The Success

The station site was constrained by the surrounding streets, land use and building (including the Shard) offering limited scope to widen the platforms or enlarge the concourse in its original setting. This required a complete rethink about the future configuration of the station and passenger flows to and from the platforms. The understanding of people movement and station operational principles underpinned the design development and option selection that were delivered by Network Rail by working collaboratively with the designers, Train Operating Companies, DfT, TfL and other stakeholders.

The new station has two concourses with the larger concourse located on street level opening up access to the north and south of the station and unlocking desire lines that were originally severed by the old station. Moreover, that street level concourse provides ample space of non-rail activity and is used as a thorough-fare through the station and offers a wide range of retail. Sizing of such non-rail use and at the same time keeping rail-users interests at the core of the design principles was important for determining the appropriate sizing of the station.
The original platforms were significantly curved and provided poor connections to street level through narrow tunnels and walkways. The reconfiguration of the station provided an opportunity to optimise passenger circulation and as a result improve passenger experience and train service performance. The new platforms are straighter, wider and clutter-free to improve passenger circulation and enhance visibility along the platform edges for train operations and safe dispatch.

**Design principles to optimise passenger circulation**

Such optimisation of passenger circulation was extremely important to enable a high frequency turnaround of trains running on headways of 2.0 to 2.5 minutes on new through platforms 1-9 and ease congestion on the terminating platforms that see full train loads of passengers disembarking in the peak rush hours onto platforms 10-15. This high throughput of passengers needed both escalators and stairs on each platform to accommodate the intensity of passenger movements seen at London Bridge station and to assist passengers to negotiate a level change of nearly 12 metres between platform level and the concourse below. Large lifts were centrally located to improve visibility and provided on all platforms to deliver step-free access for passengers with reduced mobility.

**The Lessons**

There is limited guidance in the industry around appropriate safety interventions where such long escalators are used in heavy footfall areas. The lateral guarding and run-off protection barriers were designed in to optimise flow of passengers by reducing crossing movements on approach to escalators and improving passenger safety. Such infrastructure installed for escalator and gatelines should be at other stations in case of high intensity flow areas.
Choosing the right size of lifts was important for a station like London Bridge to enable passengers with reduced mobility to use them with ease and even allow room for passengers with bicycles or heavy luggage. Lifts should be sighted in optimum locations so that they are accessible and clearly visible. Asset resilience and operational plan in case of degraded asset should be defined within the station operational plan to minimise impact on passengers.

Construction stages during such any major station rebuild are often challenging and in the case of London Bridge this has been no different. There were multiple staging changes in the construction sequence altering the space available for passengers to dwell and move around within the station and at the same time there were significant timetable changes that added to the complexity and put more onerous on planning station operations to the minutest level of detail. The lesson learnt here is that the future projects should do more around co-ordination of multiple disciples i.e. station staging and railway system staging together with more targeted communications with passengers to manage expectations before the changes happen and continued travel advise and communications with passengers during the interim changes as they happen.

Active crowd-management techniques were used to ensure passenger safety is not compromised during the challenging build phases and one example of this is the controlled access to platform 15. This enabled the construction programme to continue with limited disruption to passengers. The operational concept was developed, workshopped with stakeholder and station operations staff and refined. The operations were tested first live at the station before setting out fixed barriers and the passengers affected by the ‘holding area’ near platform 15 accepted the change.
Another example is the separation barriers that were designed in to mitigate the short run-off near the gateline leading to the old terminating platforms. The barriers served the purpose of providing a clear passage for interchanging passengers who wished to remain on the paid side and by-pass those congregating at the gates to exit the station. Such 'tweaks' helped reduce the impact on passengers at times when space was extremely constrained during construction.

Passenger safety risk assessments were produced for every construction stage change when there was a notable impact on passengers. This was a very effective add-on to the standard station capacity analysis and something that other projects should embed as a principle alongside with capacity assessments. At each stage change there was an entry into service review to check the need for switching to 'plan b' or changing the operational concept in terms of crowd management. Such continuous review and monitoring should be adopted in future projects.
The team has recently completed a review of platforms 4&5 in January 2019 post Thameslink timetable introduction to assess if the performance on the platforms in terms of passenger experience is as expected or can be improved in any respect. A number of recommendations have been made as a result of this study that will be trialled in February – March 2019 to improve passenger experience on these platforms.

Network Rail Station Capacity team publish a station sizing guidance – Network Rail Station Capacity Planning Guidance, November 2016. This document summaries passenger congestion thresholds stipulated by Network Rail and should be adopted by all new station schemes.

**STATION CAPACITY PLANNING GUIDANCE**

Network Rail
November 2016

![Image of London Bridge station]

It is recommended that schemes should consider dispersal of passengers and public movement in the immediate surrounding of the station. London Bridge station redevelopment programme assessed the impact on pedestrians in a wider area around the station and that drove the optimum positioning of new pedestrian crossings, pavement sizing, changes to pavement furniture and better evacuation strategies.

*Map shows capacity assessment of surrounding streetscape.*
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Further information
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