PAVING THE ROAD FORWARD FOR OUR CLIENTS
CONTENTS
Executive Message 4
REGIONS
China 6
Europe 8
India 10
Latin America 12
United Kingdom 14
FEATURE
Tianjin Fire Research Institute 16
The International Codes and Standards Group, like all at FM Global, is in it for the long term.

As our current and future clients establish themselves in emerging markets, the building codes and standards they encounter could have an adverse effect on their risk profile. Our job is to influence and elevate those standards wherever necessary to help our policyholders build or maintain a strong risk profile. In this way, we contribute to the long-term value that FM Global, as a mutual company, offers its clients.

By engaging public officials, research organizations and the general public, our team works to help pave the road to achieving sprinklered buildings. Our purpose, by design, is to support our operations and their commitment to make our clients more resilient wherever they do business. It is a shared endeavor.

For International Codes and Standards (ICS), tales of overnight success are rare. As our clients move into new markets, their attempts to follow FM Global loss prevention recommendations can sometimes hit a roadblock. Whether it is in Asia, Latin America or Europe, our objective is to clear those obstacles. We fully understand local codes and regulations so that we can articulate how they may differ from requirements in FM Global Property Loss Prevention Data Sheets, and why sprinklers are necessary.

I am pleased that our work is yielding results. With every new inroad, we are improving consistency, changing preconceived notions, and ultimately helping to secure our clients’ long-term stability. Through collaboration with organizations such as the Business Sprinkler Alliance, the Brazilian Sprinkler Institute and the Fire Loss Prevention Forum of India, we spread the message that the benefit of fire sprinklers reaches beyond property protection.

The knowledge and support of our operations offices has been instrumental. Together we are helping to make businesses more resilient through education and by demonstrating the importance of effective fire protection. It is challenging enough for our clients and other businesses when moving into a new country. The work performed by our team will pave a smooth road for the introduction of sprinkler protection in markets throughout the world.

Christopher Wieczorek, Ph.D.
Vice President, Manager, International Codes and Standards
In China, International Codes and Standards has a long history of working with the government to improve fire codes and regulations.

FM Global’s reputation as an expert in loss prevention has made it a respected voice among researchers and fire officials in China, helping protect FM Global clients throughout the country.

ICS is currently working with one of China’s leading fire research institutes on a multi-year project to better protect certain types of warehouses and factories.

The national fire code in China is generally quite strict, especially for buildings where large numbers of people gather, like public buildings, office buildings, shopping malls and airports. But for industrial buildings, manufacturing facilities and warehouses, the code is not as strict. Many industrial buildings and warehouses are not required to have sprinklers.

This gap in the code can leave FM Global clients susceptible to large industrial and warehouse fires. To help make its clients more resilient, FM Global is currently working with the Tianjin Fire Research Institute (TFRI) to demonstrate the value of sprinklers in certain classes of warehouses.

The current research project with TFRI will likely lead to sprinklers being required for Class D and E warehouses when the country’s new fire protection code GB50016 is revised at the end of 2017.

FM Global has a long history of working with TFRI that dates back to the 1970s (see related story page 16). The relationship has made FM Global a trusted partner in China, not only at TFRI but at China’s three other fire research institutes—the Sichuan Fire Research Institute (SCFRI), the Shenyang Fire Research Institute (SYFRI) and the Shanghai Fire Research Institute (SHFRI).

Work to improve the fire codes is not always about making the sprinkler requirements more stringent. For example, buildings in China with ceiling heights of greater than 12 meters (39 feet) were required to install water cannons instead of sprinklers. Working with TFRI, FM Global helped conduct research that showed sprinkler effectiveness beyond 12 meters. The height limit for sprinklers in public buildings has since been raised to 18 meters (59 feet). FM Global is working to have that limit raised for all classes of industrial buildings. This change in the code could allow FM Global clients to reduce their costs by utilizing the optimal fire protection system.

“We have a very good reputation in China,” explains Rachel Yin, Ph.D., codes and standards consultant. “Sometimes doing the research and changing the codes is a long process, but usually our message is well-received and that can only benefit our clients.”

Because of its reputation, FM Global has been invited to serve on national committees responsible for the codes governing the installation and testing standards for sprinkler systems. Fenghui Jiang, Ph.D., operations chief engineer, Asia operations, sits on the installation committee; and Bert Yu, Ph.D., staff vice president, principal research scientist, sits on the sprinkler testing standard committee. By having a voice on these committees, FM Global can help ensure that the codes reflect the best in fire protection research and application.

FIRE CODE IMPROVEMENT ISN’T ALWAYS ABOUT MAKING SPRINKLER REQUIREMENTS MORE STRINGENT.

