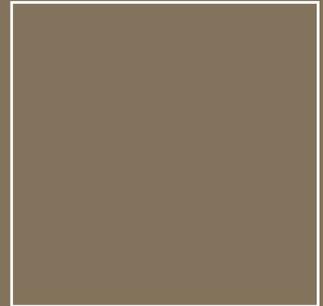
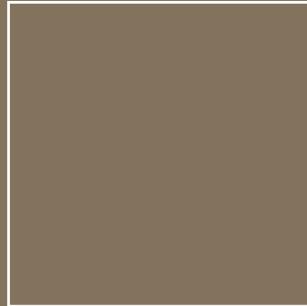
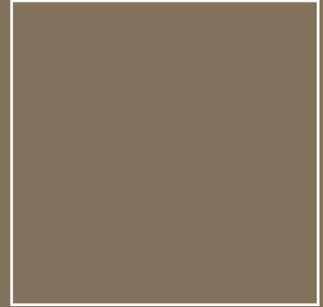
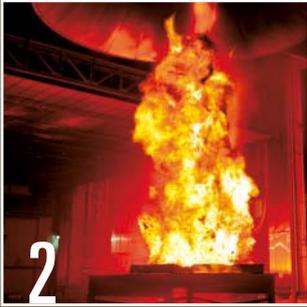


The FM Global Research Campus





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Exploration

Innovation

Mitigation

Delivering Superior Loss Prevention Through Research and Testing

FM Global's 1,600 acre (648 ha) Research Campus in West Glocester, R.I., USA, is the premier center for property loss prevention scientific research and product testing. Here, FM Global helps many of the world's largest companies understand how to prevent significant physical threats from affecting their properties and business operations.

The Research Campus also is a leading resource for manufacturers seeking third-party certification of their products. FM Approvals, an FM Global enterprise, provides assurance that a tested product's performance meets the highest property loss prevention standards and will perform as intended.

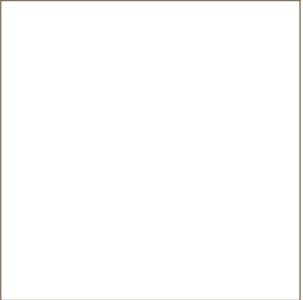
A Research Campus Like No Other

One of the most innovative research and testing centers in the world, the US\$78 million campus ranks as the largest investment in loss prevention FM Global has ever made. At the complex, distinguished scientists and loss prevention engineers conduct research in four main laboratories: *Fire Technology*, *Natural Hazards*, *Electrical Hazards* and *Hydraulics*. Each is equipped with the most advanced technology and was designed with property owners, product manufacturers and continuously evolving industry trends in mind. Another prominent feature is an explosion bunker specially designed to help visitors understand the damaging effects of dust explosion.

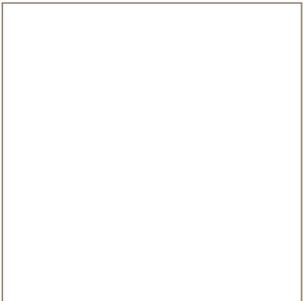
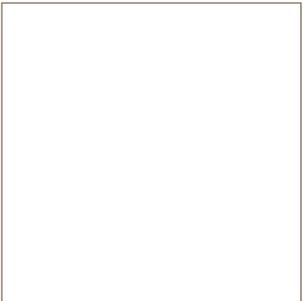
The Research Campus is located on the grounds where FM Global's Test Center has stood since 1967. Home of the world's first fire-products collector, the Test Center was long considered a world-class facility for the scientific study of property loss prevention. The new campus is equally impressive by 21st century standards. Here, our researchers can address the higher ceilings of newly constructed warehouses, reduce the time it takes to set-up and dismantle tests, and more realistically simulate the impact of natural hazards. Our clients can conveniently access research and testing services at a single location.



A heptane fuel test is conducted in the large-burn lab at the Research Campus.



