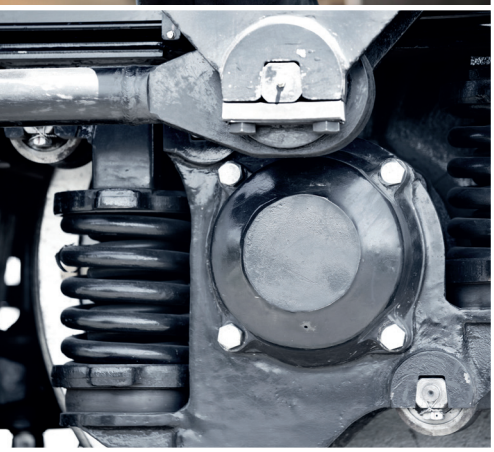
warringtonfire

Proud to be part of element



RAIL TESTING

www.warringtonfire.com


Liverpool Street
UNATTENDED LUGGAGE
Liverpool Street

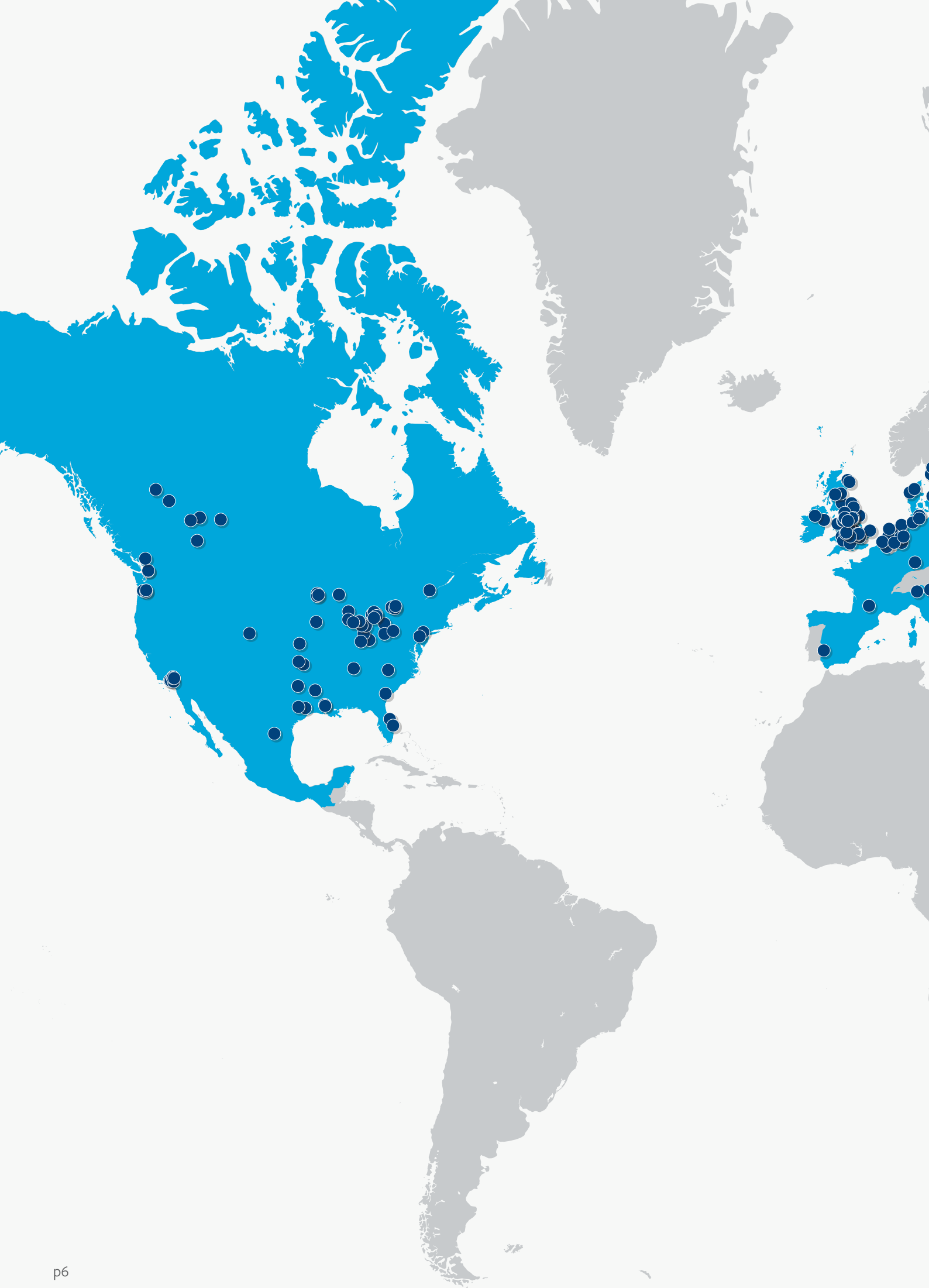
CONTENTS

ABOUT ELEMENT

We are one of the world's leading laboratory-based testing groups, trusted by organizations to test and advise on the safety, quality and performance of their products and operations. We operate 189 laboratories and offices and employ 6,700 people throughout Europe, the Americas, the Middle East, Asia/Asia Pacific and Africa.

Our capabilities help to extend asset life bring predictability to applications, and shorten the time to market for customers' products, processes and materials. With over 90 years' experience, we specialize in testing across a number of key sectors ranging from Aerospace to Fire & Building Products; Oil & Gas and Industrials; Infrastructure & Environment; Transportation; and Health Sciences.

In June 2017, Exova Group Limited was acquired by Element Materials Technology, a company with a global presence. Element's laboratories are staffed by experts specializing in materials testing, product qualification testing and failure analysis for the Aerospace, Oil & Gas and Infrastructure Transportation & Industrials sectors. For a complete list of Accreditations & Approvals and more information, please visit **www.element.com**



WORLD-CLASS. WORLDWIDE.