This change in the code could allow all FM Global clients to reduce their costs by utilizing the optimal fire protection system.
Promoting the use of sprinklers in Europe is all about changing perceptions.

Misconceptions about sprinklers, their cost, their value as a loss prevention tool, and the belief that industrial fires are uncommon, have slowed the adoption of sprinklers in many European countries. Most European fire codes, like those in the U.K., are centered around life safety. Sprinklers are primarily seen as property protection devices and thus don’t make it into many European fire codes.

ICS has been working to change this type of perception. Throughout Europe, ICS has worked with local governments, industrial groups and firefighter organizations to promote sprinkler usage and provide information about the economic and life safety benefits of sprinkler protection.

In France, FM Global has been conducting sprinkle courses for officers of the Fire Service to raise awareness of the benefits of sprinklers. There are very few requirements for automatic sprinklers in the French codes, but their installation can be used to offset other aspects of passive fire protection. The Fire Service and the regional DREAL (department advising on environment, development and housing) have the final say in modifying fire codes if sprinklers are present.

FM Global’s efforts are paying off. Throughout the country, the Fire Service is not only accepting sprinkler offsets but in some cases recommending them. This has potential benefit to FM Global clients, who can reduce property loss by installing sprinklers and eliminate the cost of other fire protection requirements.

In Germany, ICS has launched a project to study the economic impact of the use of sprinklers. German building codes restrict compartment sizes in industrial facilities and rely heavily on firewalls and fire doors to protect occupants. The codes allow for designs with larger compartments and fewer firewalls if sprinklers are used. ICS is leading an effort among local experts to conduct a cost-benefit analysis of the firewall protection design versus a facility protected by sprinklers.

“Essentially, we are designing two factories, one with sprinklers and one without,” said Bruce Bromage, assistant vice president, senior consultant, International Codes and Standards. “We’re going to see what the true cost really is. We think people will be surprised at the economic benefits of putting sprinklers in a factory.”

FM Global is also raising awareness of the devastating effects of industrial fires, combating the belief that huge fires do not occur in European countries. This myth may be rooted in some historic truth. In many European countries, industrial buildings were constructed with reinforced concrete and as such were less susceptible to fires. Newer industrial facilities are being built out of steel with insulation that can be combustible, making them more susceptible. However, the perception that large industrial fires do not occur in Europe still remains, adds Bromage, and “ICS is working to change that perception.”

Throughout Europe, fire protection is moving away from prescription-based codes to performance-based, where more attention is paid to the risk and how the fire protection solution helps to minimize it. In Italy, for example, a performance-based code issued in 2015 recognizes that the installation of automatic sprinklers reduces the level of risk. This is good news for FM Global and its clients, given FM Global’s ability to clearly demonstrate the loss prevention value of sprinklers.

We think people will be surprised at the economic benefits of putting sprinklers in a factory.

In 2016, there were two major fires in meat processing facilities in Germany, both causing more than €100 million in damage. Those fires prompted FM Global to conduct a study of industrial fires in the food industry. The study found there were 88 fires over a five-year period (2010 – 2014). The study also identified 11 major food industry fires in the last 10 years, all of which had more than €10 million in damage and three, including the two last year, with more than €100 million in damage.

More striking than the sheer number of fires, was the impact of sprinklers on the overall damage to the facilities. The average damage in a factory with a well-designed and fully functional sprinkler system was €580,000. The figure for factories lacking sprinklers or where the protection was inadequate was €8,450,000, nearly 15 times more.

### AVERAGE DAMAGE OF AN INDUSTRIAL FIRE IN THE FOOD INDUSTRY

- **Factory with a well-designed and fully functional sprinkler system:** 
  - ENVIRONMENTAL IMPACT
  - LOSS OF LIVES
  - LOCAL IMPACT
  - PLC DETRIMENT
  - **SEVERE ECONOMIC CONSEQUENCES**
  - €580,000

- **Factory lacking sprinklers or where the protection was inadequate:**
  - ENVIRONMENTAL IMPACT
  - LOSS OF LIVES
  - LOCAL IMPACT
  - PLC DETRIMENT
  - **SEVERE ECONOMIC CONSEQUENCES**
  - €8,450,000

15 TIMES MORE!
International Codes and Standards has been focused on a rare opportunity to advance fire and sprinkler protection within the national building codes in India, ultimately helping FM Global clients better protect themselves against devastating fires.

It has been more than 10 years since the National Building Code of India (NBC) has been revised. The NBC is a special publication of the Bureau of Indian Standards (BIS) and provides guidelines for regulating building construction activities across the country. The code is currently being reviewed and provides an opportunity to standardize fire protection, fire prevention and life safety regulations throughout India.

