



## Ensuring safety for 200m Elizabeth line passengers

AIS & Siemens provide £4m tunnel ventilation system on the Crossrail project

### AT A GLANCE :

#### TUNNEL VENTILATION CONTROL SYSTEM ON THE CROSSRAIL CONSTRUCTION PROJECT

- Control System for 48 large fans and over 160 dampers located across 18 tunnel shafts
- 18 Ventilation Control Panels (Siemens MCCs) provide fan and damper control
- Cooling for stationary trains and ventilation during maintenance activities under normal operations
- Smoke extraction will aid passenger safety in the event of an emergency - hundreds of ventilation modes and back up modes in the event of ventilation equipment failure
- Designed to SIL2 safety integrity levels in accordance with BS EN 61508
- Custom designed and developed software based on Siemens safety approved (SIL rated) S7-400FH PLCs and WinCC OA (Open Architecture) SCADA software
- Clear and intuitive touch screen HMI integrates all of the required data to enable the railway controller to quickly and reliably initiate emergency modes
- The system supports users at the main Regional Control Centre and at the Backup Control Facility for full redundancy



Crossrail is one of the largest infrastructure projects of its kind currently being undertaken in Europe. Intended to carry over 200m passengers each year, it is building 42km of tunnels, 10 new stations and improving 30 more. The finished railway, which will be named the Elizabeth line when it opens in central London in 2018, will be an accessible route of 40 stations from Reading and Heathrow in the west to Shenfield and Abbey Wood in the east.

Key to the safe operation of the new tunnel network are 48 large fans, controlled by an advanced VCS (tunnel ventilation control system) developed by Applied Industrial Systems (AIS) using Siemens technology. The VCS is designed to provide operational ventilation for trains, manage air supply quality during routine maintenance and co-ordinate smoke extraction and ventilation in the event of a fire.

### Appointed to design & build a SIL2 approved integrated control system

Following a competitive tender, WinCC OA specialist Applied Industrial Systems (AIS), working as part of a Siemens led team was awarded the contract, worth £3.9m in total, to provide software and systems engineering services for the Elizabeth line VCS (tunnel ventilation control system). The project, which commenced in September 2015, will deliver the control for the fans and associated equipment, as part of the life safety systems.

“ Siemens and AIS have proven experience with high profile projects in this area so we knew the technology and support services were proven and felt they were best suited to meet the project's demands. ”

**Simon Mott**  
VCS Package Engineer at ATC JV

Siemens and AIS were appointed by ATC JV (a joint venture between Alstom, TSO and Costain) who are responsible for the tunnel fit out package on the Crossrail project, which includes the mechanical and electrical (M&E) systems. As a partnership, the Siemens / AIS team offered a combination of the highly regarded Siemens SIL approved WinCC OA SCADA software, AIS' relevant SCADA integration experience and a strong track record for delivering large infrastructure SIL2 approved ventilation control systems on time and within budget.

**Main project systems integrator**

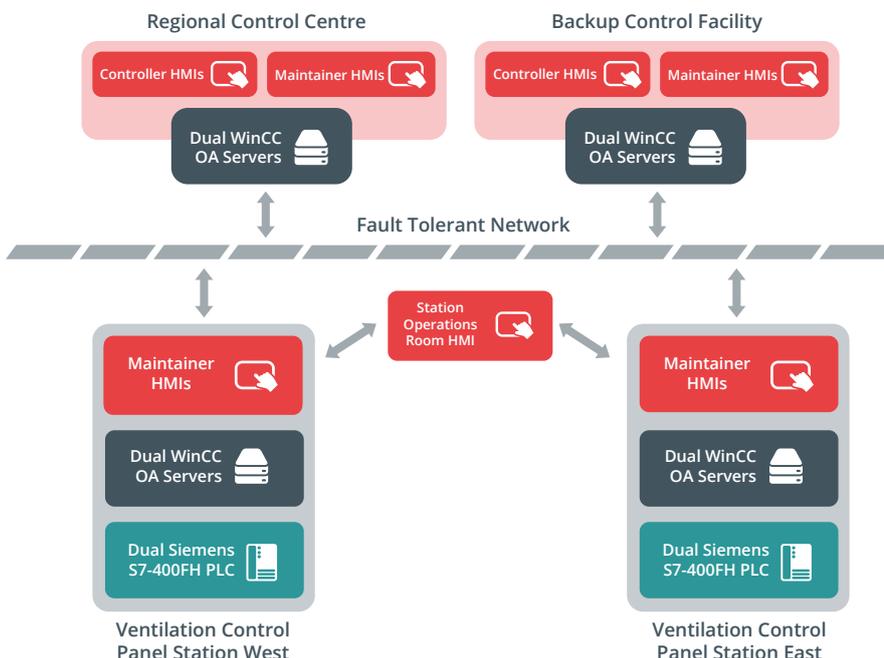
As the main systems integrator for the tunnel ventilation system (VCS), AIS is responsible for SCADA and Control software and systems integration using Siemens WinCC OA SCADA, along with their Programmable Logic Controllers as the base products.