184 laboratories across five continents, providing global solutions to our customers.

OUR MISSION:

THE BEST TESTING PARTNER IN THE WORLD

OUR VISION:

THE WORLD'S MOST TRUSTED TESTING PARTNER

OUR VALUES:

SAFETY

We keep our colleagues and visitors safe.

INTEGRITY

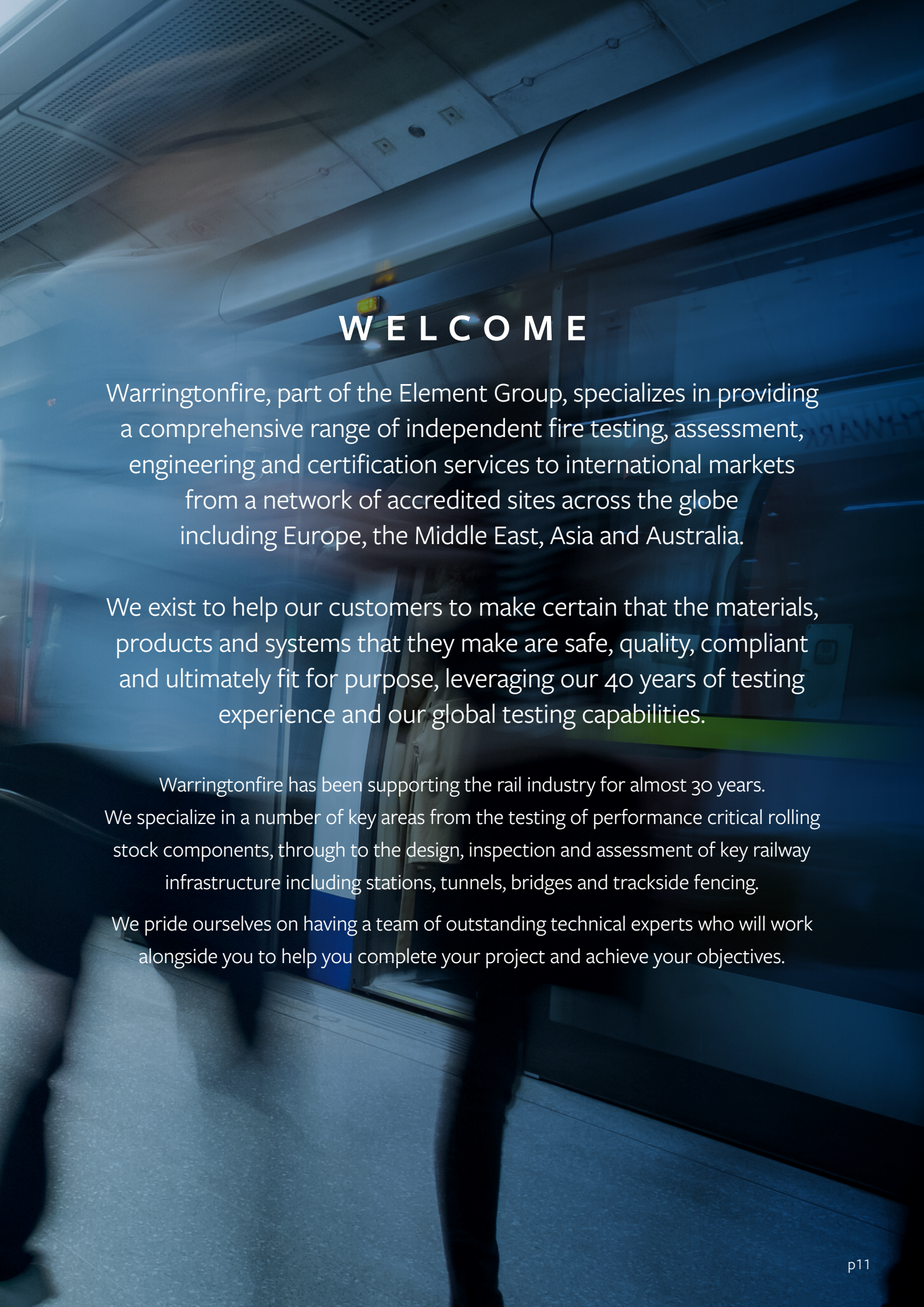
We act honestly and fairly to do the right thing.

EXCELLENCE

We set new standards of excellence in everything we do.

PARTNERSHIP

We work together for the benefit of our customers.



WELCOME

Warringtonfire, part of the Element Group, specializes in providing a comprehensive range of independent fire testing, assessment, engineering and certification services to international markets from a network of accredited sites across the globe including Europe, the Middle East, Asia and Australia.

We exist to help our customers to make certain that the materials, products and systems that they make are safe, quality, compliant and ultimately fit for purpose, leveraging our 40 years of testing experience and our global testing capabilities.

Warringtonfire has been supporting the rail industry for almost 30 years. We specialize in a number of key areas from the testing of performance critical rolling stock components, through to the design, inspection and assessment of key railway infrastructure including stations, tunnels, bridges and trackside fencing.

We pride ourselves on having a team of outstanding technical experts who will work alongside you to help you complete your project and achieve your objectives.

RAIL FIRE TESTING

Warringtonfire provides a comprehensive range of independent fire testing services to the rail industry from its UKAS, DAkkS and BELAC accredited testing laboratories in Warrington UK, Frankfurt, Germany and Gent, Belgium. Its teams of highly experienced technical experts have a deep understanding of the industry's specific requirements and can provide Reaction to Fire testing (flammability/combustibility, toxic fume emission and smoke emission) to BS, LUL, EN, NF, DIN and UIC standards and Fire Resistance testing to both BS and EN standards.