While the NBC is a national-level code, individual states frame their own fire prevention and life safety rules. These codes and their enforcement can vary widely from state to state. But the revised NBC could bring a consistent, national approach to fire protection. The NBC lays down a national set of minimum provisions for building design to ensure public safety, including structural sufficiency, fire hazard and health safety. FM Global has been working to improve overall fire protection, including in warehouse and manufacturing facilities.

Sumit Khanna, FM Global codes and standards consultant, has been working closely with the Civil Engineering Division (CED) panel for fire protection, and the individuals on that committee responsible for writing fire protection guidelines. Khanna has been able to make formal presentations to committee members, share FM Global data sheets and standards, and set up meetings to showcase the development in sprinkler technology for fire loss prevention.

He also sits on the subcommittee that writes product and sprinkler design and installation standards. And he has formally requested an FM Global seat on the committee responsible for special hazards.

ICS helped to create the Fire Loss Prevention Forum of India, which brings together state and local authorities, leading academic experts and FM Global scientists and researchers to discuss ways to improve fire loss prevention in India.

FM Global has held loss prevention and sprinkler design and installation training for fire authorities and consultants in Mumbai, Pune, Delhi, Lucknow, Hyderabad, Goa and Bangalore—all areas with advanced economies and home to several FM Global clients. It has also conducted training for authorities with local jurisdiction over fire safety and building codes. This helps the local authorities understand the most advanced standards, which is beneficial to FM Global clients when they submit plans for approval.

ICS is working to spread the message of sprinkler protection among local authorities and the firefighting community.

In addition, the team has written articles on sprinkler protection, issues of corrosion in pipes, high-ceiling warehouse protection and new in-rack guidelines with virtual floor concepts for the National Association of Fire Officers Journal. Its members have lectured at the National Fire Service College and led training and workshops with the Fire and Security Association of India (FSAI) and the Indian Chamber of Commerce.

FM Global is also providing design and equipment specifications for new fire labs at the National Fire Service College and is conducting joint research with IIT-Madras on the fire propagation apparatus (FPA). Faculty and students of IIT-Madras have spent time working with staff at FM Global research facilities to further develop fire research programs in India.

“We have a very good reputation overall in the fire protection community,” Khanna explains. “We have a real interest in upgrading the local codes and the local standards. We are seen as a knowledge resource ready to share information on fire loss prevention, which ultimately helps India, and of course our clients, in preventing fire losses.”

ICS’s focus on India’s National Building Code is aimed at helping clients become more resilient. FM Global’s loss experience, history and research clearly indicate that sprinkler systems are the single most effective fire prevention tool.
Throughout Latin America, International Codes and Standards (ICS) is working to raise the collective voice of the sprinkler protection industry.

Sprinklers are unmatched in protecting against fire loss. When the right system is used, properly installed and maintained, the likelihood of a catastrophic loss is greatly reduced. Through the work of ICS, several industry groups have been formed throughout Latin America to help deliver that message. These groups work with authorities to get sprinkler codes created, increase the use of sprinklers in industrial facilities and ensure equipment and installation standards are met.

“We identified from the start that there was a disconnect among the stakeholders of the fire protection industry,” explains FM Global’s Marcelo Lima, assistant vice president, senior codes and standards consultant. “The first step was to try to organize the sprinkler sector so there would be a representative voice with government authorities.”

Nowhere is that more evident than in Brazil. Work by the Brazilian Sprinkler Institute (ISB) has helped raise fire protection awareness, and efforts by the Brazilian Sprinkler Association (ABSpk) have helped improve understanding of the value of sprinkler protection, the Brazilian Sprinkler Institute (ISB) and representatives of the insurance industry.

The idea of an organized sprinkler sector is spreading to other countries.

In Mexico, FM Global helped create the Mexican Sprinkler Association (AMRACI), which now has more than 100 member companies. AMRACI has been a catalyst for action over the last four years, helping shape fire codes that are still in their infancy in Mexico. It also was the driving force behind the production of the country’s first national sprinkler installation standard, which will be a requirement in all new federal buildings in Mexico.

The group was invited to be part of the committee revising NOM-002, a safety-in-the-workplace national standard that is a reference in fire protection. AMRACI has also been very active in providing training and certification for sprinkler designers and contractors.

The idea of an organized sprinkler sector is spreading to other countries. Colombian companies created their own association (ANRACI) last year, following in the steps of ABSpk and AMRACI. "The greater the understanding of the value of sprinkler protection, the better protected our clients will be," Lima concludes.

