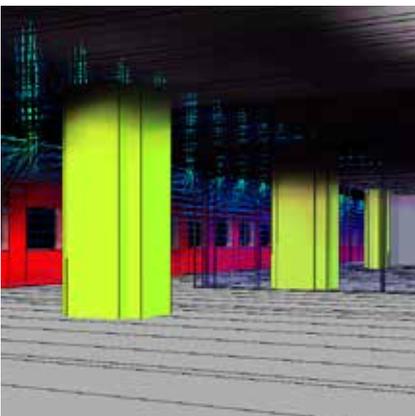




INSTITUTE FOR APPLIED FIRE SAFETY RESEARCH

- FIRE ENGINEERING
- CONSULTING
- TESTING



ASKING.
ANALYSING.
ANSWERING.



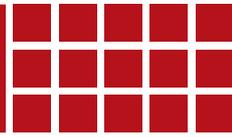
IFAB – INSTITUTE FOR APPLIED FIRE SAFETY RESEARCH

IFAB is one of the most experienced institutes in Fire Safety Consultancy and Research in the world. The IFAB team has been involved in fire testing since 1994, and benefits from the experience gained from over 1800 fire tests in different applications. In addition to fire testing, today IFAB also focuses on fire engineering. IFAB's services cover fire protection consultancy, fire protection design and fire testing. The Company Mission is to provide innovative and effective fire protection services to clients at reasonable cost. IFAB is eager for challenges; the tougher the request from a client, the more determined IFAB is to solve it:

- » We are **ASKING**.
- » We are **ANALYSING**.
- » We are **ANSWERING**.

IFAB – A DIFFERENT APPROACH

IFAB knows fire in practice and is therefore different from other organizations that only design on a theoretical basis. IFAB's approach is to utilise the information it has collected from numerous fire tests to ensure the most effective fire safety solutions. This gives a clear advantage when compared, for example, to simply using other modern tools like computational fluid dynamics (CFD), because the theoretical models can be validated with IFAB's own experimental data. IFAB has state of the art quality management systems. Not only is the company itself accredited according to DIN EN ISO/IEC 17025 as test laboratory, but several members of the IFAB team also have accreditation in other specialised fire safety topics.



IFAB – OUR SERVICES

IFAB provides a full range of services, from fire risk analysis and feasibility studies to the commissioning of different fire protection systems and solutions. IFAB's background is in fire testing and research. This ensures that the design methods used and solutions provided are technically and commercially optimised, providing the best value for clients.

» CONSULTING AND DESIGN

IFAB offers consulting services across different application areas, from feasibility studies to system acceptance testing. These services include detailed designs, site supervision and on-site tests. IFAB's approach is to utilize the knowledge gained from experimental fire tests and build a holistic fire safety solution for the client.

» FIRE AND SMOKE TESTING

To date IFAB's team has carried out over 1800 full scale fire tests, and it carries out more tests every year. The product portfolio covers everything from small laboratory scale tests to full scale truck fires in tunnels.

The IFAB team is also constantly carrying out smoke tests for various applications such as trains and metro stations. IFAB as accredited fire test laboratory complies with DIN EN ISO/IEC 17025.

» COMPUTATIONAL FLUID DYNAMICS (CFD)

IFAB uses computational fluid dynamics (CFD) for modelling smoke behaviour and also to model the impact of fire suppression systems on fire and smoke. The major advantage offered by IFAB is its massive fire test database, which can be used for the validation of CFD models.

IFAB also uses CFD for evaluating evacuation plans.

» INDEPENDENT CHECKER AND FIRE INVESTIGATIONS

IFAB personnel are qualified to work as independent checkers and reviewers of fire safety designs. Fire investigations are also part of the service portfolio.

» RELIABILITY ENGINEERING

IFAB offers reliability engineering services. IFAB's certified engineers can support clients in their product development and in the approval process. Alternatively, complete fire protection systems can be examined using for example RAM+S or LCC analysis.

» TRAININGS AND SEMINARS

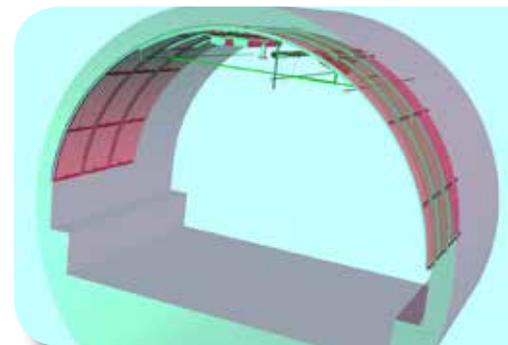
IFAB organizes training sessions and seminars on a variety of fire fighting topics. Some training sessions are meant for a wider public, others are tailored to customer needs. Training sessions can be at the customer's or at IFAB's premises.