EXAMPLES OF COMPONENTS WE TEST

- Wall linings
- Ceiling linings
- External wall surfaces
- Fire retardant treatments
- Jointing systems
- Cables
- Floor coverings
- Seating
- Rubber seals
- Foam materials

WHAT DO WE TEST

- Flammability / combustibility
- Toxic fume emission
- Smoke emission
- Fire resistance

WHAT DO WE TEST

- BS 6853 – Code Of Practice For Fire Precautions In The Design And Construction Of Passenger Carrying Trains
- London Underground Limited (LUL), Category CAT1, Number S1085, Issue Number A4
- EN 45545-2 – Requirements For Fire Behavior Of Materials & Components
- NF F 16-101 – Railway Rolling-Stock, Fire Behavior, Choice Of Materials
- DIN 5510 – Preventative fire protection in railway vehicles
- UIC 564-2 – Regulations Relating To Fire Protection and Fire Fighting Measures In Passenger Carrying Railway Vehicles Or Assimilated Vehicles Used On International Services

RAIL FIRE TESTING

Warringtonfire testing services comprise fire tests and assessments to a large number of national and international standards. Our laboratories are based in Warrington, UK, Frankfurt, Germany and Gent, Belgium which are UKAS, DAkkS and BELAC accredited, respectively. Many of our staff are recognized as international experts within their field and are actively involved in the development of new test procedures. We can conduct the following test methods that are specifically called upon in the aforementioned railway standard:

FLAMMABILITY / COMBUSTIBILITY:

- EN 13501-1 – Fire classification of construction products and building elements.
- EN ISO 11925-2 – Ignitability of building products subjected to direct impingement of flame. Single-flame source test
- EN 13823 – Building products excluding floorings exposed to the thermal attack by a single burning item
- EN ISO 9239-1 – Horizontal surface spread of flame on floor covering systems. Determination of the burning behavior using a radiant heat source
- EN ISO 1716 – Determination of the heat of combustion
- EN ISO 1182 – Non-combustibility test
- NF P 92-501 – Radiation test used for rigid materials, or for materials on rigid substrates (flooring and finishes) of all thicknesses and for flexible materials thicker that 5mm
- NF P 92-503 – Electrical burner test used for flexible materials
- NF P 92-504 – Flame persistence test and speed of the spread of flame
- NF P 92-505 – Test used for thermal melting materials. Dripping test
- ISO 5658-2 – Lateral flame spread on building products in vertical configuration
- EN ISO 5660-1 – Method for measuring the rate of heat release of products
- EN 60695-2-1/0 – Glow-wire test method
- EN 60695-2-1/1 – Glow-wire end product test
- UIC 564-2 Appendix 5 – Fire resistance of coated and uncoated textiles
- UIC 564-2 Appendix 6 – Fire resistance of rubber door and window seals
- UIC 564-2 Appendix 7 – Fire resistance of materials by oxygen number
- UIC 564-2 Appendix 8 – Fire resistance of foam materials
- UIC 564-2 Appendix 10 – Fire resistance of interconnecting gangway rubber flanges
- UIC 564-2 Appendix 11 – Fire resistance of rigid thermoplastic materials
- UIC 564-2 Appendix 12 – Fire resistance of floor coverings
- UIC 564-2 Appendix 13 – Fire resistance of seats
- DIN 5510-2 –Testing of railcar seats
- DIN 4102-14 / EN ISO 9239- 1 - Testing of flooring materials, classification SF1-SF3

- BS 476 Part 6 – Fire propagation
- BS 476 Part 7 – Surface spread of flame
- EN ISO 4589-3 Annex A – Temperature index / flammability temperature test
- BS 476 Part 4 – Non-combustibility test
- BS 6387
- BS EN 50200
- EN 45545-2 Annex A and B – Seat vandalisation & heat release test
- DIN 5510 – Preventative fire protection in railway vehicles
- DIN 54837 -Testing of materials, small components & component sections for rail vehicles: determination of burning behavior using a gas burner
- DIN 53438 Parts 1-3
- EN ISO 4589-2 – Determination of burning behavior by oxygen index

TOXIC FUME EMISSION:

- EN ISO 5659-2 - Toxicity, Annex C, D
- EN 45545-2 Annex C – European rolling stock test protocol for analysis of toxic gases using FT-IR
- EN ISO 5659-2 – Smoke generation. Determination of optical density by a single chamber test oxygen index
- BS 6853 Annex B.1 – Mass based toxicity test
- BS 6853 Annex B.2 – Area based toxicity test
- NF X 70-100 – Mass based toxicity test

SMOKE EMISSION:

- BS 6853 Annex D.8.3, D.8.4, D.8.5, D.8.6 & D.8.7 – Three meter cube smoke density test
- NF X 10-702 – Determination of the opacity of the fumes in an atmosphere without air renewal
- IEC 61034-2
- EN 50268-1 - Measurement of smoke density of cables burning under defined conditions

FIRE RESISTANCE:

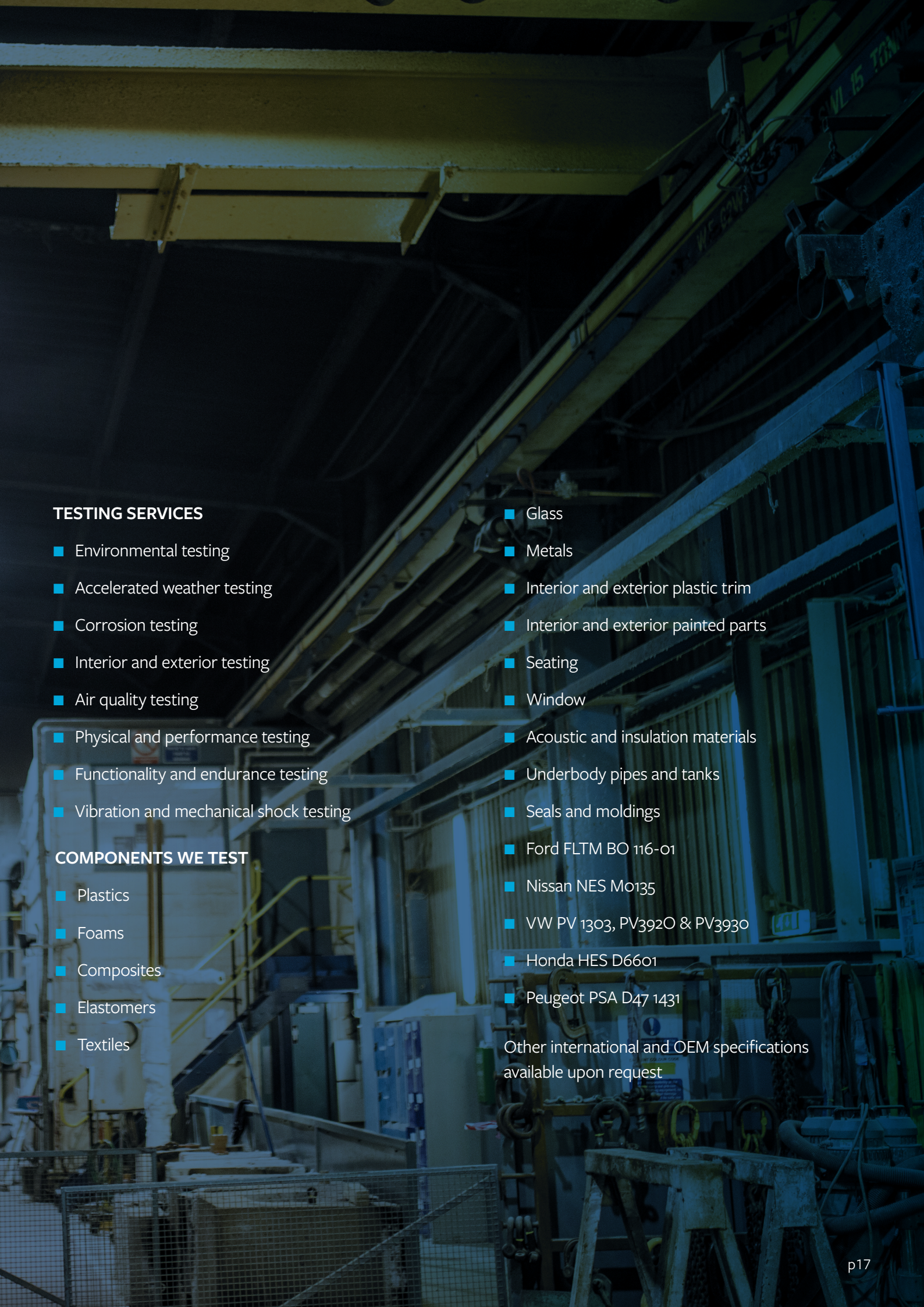
- EN 45545-3 Railway applications - Fire protection on railway vehicles
- BS 6853 – The Code of Practice for Fire Precautions in the Design and Construction of Passenger Carrying Trains
- EN 1634-1 – Doors
- EN 1364-1 - Partitions & walls
- EN 1365-2 & EN 1364-2 floors
- BS 476 Part 22 non load bearing structures
- BS 476 Part 21 load bearing structures burning under defined conditions

Color Key

- Standards tested in UK only
- Standards tested in Germany only
- Standards tested in more than one of our facilities, please contact your local laboratory for more details

RAILWAY COMPONENTS – PERFORMANCE TESTING

Warringtonfire provides a comprehensive range of performance testing for components, materials and paints. Our UK test facilities are based in the West Midlands and Hertfordshire which enables us to cover a wide variety of industry requirements.



TESTING SERVICES

- Environmental testing
- Accelerated weather testing
- Corrosion testing
- Interior and exterior testing
- Air quality testing
- Physical and performance testing
- Functionality and endurance testing
- Vibration and mechanical shock testing

COMPONENTS WE TEST

- Plastics
- Foams
- Composites
- Elastomers
- Textiles
- Glass
- Metals
- Interior and exterior plastic trim
- Interior and exterior painted parts
- Seating
- Window
- Acoustic and insulation materials
- Underbody pipes and tanks
- Seals and moldings
- Ford FLTM BO 116-01
- Nissan NES M0135
- VW PV 1303, PV3920 & PV3930
- Honda HES D6601
- Peugeot PSA D47 1431

Other international and OEM specifications available upon request

OUR TECHNICAL CAPABILITIES AND METHODS OF TESTING

ENVIRONMENTAL TESTING

- High and low temperature -70°C to 250°C
- Humidity 10% to 95%
- Thermal shock -75°C to 170°C (Transition five seconds)
- Water condensable (100% humidity)
- Open air weathering
- Chamber range to 6m x 3m (various sizes available)

ACCELERATED WEATHERING TESTING

- Xenon Weather-Ometer
- Fluorescent UV
- Sunshine Weather-Ometer (Carbon Arc)
- Open air weathering: Kalahari and Florida
- Solar Simulation: Metal Halide and Infra-Red testing
- Interior and exterior weather-ometer tests
- Specifications include ASTM and ISO

CORROSION TESTING

- Neutral Salt Spray ASTM B117
- CASS (Copper Acetic Salt Spray) ASTM B368
- Cyclic Corrosion Roof spray capabilities
- Humidity exposure 5% to 95%
- Water Condensable 100%
- Ozone testing
- Fluid resistance
- Specifications include ASTM and ISO
- Chamber size up to 5m x 3m x 3m

