

Walthamstow Central Subway Case Study



Problem

The structure is a cut and cover reinforced concrete box that acts as a subway link between Walthamstow Central and the Waltham Forrest Bus Station. The surface area of the internal structure is approximately 1500m². The structure was commissioned as part of the pre PPP contracts. The chosen design solution was a Bentonite matt. This failed to be effective and the contractor spent a considerable sum chasing leaks around the subway. The situation turned contractual and work was stopped. USIL (now Triton Norway (TN)), along with Metronet proposed the MPS system to rectify the situation and achieve the LUL cat 1 standard level three requirements. The structure was due to be fitted out imminently but were on stand down due to the water ingress adding to the contractual pressure.

Challenges

There was no set process for obtaining acceptance across the LUL network of a product such as the MPS system. With great enthusiasm and assistance from both LUL and Metronet a way forward was agreed. The MPS system had to go through the normal LUL and Metronet CDS and site approvals systems to be allowed on site, prove compliance with the UK and EU directives on both Low Voltage Safety and EMC compliance as well as the extra over Metronet signalling requirements, demonstrate the anodic properties of the system and that there was no direct connection to the re-bar along with an extra over requirement to achieve a level 4 (Totally Dry) standard requirement set by LUL at 90% Relative Humidity within the structure.

Industries:

Transportation (London Underground Ltd)

Regions:

United Kingdom and Ireland

Summary:

- LUL level 4 Target 90% Relative Humidity in structure achieved
- 40 Watts consumption for the installation
- Structure was available for fit out after 12 weeks
- Drying time 6 months

Timings:

- The design of the MPS® (AOP) system took 6 weeks
- The assurance acceptance of the design took 12 weeks (First trial Installation on LUL infrastructure)
- Structure was available for fit out 10 weeks after work starting on site
- Drying time 6 months

Success Criteria:

- The reinforced concrete subway is a capillary structure
- The structure is fully below the water table and has just 1 Cathode
- 9 mechanical cracks were identified and repaired by the contractor
- Public areas have vapour closed coatings causing the system to draw more current

Pulse Boxes:

- Two permanent pulse boxes as extra capacity is required for future concourse area contract
- Due to vapour closed area a third pulse box has been installed temporarily

Working within the LUL environment meant that all staff had to be certified and accredited. Due to the nature of access to this structure and the Fit out contractors work taking priority, the main works were carried out in a 5 hour night shift pattern this left an effective productive rate of 4 hours per night.

The break through of the structure into the station area had not taken place which left the structure classified as a confined space; this limited the men and materials that could be used. In conjunction with this and the section 12 fire classification Specialist dust suppression equipment had to be used contributing to the lost hour of productive time.

An advantage of the MPS system is that it increases the effectiveness of the bond between applied materials and the original structure by drawing some of the material into the capillaries of the structure. This proved a challenge in achieving the RH as more water was been added by the Fit out contractor in their work.

TN make a statement of success criteria that the inside surface of the structure must be vapour open. This was not possible with this installation as ceramic glazed tile are to be used in the public areas. This is designed into the capacity of the system. TN are able to give assistance with compatible materials unfortunately a tanking material Ronafix (Vapour Closed) was used by the fit out contractor without the knowledge of TN this caused the system to slow down and draw extra current. A third pulse box was installed to cope with this extra requirement.

Contract

The cost of the trial was not bourn fully by Metronet however they did contribute to the cost, as this is the first installation in the UK and LUL environment. Taking into account all the restrictions and obligations, If this project had been assessed as a normal commercial project. The MPS system is not an off the shelf product at a standard rate. Each structure has its own set of conditions and environment and therefore its own cost. The MPS system is a unique innovative first world technology with a simple installation technique. However the largest component to cost is the cost of labour and the access to site. There is no need to undertake expensive excavations as the MPS system is applied within the inside/dry environment of the structure. Hence the placement of the MPS is slightly more expensive than a traditional temporary solution but much less that a traditional permanent solution and for this we give a structural life time guarantee on the MPS equipment.

Outcome

The MPS system has achieved DTI approval and we now have the CE mark. We are also compliant in terms of EMC to the extra over Metronet signalling system and infra structure requirements. Areas of the structure that have been unaffected are now showing that the target 90%RH has been achieved or bettered. Final sign off by Metronet was achieved on 26th September 2007. This means that we are now in a position to pursue feasibility studies and design concept work on other assets and stations. During June and July 2015, Triton Norway was engaged by TFL to relocate the control gear of the AOP system at Walthamstow Central. At this time, the system had been powered on and working without maintenance for 9 years. It had kept the Walthamstow underpass dry and operational for all this time and since this is a hidden system, LUL had forgotten it was even there.

AOP system

Hydrotech the original company terminated in 2011, Triton Norway remains as the authority on AOP as the system was developed by the Triton Norway team. The latest generation of AOP is now called AOP (Advanced Osmotic Puls). The AOP System is a revolutionary technology based on an accepted theory of electro osmosis. It gives new life to existing brick, masonry and concrete structures avoiding expensive reconstruction and has a broad field of application in new concrete structures. The "state of the art" methods in use in the building industry today can be characterised as temporary solutions to a problem for which there is no apparent cost effective permanent solution. The AOP System provides a permanent solution. The AOP System is utilised for transporting water encapsulated within the capillaries out of structures, as well as permanently preventing the penetration of water into structures. A control unit produces a low voltage electrical charge, which is passed through electrodes in the form of probes or wires strategically placed within portions of the walls and/or floors which are wet.