Charité Berlin project



Metro Cologne project



Dartford Crossing tunnel project

IFAB has carried out over 200 full scale fire tests for tunnel and metro applications. For tests on fixed fire fighting systems with a very high design heat release rate of over 100 MW, IFAB is the most experienced test organization in the world. By using the knowledge gained from real fires in these challenging environments, IFAB engineers are able to produce effective and innovative fire safety designs for tunnel and metro applications. These facilities are often not well covered by existing standards and require engineered solutions. This emphasises the need for excellence in the field, and for the in-depth knowledge that IFAB has to offer.

IFAB can offer consultancy, design and testing services that cover the whole process – everything from a complete fire risk analysis to commissioning tests for fire safety systems. The IFAB product portfolio includes:

- » FIRE RISK ANALYSIS
- » FIRE SAFETY CONCEPTS
- » FIXED FIRE FIGHTING SYSTEMS
- » FIRE INVESTIGATION
- » FIRE AND SMOKE TESTING
- » COMPUTATIONAL FLUID DYNAMICS (CFD)
- » VENTILATION SYSTEMS
- » RELIABILITY ENGINEERING
- » TRAINING AND SEMINARS

IFAB is also a fire safety specialist for other infrastructure and rail applications, which ensures holistic fire protection solutions. IFAB has reference clients who represent tunnel operators and fire protection manufacturers with a global reputation. IFAB's engineers are known for delivering high quality consultancy and testing services on schedule. IFAB personnel have extensive experience in tunnel and metro applications both in practice and in research. IFAB is one of the key research organizations within the tunnel safety field, and its personnel serve on most well-known committees for tunnel fire safety standards and research.

Autostrada Brennero tunnel project



IFAB is one of the most experienced fire protection consultancy and testing companies for the rail industry. IFAB's experienced engineers are the right partners to consult when it comes to guaranteeing the safety of all kinds of rolling stock - high speed trains, locomotives, light rail vehicles, double deck coaches, special rail vehicles and so on.

IFAB's references cover well-known operators and manufacturers. IFAB's team has been involved in fire protection for over 1000 rail vehicles, and it even has engineers qualified to conduct fire investigations. IFAB's product portfolio for rail includes every stage of safety design for rolling stock.

Our services include:

- » FIRE RISK ANALYSIS
- » FIRE SAFETY CONCEPTS
- » FIRE INVESTIGATIONS
- » FIRE AND SMOKE TESTING
- » COMPUTATIONAL FLUID DYNAMICS (CFD)
- » CONSULTING ON FIRE SAFETY STANDARDS
- » RELIABILITY ENGINEERING
- » TRAINING AND SEMINARS



Stadler Flirt project

IFAB is known for its innovative designs for rail applications. With their previous experience in the railway industry, IFAB's engineers are also able to take operational aspects into account. In addition, IFAB engineers are very familiar with rolling stock standards and even provide consultancy on them. Reliability engineering is an integral part of IFAB's designs. This ensures that designs and concepts comply with the requirements set by various authorities.

IFAB can provide holistic safety concepts that cover not only rail applications but also the surrounding infrastructure such as stations and tunnels. The advantage of this is that, by using different fire safety methods that compensate for each other, it is possible to find the best overall concept. The aim is to get safer designs with lower costs.

This approach has been utilised on previous reference projects. IFAB has many references for most European rolling stock manufacturers and many rail operators around the world.

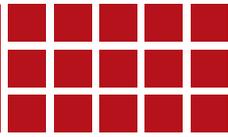


Hamburg Elbphilharmonie project

Buildings and industrial represent the applications that are most often covered by standards. IFAB personnel can provide fire safety consultancy, design and testing services in accordance with international and national standards and requirements. IFAB has in-depth knowledge not only of the standards but also of fires. This is a major benefit in applications that have areas that are not covered by standards. Industrial applications in particular often have non-classified hazards, or a client may request higher protection than that required by the standards. These applications are ideal areas for IFAB with its wealth of knowledge, since it can even carry out laboratory or full scale fire tests to develop and demonstrate the optimal and most cost effective fire protection solution.