INTERIOR & EXTERIOR TESTING

- Material Types: Paints, Plastic, Rubbers, Textiles, Metals Coating, Glass
- Components Tested: Seating, Instrumental panels, Doors, Consoles, Overhead systems, Acoustical packages, Flooring systems, Trunk trim, Garnish automotive glazing, Windows

PHYSICAL & PERFORMANCE TESTING

- Adhesion
- Scratch and mar
- Taber
- Scuffing
- Erichsen
- Finger abrasion
- Abrex
- Martindale
- Soiling and cleanbility
- Transverse abrasion
- Curved surface abrasion
- RCA abrasion
- Functionality testing
- Durability
- Strength testing
- Endurance testing
- Colourfastness
- Crocking
- Migration / blocking
- Hardness

- Impact / Indentations
- Stone chip resistance
- Chemical resistance
- Tensile: Peel, Compression, Shear
- Rigidity and deflection
- Dimensional stability
- Colour measurement
- Gloss retention
- AATCC greyscale
- Paint and plating thickness
- Safety
- Stability
- Fatigue testing
- Load testing

AIR QUALITY TESTING

- Fogging / Condensable Constituents: Photometric, Gravimetric, Light Transmittance
- Odour / Smell testing
- Total VOC / Carbonyl testing
- Thermal-desorption
- Tedlar bag
- Shed / Summer testing
- Specs ISO Methods / ISO 12219

FUNCTIONALITY & ENDURANCE TESTING

- Interior and exterior door handles
- Fuel pump assembly
- Brake hose and fuel lines
- Seat mechanisms
- Vents
- Steering columns
- Force pound test and pressure

VIBRATION & MECHANICAL SHOCK TESTING

- Specifications include ASTM & ISO
- Capabilities: Resonance Search and dwell, Sine vibration, Random vibration, Multiple accelerometers to control and monitor various simultaneously, Jigs and fixture build to simulate in vehicle orientation

SEAT TESTING

- Strength and durability testing of passenger and driver seats
- Testing of upholstery performance of passenger seats
- Station seat testing

ERGONOMIC ASSESSMENTS

- Access systems between train carriage and station platform for high risk users.
- Access to ticket booths and similar installations
- Control room layout

CASE STUDY

CROSSRAIL PROJECT, LONDON – QDR PROCESS

Crossrail, Europe's largest infrastructure project, is delivering a new railway for London and the South East. 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 2019, will be a fully accessible route of 40 stations from Reading and Heathrow in the west to Shenfield and Abbey Wood in the east. Crossrail will change the way people travel - It will add 10% to central London's rail capacity, reduce journey times and increase choice.

The central section of the Elizabeth line is underground and stations link with the existing London Underground network at Paddington, Bond Street, Tottenham Court Road, Farringdon, Liverpool Street, Whitechapel and Canary Wharf. The interaction of the Elizabeth line with existing London Underground, Docklands Light Rail and Main Line stations results in highly complex station designs, and the fire safety of these stations is a crucial aspect of the design, both in terms of providing life safety to passengers and staff and also providing provisions for the fire brigade. We were responsible for the fire safety design of four of the underground stations, Whitechapel, Farringdon, Victoria Dock and Pudding Mill Lane Portal, as well as the tunnels, in the early design and development phase. In addition, we were asked to carry out a Qualitative Design Review (QDR) process for all areas of the project. The QDR process was developed in order to gain the approval of all the relevant stakeholders to the fire safety design of the project.

CROSSRAIL PROJECT, LONDON – QDR PROCESS

PURPOSE OF QDR PROCESS

The Elizabeth line stations connect to a number of existing London Underground and Network Rail stations. In addition, there are a number of adjacent areas that have an impact on the design and operation of the stations (such as the ExCel conference site and several over-site developments). There are also a number of different third-party approval bodies responsible for the various areas of the project (including the fire brigade, Building Control and the client's independent reviewer). It is necessary to gain approval from all these parties to the fire safety design of the project, which creates logistical and practical problems for the project. The purpose of the QDR process is to get all of the important stakeholders in the project to discuss and agree on various aspects of the fire safety design and agree upon the acceptance criteria for any analysis required for progression of the design. If carried out successfully, this then allows the next stage of design to continue along a route agreed by the major stakeholders in the project. If any analysis is required at further stages, the acceptance criteria will have already been outlined in the QDR process.

OBJECTIVES OF QDR PROCESS

The main objectives of the QDR process are for all the stakeholders to agree on:

- The applicable legislation
- The guidance documents used in the design process
- The route to general approval from all stakeholders
- The acceptance criteria for any analysis required to gain approval
- The fire scenarios being analyzed
- A review of each fire scenario to ensure that in each case the acceptance criteria is met
- Any specific issues which need to be dealt with during the next stage of design.

To achieve these objectives it was important that a suitable process was followed to cover all of the issues and to review the designs as efficiently as possible.

QDR PROCESS

The process chosen for the Crossrail project was the QDR process which followed the outline defined in BS7974 Part 0 as follows:

- Review the architectural design
- Establish the fire safety objectives
- Identify fire hazards and possible consequences
- Establish trial fire safety designs
- Identify acceptance criteria and methods of analysis
- Establish fire scenarios for analysis

This process was therefore followed at each of the QDRs to review the fire safety design for all of the agreed fire scenarios.

SCOPE OF WORK

The QDR process organised by Warringtonfire reviewed the central section of the railway design, which included the four underground stations previously mentioned, the tunnels, portals and shafts and a number of overground stations.