Left: Members of the Advisory Council to the Brazilian Parliamentary Fire Safety Caucus, composed of members of government, regulatory agencies, private industry and academia, met in Brasilia, Brazil, to discuss proposals on fire safety policy for consideration at the federal level.

International Codes and Standards and the Brazilian Sprinkler Institute (ISB) have been working together for the last four years to develop more information and local literature about fire safety and fire protection in Brazil. Since 2013, the ISB has awarded a US$3,000 cash prize for the best academic paper of sprinkler usage in Brazil. The winner is invited to visit the FM Global Research Campus in Rhode Island, USA, and the papers are published and offered free of charge.
In the U.K., International Codes and Standards challenges misconceptions about fire regulations, frequency of industrial fires and cost of sprinkler protection.

A strong group has been formed in the U.K., advocating the use of sprinklers in industrial and commercial buildings. The ICS, instrumental in forming this group, coordinates actions on fire-related issues (particularly sprinklers), brings forward new data to government officials, and educates construction and business leaders on the value of sprinklers.

The building and fire regulations in the U.K. have long been primarily constructed around life safety, and property protection is not considered. “This point is widely misunderstood by building users and developers who feel current regulations lead to buildings that are adequately protected against fire. This is simply not how the regulations are formed,” explains Tom Roche, FM Global assistant vice president, senior codes and standards consultant. While FM Global’s research shows that sprinklers are one of the most effective ways to protect against property loss, sprinklers are not automatically required for warehouses or industrial complexes.

ICS has been attempting to raise awareness and get sprinkler requirements included in the national fire regulations. Most of the work is done through the Business Sprinkler Alliance (BSA), which FM Global helped to form. The BSA advocates for increased acceptance and use of fire sprinklers in commercial and industrial premises, and it has sought to create connections across government, parliament and the fire protection sector to ensure that the discussion is pushed at both local and national levels.

At the same time, the BSA is building evidence to foster changes to the current building fire regulations that have not been substantively reviewed in the last 10 years. FM Global is ideally placed to support this, explains Roche. “In an established market it is important that you bring evidence to the table, to effect change, and this is where FM Global has a lot to offer.”

The outreach goes beyond the U.K. In May, FM Global led a panel session on making infrastructure more resilient at the Understanding Risk 2016 Conference in Venice (see conference photos at right). The conference is run by the Global Facility for Disaster Reduction and Recovery, an organization within the World Bank, and drew more than 350 risk professionals from more than 100 countries. At the conference, Roche led the panel session, “Check the Vitals: Making Infrastructure More Resilient” which included experts from Canada, India, Italy and Japan. His presentation is now available online: understandrisk.org/event-session/check-the-vitals/

Roche is also working with his colleagues around the world on a Building Code Ranking. The Ranking looks at building codes around the world and their effectiveness in protecting against fires and other natural hazards. The system ranks building codes based on the experience of FM Global’s field engineering force who rate the requirements within the code and how the code is observed and enforced. The code ranking will be used in the FM Global Resilience Index, which helps multinational clients and all commercial businesses to understand the relative risk to their facilities around the world, and when it may be necessary to go beyond the fire protection guidelines in those codes.

The BSA collects data on industrial fires throughout the U.K. The data is used to show businesses and government agencies just how prevalent industrial fires are, and the impact of sprinklers in reducing those fires. The BSA website includes an interactive map (shown at left) that details “sprinkler saves” and significant unsprinklered fires in industrial and commercial premises since January 2012. The BSA has documented more than 100 industrial buildings saved by sprinklers in the last five years.
By bringing together the scientific and fire protection community, International Codes and Standards (ICS) has been able to spearhead changes in fire codes around the world.

In China, ICS is building on FM Global’s long and beneficial partnership with the Tianjin Fire Research Institute (TFRI). FM Global and TFRI have been working together to understand the science behind fire and fire protection for more than 30 years.

The partnership began soon after the U.S. and China established full diplomatic relations in 1979, through the efforts of Dr. Cheng Yao, FM Global’s research division manager at the time, who opened a dialogue with China’s four fire research institutes. The relationships with all four have grown ever since, including a particularly strong connection with Tianjin.

“My colleagues have a very long and successful relationship with FM Global,” explains Bingjie Yang, researcher with the TFRI Fire Code Department. “FM Global has provided a great deal of technical support for our fire testing research and has shared a lot of information which has helped us as we revise our codes and standards.”

Established in 1965, TFRI is one of the leading fire science research institutes in the world. Its work includes fire theory research, fire-cause analysis and determination, research on fire protection and
prevention technology; fire engineering technology; and fire code standardization. It is also home to the national quality inspection center which conducts product testing on fixed firefighting systems and fire-resistant building components.

