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### **Safety – a top priority for Netherland’s High-Speed Line tunnels**

**Siemens has supplied both technical expertise and operational support to the groundbreaking HSL (High-Speed Line) railway line in the Netherlands, which, by connecting the country to the European high-speed railway network for the first time, has opened new opportunities for the regional economy.**

Ultra-fast trains with speeds up to 300 km/h now carry passengers over 100 kilometers – making the link one of the largest high-speed railway projects in Europe. The achievement doesn’t stop there however: the progressive approach taken throughout the project encompasses many aspects, particularly the manner in which all parties involved have worked together to reduce the impact of the new line on the environment, the combination of different and sometimes unique technologies used for the construction of the sub- and superstructure of the line and its operation, and the overall collaboration between the government and private parties.

Indeed, for this project, the Dutch government entered the largest PPP (Public Private Partnership) contract ever concluded in the Netherlands, appointing the Infrasppeed construction consortium to undertake the provision and maintenance of the superstructure of the new link between Amsterdam and the Belgian border. The superstructure comprises: the rails; the electric system (overhead wires and transformer stations); the communication, ventilation, safety and signalling systems; the sound barriers, balustrades and fences, as well as the operational and emergency facilities in the tunnels. One of the founding members of the Infrasppeed construction consortium, Siemens successfully delivered the power supply system, the ETCS (European Train Control System) signalling system, the GSM-R communication systems and ancillary equipment for the dedicated rail line.

Safety was a key consideration throughout the whole project, from the design phase through to the construction and now operation of the line. A safety plan was set up, which comprises strict safety requirements and measures for the rail systems and other superstructure components, the vicinity of the line, the operator and the trains – all of which is designed to minimise the risks on and along the track and inside the train, as well as limiting the consequences of incidents. As part of this plan – and because accidents and fires in operational tunnels have greater consequences than those

occurring in open air and can result in loss of life, costly structural damages and lengthy disruptions of the rail network – special attention was given to tunnel safety, with carefully designed tunnel tubes and escape routes and shafts. Siemens supplied the fire safety systems for the five tunnels specially constructed for the railway line. These include the Groene Hart tunnel, which runs a distance of seven kilometers between Benthuizen and Hoogmade, and has the world's largest outside diameter for a bored tunnel, reaching almost 15 meters; and the new tunnel under the Ringvaart aqueduct, which has a depth reaching 12 meters below normal Amsterdam water levels. Priority was given to ensuring quick intervention and safe escape in case of fire, so the tunnels are equipped with a total of nearly six hundred manual call points, with flashing lights near the escape routes. The escape platforms and tunnels' technical rooms – housing critical operational systems ensuring tunnels remain open for traffic – are fitted with almost nine hundred Algorex smoke detectors and over fifty aspirating smoke detectors to ensure immediate fire detection, even in highly ventilated areas. The entrances and exits of all the tunnels are monitored by Sistore CX video surveillance from Siemens and – to prevent the theft of copper and other valuable materials – the maintenance yard is also covered by Sistore CX EDS motion detection.

In order to ensure optimum incident limitation within the tunnels and on the track, a high level of integration was required, with all traffic, lighting, fire safety, security and ventilation systems combined through the Sitraffic traffic control system from Siemens in the central control center for the track and in each of the tunnels' control centers. Sitraffic manages all safety and functional requirements, from day-to-day operation to emergency management. For the tunnels, this level of integration ensures that all systems work together to react automatically and efficiently to incidents with minimum human intervention.

To keep the High-Speed Line operational to the level required by the contract (99.46% availability for the first 25 years), a good service agreement and cooperation with the HSL service department were also essential. Siemens was entrusted with providing a range of comprehensive services for the tunnels, drawing from its Advantage Services portfolio. This included consultancy and risk assessment, fire safety system design, installation support, commissioning and training. In addition, the Advantage Pro service agreement covers system maintenance and ensures the installation is certified to the Dutch regulations – this includes a yearly inspection of the fire safety equipment and preventive maintenance to guarantee an optimal condition and system availability. In case of a failure, Remote Service combined with a service center on call 24/7 is at hand to provide a fast repair (corrective maintenance) and minimize the system downtime. Thanks to good cooperation and planning between the HSL maintenance department and Siemens, the time for preventive and corrective maintenance is kept to a minimum.

Through its lifecycle management services, Siemens further offers the possibilities to update and upgrade to the latest software and hardware, thereby ensuring that the stringent safety requirements are consistently met today and over the entire contracted operational life of the High-Speed Line. Overall, the fire safety systems and services supplied by Siemens contribute as much

2 / 3

to delivering a safe travel environment on the line as they safeguard the availability of this essential economic link to the rest of Europe.

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