We carried out the fire safety design work on a number of the stations and tunnels included within the QDR process, including the preparation of presentations for the QDRs reviewing these stations and the chairing of the QDR session. For the other stations and other parts of the scope of work, Warringtonfire liaised with the relevant parties who were involved in the design, to produce presentations detailing all of the fire scenarios for review and the fire safety systems and design in place to meet the design guidance and criteria.

One of the most crucial aspects of overseeing the QDR process was to ensure that the discussions between all of the relevant parties were heading in the right direction, towards a general agreement and that all fire scenarios were reviewed and agreements were reached. With so many stakeholders involved in such a complex project, organization was key to achieving the required objectives.

This was carried out effectively by Warringtonfire who managed and oversaw the process to achieve the desired outcomes.

OUTPUTS OF THE QDR PROCESS

Keeping accurate records of the discussions and agreements was also crucial to recording the outputs from the QDRs. Following each QDR a report was produced detailing the acceptance criteria agreed and any outstanding issues that would need to be resolved at the next stage of design.

A tracker document was also created that listed all of the acceptance criteria and to record what items remained outstanding and needed

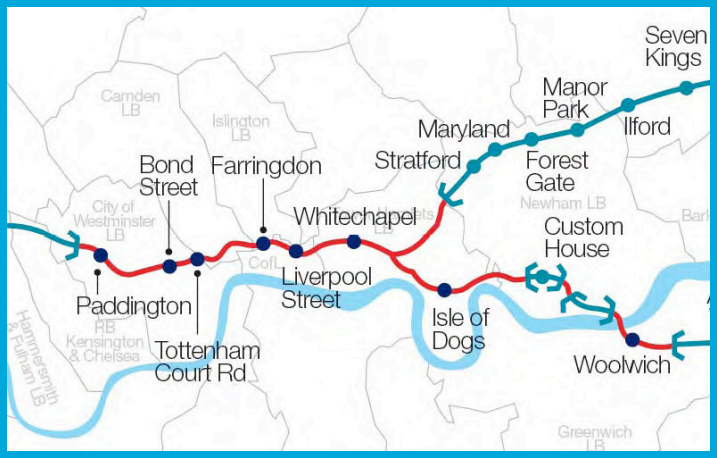


Figure 2 - Section of the Elizabeth Line

ACHIEVEMENTS OF QDR PROCESS

Following the QDR process, each aspect of the fire safety design of the stations, tunnels and shafts within the scope of works had been reviewed by all of the major stakeholders in the Crossrail project.

All of the agreed fire scenarios were reviewed and the acceptance criteria were agreed by all of the stakeholders for each scenario.

If any further analyses were identified as being required at further design stages, the acceptance criteria for those analyses were also agreed.

These outcomes allowed the design to proceed to the next stage with clear agreements and acceptance criteria for how the design should continue. All agreements were also documented by Warringtonfire so that when the designs were passed to the next stage all information was recorded.

This was a crucial stage of the Crossrail project when all of the stakeholders were first involved in the design and it needed to be carried out in an organised and efficient manner, which was successfully achieved by Warringtonfire.

CASE STUDY

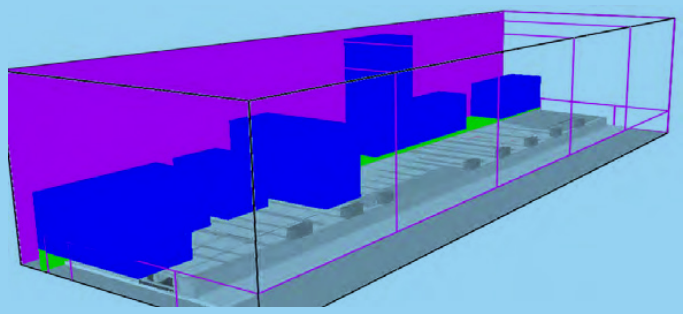
EAST LONDON LINE

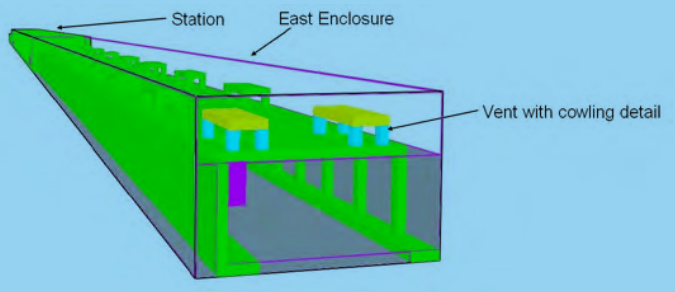
The East London Line Project consists of the construction of four new train stations, the upgrade and refurbishment of six existing train stations, the construction of a new control center, the construction of maintenance and cleaning facility and the construction of various buildings needed for the operation of the new line. The line consists of existing infrastructure and tunnels running through London.

The stations were to be designed to a combination of RSPG (Rail Stations Principles and Guidance) and LU standards. The entire design and construction process was subject to the Qualitative Design Review (QDR) process as detailed in British Standard 7974 (Fire Engineering Principles).
The project brief was to take the outline client designs through the detailed design and approvals process and finally through the construction of the line.

OVERALL STRATEGY

The entire line was subject to the client's overarching fire strategy, which set out the major principals that each station should be designed or refurbished to. Each separate building and station then had an individual fire safety report that detailed the fire safety requirements for that particular facility.





EVACUATION

Each new station had to comply with strict evacuation times, set out by the overarching fire strategy. Each new station stairs were sized to comply with these criteria using the calculation methodology contained in the LU station planning standards. Where a station was enclosed or underground, smoke modeling techniques such as Computational Fluid Dynamics (CFD) were used to assist in the justification of the evacuation times. The CFD techniques were also used to optimize the design of the smoke extract systems required on each site.