The VCS application for the Elizabeth line is considered a life safety system as it includes controls for the tunnel wide ventilation equipment for both operational and emergency ventilation. This covers the control of 48 large fans and over 160 dampers distributed across 18 ventilation shafts using Siemens MCC equipment. The VCS is also integrated with the signalling package and site wide SCADA system.

As a safety interface, the VCS interface to the signalling system uses information on train location to control the ventilation system for normal and emergency ventilation. In turn, the signalling system uses the status of the ventilation system to limit movement of trains in the event of a ventilation shaft becoming unavailable.

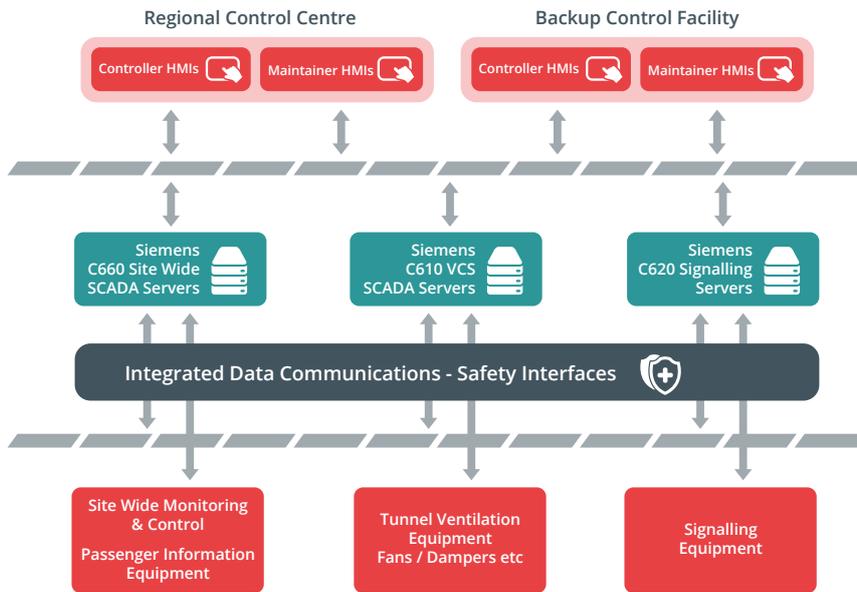
Designed to deliver 99.96% availability, the system is operated from the Regional Control Centre RCC and controllers use dedicated colour touch-screen HMI interfaces integrated with local WinCC OA servers to provide system wide control. Also supported is a Backup Control Facility to provide full redundancy if the RCC is unavailable for any reason.

“Crossrail is the most advanced of all the joint tunnel ventilation system projects undertaken by Siemens and AIS and being awarded it by ATC JV is a testament to our specialist capabilities,” says Simon Burras, Managing Director at Applied Industrial Systems. “The project to help build the Elizabeth line brings together Siemens' safety approved products and AIS' software developers, engineers and designers to create a safety rated system in line with rail regulation requirements.”



**System & WinCC OA Architecture**

VCS distributed over 18 ventilation shafts and based on standard Siemens MCCs using SIL approved products S7-400FH PLCs and WinCC OA SCADA.



## Siemens Integrated Architecture

Siemens integrated systems for Crossrail - covering signalling, site wide SCADA and comms and ventilation control.

“By developing the user interface together with the operations team, we have ensured that safety functions were automatically built into operational procedures from the outset,” he adds.

“Developing a SIL certified SCADA system requires a combination of a robust SCADA package and a methodical and skilled engineering team. Siemens have a long history of working with AIS and thanks to their many years of experience in developing tunnel ventilation and safety systems we have achieved exactly the right balance,” says Daniel Smalley, SCADA Product Manager for the UK and Ireland at Siemens.

### AIS' added value as control system integrators

- Expert tunnel ventilation control system specialists
- Ability to integrate multiple, disparate control systems under a single user interface
- Highly experienced at developing SIL 2/3 certified SCADA systems
- Collaborative design approach ensures high user acceptance with projects delivered on time and within budget

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