Over the years, ICS and TFRI have worked closely, partnering on research projects and sharing results. FM Global has shared its technical knowledge on testing equipment and building test facilities, and has hosted scientists from TFRI at the Center for Property Risk Solutions in Norwood, Mass., USA. On its end, the TFRI quality inspection center now does product testing for FM Approvals on building materials and fire protection systems used by FM Global clients in China.

“Today we work more in cooperation on projects,” says Dr. Xin Liu, a researcher at the TFRI Fire Testing Department for the last 10 years. “When we started large-scale fire testing, FM Global shared its knowledge and experience for setting up the testing lab and for conducting large-scale tests.”

Dr. Liu even spent a year in the United States as a visiting scholar. She worked with FM Global engineers and scientists at the company’s research center in Massachusetts and at its Research Campus in Rhode Island.

FM Global is currently working with TFRI to demonstrate the value of sprinklers in warehouses in specific classes. FM Global’s own research has long shown that facilities that store what are considered hard-to-combust or non-combustible materials (Class D & E facilities in China) can, and do, experience catastrophic fire losses.

“The belief in China is that Class D and E warehouses don’t contain combustible materials, so there is no fire hazard,” explains Rachel Yin, Ph.D., FM Global codes and standards consultant. “But they do have packing materials, cartons, wood pallets and other materials that pose a significant fire hazard.”

FM Global and TFRI started the discussion of the fire hazard in Class D and E warehouses in 2014. TFRI wanted to do its own research on sprinklers in these facilities. With the help of ICS, the research institute conducted several fire tests and surveyed 18 Class D and E warehouses. The fire tests showed the significant risk of fire, and 17 of the 18 warehouses surveyed were in need of sprinkler protection. “When they started doing the tests they expected the fires to be very small,” Yin explains, “but the tests show that they were in fact very large and the growth rate far exceeded their expectations.”

ICS is recommending additional tests this year and it is expected that sprinklers will be required for Class D and E warehouses when the new fire protection code GB50016 is revised at the end of 2017.

The new requirements will be similar to FM Global’s recommendations, which will increase protection against catastrophic loss for FM Global clients in China. It is just one example of the partnership providing value for FM Global clients and improving loss prevention efforts.

“By working closely with the Chinese fire institutes, we are able to share our research and our standards. As a result, our standards are closely aligned with those in the fire codes in China, which can only help our clients.”

BERT YU, PH.D., STAFF VICE PRESIDENT, PRINCIPAL RESEARCH SCIENTIST, FM GLOBAL
ICS Team and Contact Information

**Manager**
Christopher Wieczorek, Ph.D.
Vice President,
Manager International Codes and Standards
1 Windsor Dials
Windsor, POST-B SL4 1RS
United Kingdom
+44 (0) 1753 750 495

**Europe**
Bruce Bromage
Assistant Vice President,
Senior Codes and Standards Consultant
8 Cours du Triangle
La Defense Cedex
Paris 92937
France
+33 (0)1 46 93 31 50

**India**
Sumit Khanna
Codes and Standards Consultant
FME India
No. 1&2 Murphy Road, Ulsoor
Unit 902, 9th Floor, The Millenia Tower B
Bangalore 560008
India
+91 (0)80 6694 0223

**Latin America**
Marcelo Lima
Assistant Vice President,
Senior Codes and Standards Consultant
FM do Brasil Serviços de Prevenção de Perdas Ltda
Av. Pres. Juscelino Kubitschek, 360-15 andar
São Paulo, SP 04543-000
Brazil
+55 (0)11 3077 3831

**United Kingdom**
Tom Roche
Assistant Vice President,
Senior Codes and Standards Consultant
1 Windsor Dials
Windsor, SL4 1RS
United Kingdom
+44 (0)1753 750 330

**China**
Rachel Yin, Ph.D.
Codes and Standards Consultant
FME Shanghai – 222 Hubin Road
Unit 03-09, 3rd Floor, One Corporate Avenue,
Shanghai 31 200021
China
+86 (0)21 2329 8135

©2017 FM Global. All rights reserved.
Factory Mutual Insurance Company (FM Global) has developed this report for insurance underwriting purposes.
The report is provided to you for informational purposes only to reduce the possibility of loss to insured property
by bringing to your attention certain potential hazards or conditions. FM Global does not address life, safety or
health issues. You must make the decision whether to take any action. FM Global undertakes no duty to you or any
other party by providing this report or the activities on which it is based. The liability of FM Global is limited to that
contained in its insurance policies.