THE OPERATIONAL CONTROL CENTER

The center is to control the East London line. The center was designed so that even if a fire occurred within the building, the operators could safely shut down the line before evacuating. To aid this function the building was provided with high levels of smoke detection, suppression systems and compartmentation.

OPERATIONAL CONTINUITY AND ASSET PROTECTION

The entire line was subject to reliability and asset protection requirements. BS 6266 was used to determine the appropriate protection methods to allow the line to operate with minimal disruption. To determine the requirements risk assessments were carried out that looked at the function of each room, the equipment within that room, it's role in the lines operation, the likelihood of a fire occurring and the effects of a fire. The results of this risk assessment then allowed recommendations for protection to be given.

RISK ASSESSMENT AT EXISTING STATIONS

Risk Assessment inspection of the fire safety systems such as the alarm systems, compartmentation and suppression systems was carried out. These were assessed against the standards of the client's overarching fire strategy as well as the Section 12 Sub-Surface Regulations. Non-compliances against standards were flagged up and recommendations were then given to the design team to help move the refurbishments forward. Following revised designs the proposals for the newly designed fire safety systems were reviewed to ensure that compliance with standards was achieved.

FIRE BRIGADE ACCESS ON THE LINE

The access for the fire brigade needed to be considered on the line as a whole which involved looking at the provisions to any existing stretches of infrastructure, which includes the Victorian tunnel system and the sections of tunnels under the Thames. Via the QDR process and agreement with the LFEPA a system of fire hydrants were designed to improve the protection to the tunnel system.

SUMMARY

The East London Line project required the fire safety design for around 20 buildings, including new stations, upgrades to existing stations and a number of other buildings such as substations. This therefore required analysis of not only the buildings themselves, but how they interacted with the areas through which the line passed and what the effect of fire would be on the stations, the operation of the line and the buildings that surrounded the line.

Each building had it's own design criteria and design issues and required a great deal of co-ordination with the design team, contractor and the regulating bodies to ensure that the design was the optimum that could be achieved and that the project would be delivered on time and to the agreed fire safety standards that had been set out as the overriding design principles.

RAILWAY INFRASTRUCTURE INSPECTION SERVICES

The complexity of today's railway sector can impose high and often conflicting demands on rail infrastructure managers. For a safety critical industry such as the UK rail network, asset management is an essential discipline.

Timber is used extensively throughout the network and is found in many critical applications including track bearing longitudinal waybeams (wheel timbers), structural applications and decking soffits.

Warringtonfire's sister company BM TRADA provides specialized timber inspection services, which provide an enhanced level of detail and expertise, which complements regular maintenance examinations of structures carried out by Network Rail framework consultants. Our services enable asset managers to co-ordinate decisions and actions across timber containing assets which can deliver enhanced service life, more efficient use of resources and more effective risk management.

Our condition-based approach to supporting asset management has two purposes. The first immediate purpose is to detect timber defects such as decay and/or mechanical failure that could endanger safety and reliability of railway traffic. The second purpose is to carry out periodic inspections, usually at five year intervals, which, using evidence-based knowledge on how timber deteriorates, can deliver remaining service life predictions. This in turn provides insight into the asset's behavior over time which can enable condition forecasting and planning of maintenance or renewal.

A range of softwoods and more durable, stronger hardwoods are used throughout the rail network. It is the variety of timber species, type of wood preservation and natural variability of timber that can present asset managers with difficult decisions. It is this variability that makes it difficult to predict performance of timber components.

Furthermore, regular examinations take into account the whole structure and do not provide the level of detail required to make accurate predictions relating to condition and service life of timber with the result that timber components are often removed prematurely from the network.

There are two factors to consider. These are condition and strength, and both are inextricably linked.

Timber and timber-based products become vulnerable to fungal decay if the moisture content exceeds the decay threshold, which is nominally 20%. The service environment of timber in railway infrastructure results in timber being exposed to wetting for prolonged periods.

Timber surveys are carried out using non-destructive techniques which include decay detection drilling with microprobes. Core samples are not removed as this can breach any protective preservative envelope and can result in a wetting pathway.

As decay develops, it usually progresses at an increasing rate with the result that the subsequent loss in strength will not be linear. However, it is possible to evaluate if the extent of decay has reduced the cross-section of the member to the extent that strength has been affected.

If strength has not been affected then implementing a remedial preservative treatment regime can halt further deterioration and extend service life.
Condition surveys are complemented with visual strength grading and species analysis. The strength characteristics of the structural timbers are determined by undertaking indicative in situ visual strength grading of the members. This in situ grading is carried out using the requirements of the relevant British Standards as guidance. These standards are:

- British Standard BS 4978: 2007+A1 2011 'Visual strength grading of softwoods. Specification'.
- British Standard BS 5756: 2007+A1 2011 'Visual strength grading of hardwoods. Specification'.

Small specimens (matchstick size) are removed to confirm species using microscopic techniques so the correct strength class for the species/grade combination can be assigned using British Standard BS EN 1912: 2012 'Structural timber. Strength classes. Assignment of visual grades and species'.

A recent example of work carried out by BM TRADA was to support AECOM in the examination and assessment of over 70 timber structures throughout Scotland. The output from this work was to confirm the condition and strength of these timber assets. The outputs supported Network Rail in developing an inventory of these assets ranked by condition. Furthermore, this enabled prioritisation of interventional remedial work to extend service life and renewals on evidence-based condition assessment.

BM TRADA consultants are PTS AC/DCCR qualified.