IFAB is constantly carrying out fire and smoke tests for buildings and industrial applications. IFAB personnel have conducted more than 1800 fire tests in total. IFAB can carry out all standard tests with fire extinguishing systems, in accordance with IMO, FM, CEN, DIN and VdS etc. In addition, IFAB is known for its competence in developing its own test protocols and for carrying out ad-hoc fire tests. These tests are typically made for buildings that are not covered by fire standards or for special hazards in industrial applications. IFAB's product portfolio for buildings and industrial applications includes:

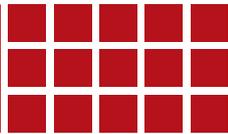
- » FIRE RISK ANALYSIS
- » FIRE SAFETY CONCEPTS
- » FIRE TESTING (STANDARD AND AD-HOC)
- » SMOKE TESTING
- » FIRE INVESTIGATIONS
- » INDEPENDENT CHECKER SERVICES
- » COMPUTATIONAL FLUID DYNAMICS (CFD)
- » RELIABILITY ENGINEERING
- » TRAINING AND SEMINARS



IFAB employs accredited engineers to carry out reliability analysis and designs for fire safety systems. Reliability engineering is a common practice used in a wide variety of industries and applications, but so far its use has been limited in relation to fire protection. This is changing since fire protection systems are of vital importance for the protection of life and property. Reliability engineering has to be an integral part of all fire safety systems used for example in rail or highly hazardous applications such as the nuclear power and oil industries.

Reliability engineering focuses on the ability of a fire protection system or component to function under expected conditions for a specified period of time. The process also typically considers maintainability and safety, since they are closely linked to reliability. The same tools can also be used to determine life cycle costs.

REFERENCES



IFAB has many reference projects for designing and analysing both single fire protection products and complete fire safety systems. IFAB has numerous references with different clients in various application areas for fire safety. Many of IFAB's key accounts are world famous brands. A full reference list is available at www.ifab-fire.com; a short list is given below of references in which the IFAB team has been involved:

STANDARDISATION & RESEARCH

IWMA, CEN, ITA-COSUF, NFPA, UPTUN, SOLIT, SOLIT 2

FIRE SAFETY CONCEPTS, DESIGNS AND RISK ANALYSIS

Television Tower Munich, City Museum Moers, Elbphilharmonie Hamburg, Main Station Cologne, Clock Tower Mecca, Nuclear fusion power plant Greifswald, DESY particle accelerator Hamburg, Engine test cells at Daimler, BMW and others, State Archive Paris, Rober-Koch-Institute Berlin, Laboratories of University of Gießen, Paracelsus Hospital Marl, Furniture market Hardeck Bochum, Metro Prague, Eurotunnel France, New Tyne Crossing Tunnel UK, Dartford Crossing Tunnels UK, Virgolo Tunnel Italy, Tunnel Jagdberg Germany, M30 Tunnels Spain, Trains for Bombadier, Siemens, Stadler, Alstom, PESA, CAF, VBK, Windhoff etc.

FIRE AND SMOKE TESTS

Elbphilharmonie Hamburg Grand concert hall - Fixed fire suppression in the auditorium, Mecca Royal Clock Tower - Fixed fire suppression with high ceiling, EVAG - Fixed fire suppression in railway vehicles, COMPO - Conveyor belt protection, FEV - Engine test cells, Siemens Desiro - Diesel locomotive protection, Thyssen Krupp Transrapid - Coach protection, FOGTEC - Fixed fire suppression in transformer stations, VdS-Approvals - Cable Ducts, OH1 and OH3 scenarios, Federal Institute for Materials Research and Testing (BAM) - Comparison of different fire suppression technologies in buses, Hitachi Monorail - Fixed fire suppression in railway vehicles, Verkehrsbetriebe Karlsruhe - Smoke tests in cable cars, Stadler Swiss - Fixed fire suppression in switchboards on railcars, EMOC - Fixed fire suppression in large paper archives, Alstom High Speed Train - Aerosol fire suppression systems, FOGTEC - Fixed fire suppression for vertical glass facades.

■ FIRE SAFETY SERVICES

CONSULTING

CONCEPTS

FEASIBILITY STUDIES

RISK ANALYSIS

CFD (FIRE, SMOKE, EVACUATION, VENTILATION, SUPPRESSION)

PERFORMANCE BASED DESIGNS (FIXED FIRE FIGHTING SYSTEMS)

TENDER PREPARATION AND EVALUATION

FIRE TESTING (LABORATORY OR FULL SCALE)

SMOKE TESTING

APPROVAL SERVICES

FIRE INVESTIGATIONS

SEMINARS, TRAINING

RELIABILITY ENGINEERING

■ FOR

TUNNELS & METRO

RAIL

BUILDINGS & INDUSTRY

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