PRODUCT TESTING AND ASSESSMENT SERVICES FOR THE EUROPEAN RAIL INDUSTRY

Warringtonfire is a leading provider of product testing and assessment services to the European rail industry. Our network of testing laboratories is fully accredited to ISO/IEC 17025 and we are able to provide testing to BS, DIN, EN, ISO, LUL, NF, UIC and US FRA standards. With over 25 years of experience, we are recognized internationally for our technical expertise and as CEN Committee members, contribute to the on-going development of rail testing standards.

GENT, BELGIUM

Warringtonfire Gent is accredited according to NBN EN ISO / IEC 17025 and mainly performs tests on construction products and materials used in transport (train, tram, bus, aeroplane, car, shipbuilding and off-shore industry).

As a privileged partner of Gent University and founding member of EGOLF, Warringtonfire Gent is your first partner for fire safety expertise.

Our fire testing capabilities within the rail industry include:

- Official fire classifications, in relation to the European Construction Products Directive and EN 13501 as well as according to transport standards, such as EN45545 and IMO FTP code
- Fire testing according to EN 45545 (Railway applications – Fire protection on railway vehicles), Part 2: Requirements for fire behavior of materials and components including:
  - EN ISO 4589-2
  - ISO 5658-2
  - ISO 5660-1
  - EN ISO 9239-1
  - EN ISO 11925-2
  - And all tests for EN 13501-1
  - Ad hoc tests on real scale to examine particular situations.

FRANKFURT, GERMANY

Warringtonfire Frankfurt is accredited according to DIN EN ISO / IEC 17025 and is officially acknowledged as a fire test center by the EBA.

Our fire testing capabilities within the rail industry include:

- Testing of railcar seats according to DIN 5510-2 and TL of the Deutsche Bahn AG and UIC 564-2
- Testing of subway and streetcar seats according to DIN 5510-2 including:
  - DIN 54837 Classifications: burning behavior S1-S5; smoke development SR1-SR2; dripping ST1- ST2
  - Testing of flooring materials, classification SF1-SF3; DIN 4102-14 or DIN EN ISO 9239-1
  - Toxicity, Annex C, D, DIN EN ISO 5659-2
  - DIN 53438, 1-3 (nicht nachweispflichtige Fahrzeugteile) Classification: S1 (K1, F1)
- Testing according to UIC-564-2
- Fire testing according to EN 45545 (Railway applications – Fire protection on railway vehicles), Part 2: Requirements for fire behavior of materials and components including:
  - Cone calorimeter, DIN EN ISO 5660-1, -2 and ASTM E 1354
  - Spread of flame, DIN EN ISO 5658-2, CFE
  - Smoke density and toxicity, DIN EN ISO 5659-2
  - Oxygen-Index-Test (LOI), DIN EN ISO 4589-2
  - Railcar seats, Annex B.

WARRINGTON, UK

Warringtonfire Warrington is accredited by UKAS according to ISO / IEC 17025, holds Certifer approval for rail testing and offers a comprehensive range of impartial fire safety services for the international rail industry. From developing fire safety design strategies and the testing and certification of fire protection products, to inspection commissioning and certification of completed projects, we can help with all aspects of fire safety for rail.

Our reaction to fire testing services for the rail industry include:

- BS 6853 – Code of practice for fire precautions in the design and construction of passenger carrying trains
- London Underground Limited (LUL), Category: CAT1, Number: S1085, Issue Number: A4
- Fire testing according to EN 45545 (Railway applications –Fire protection on railway vehicles), Part 2: Requirements for fire behavior, of materials and components.
- NF F 16-101 – Railway rolling-stock, Fire behavior, Choice of materials
- UIC 564-2 – Regulations relating to fire protection and firefighting measures in passenger carrying railway vehicles or assimilated vehicles used on international services.

WEDNESBURY, UK

Element's transportation UK test facility based in the West Midlands is accredited by UKAS to ISO / IEC 17025 and offers a comprehensive range of performance and product type testing to support a wide variety of industry requirements.

Our rail component testing services include:

- Environmental testing to BS EN 60068-2-38, BS EN 60068-2-30, ISO 6270-2 Methods
- Accelerated weather testing to ISO 11507, ISO 4892-2, ISO 4892-3, ISO 105-B02 Methods
- Corrosion testing to ISO 9227 (NSS & Cass), B380, ASTM B117 Methods
- Tensile testing to EN ISO 13934-1, ISO 1421, BS EN 1465, ISO 9664 Methods
- Colorfastness and chemical/solvent testing to BS EN 60068 & BS EN ISO 105 Methods
- Physical and performance testing
- Air quality testing
- Functionality and endurance testing.

STEVENAGE, UK

Warringtonfire's furniture testing business FIRA International is accredited by UKAS to ISO / IEC 17025 for BS 5459-2, EN 16139 and EN 12727 and specializes in the testing of railway carriage seating for leading global train manufacturers as well as the ergonomic assessment of key station infrastructure.

Our services to the rail industry include the following for both railways carriages and stations:

Seat Testing

- Strength and durability testing of passenger and driver seats in line with train operator specifications, based on BS 5459-2: 2000 +A2: 2008 Specification for performance requirements and tests for office furniture. Office pedestal seating for use by persons weighing up to 150kg and for use up to 24 hours a day, including type-approval tests for individual components and EN 16139: 2013 Furniture. Strength, durability and safety. Requirements for non-domestic seating
- Testing of upholstery performance of passenger seats to BS 6261: 1982.Method for evaluating the application of and interaction between components in upholstered furniture to assess the performance of the upholstered seat in us
- Station seat testing to EN 16139; 2013 Furniture. Strength, durability and safety. Requirements for non-domestic seating EN 12727: 2000 Furniture. Ranked seating. Test methods and requirements for strength and durability.

ERGONOMIC ASSESSMENTS

- Access systems between train carriage and station platform for high risk users
- Access to ticket booths and similar installations
- Control room layout.

www.warringtonfire.com