Fire Technology Laboratory

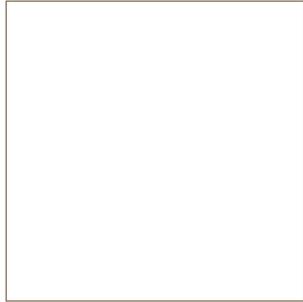
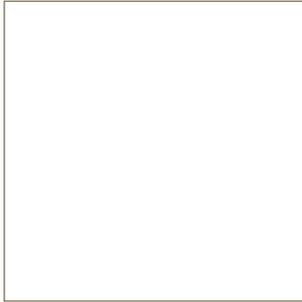


Fire begins when an ignition source connects with combustible material in the presence of oxygen. The formula is easy to grasp, but understanding the science of fire dynamics is anything but simple. At the Fire Technology Laboratory, we continue to advance the understanding of how materials and fire behave, measure and learn from the rate of heat release from different configurations of materials, and determine combustibility and protection requirements for different commodities produced and used by our clients.

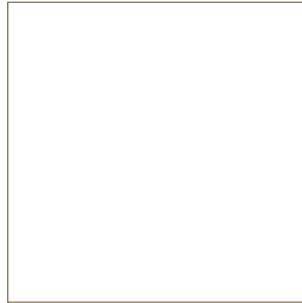
Spanning 108,000-ft.² (10,033-m²), FM Global's Fire Technology Laboratory is the centerpiece of the Research Campus and the largest facility of its type in the world. The laboratory's sheer size allows researchers to replicate warehouse-size fires of up to 2,000 F (1,093 C). Moreover, because several fire tests can be conducted simultaneously, clients don't have to wait long for research results. Through this full-scale testing, our researchers and engineers develop property loss prevention solutions that ultimately minimize operational downtime, supply chain interruption and loss of market share for our clients. The Fire Technology Laboratory also features several smaller labs for intermediate- and small-scale burn testing, enabling FM Global researchers to study a much broader range of commodities and storage arrangements.

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1. This one-megawatt fire-products collector, one of several located in the Fire Technology Laboratory, helps to quantify potential heat output of various products used or created by clients.
2. Sprinkler system control valves, such as these, regulate the distribution of water to the branch lines of large sprinkler systems widely used in industry.
3. A high-clearance test is conducted in the large-burn lab to determine the effects of a fire when a commodity is stored under a high ceiling.



Hydraulics Laboratory



Fire is the leading cause of property losses worldwide, yet it's been proven that devastating fire loss is indeed preventable with the proper sprinkler protection in place. By establishing performance criteria and through rigorous testing, engineers and researchers at the Hydraulics Laboratory have played a major role in FM Approvals' certification of devices used for cost-effective fire protection.

Projects undertaken at the Hydraulics Laboratory are driven by the needs of industry and by our clients' desire for fire protection that is effective, affordable and flexible. At the laboratory, sprinkler performance capabilities are scientifically understood and empirically tested so that, in the final analysis, there is no question about a system's effectiveness.

The laboratory houses both wet- and dry-lab test areas where engineers and technicians perform various hydraulic, mechanical and environmental tests on fire protection system components and related devices, such as sprinklers, couplings and valves. Tests such as these ensure the devices will work as intended when properly installed and maintained; and the cost of testing and development is kept to a minimum in an effort to make reliable and effective products available at an affordable price.



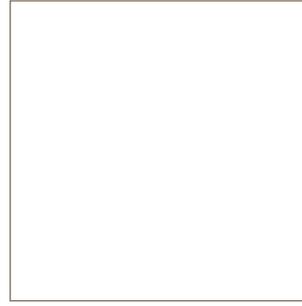
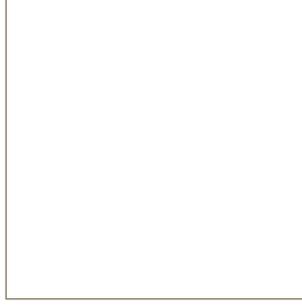
1. A multiple-sprinkler test determines the effectiveness of a system under study.
2. In the control room, tests are monitored and information is gathered for results and analysis.
3. A small sample of the hundreds of sprinkler models that have been tested and FM Approved.



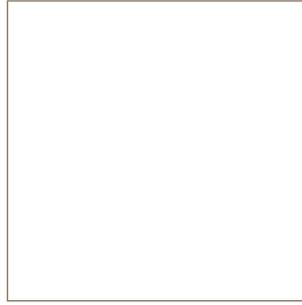
The main floor of the wet lab of the Hydraulics Laboratory is the central artery for testing the operational features of fire systems.



Engineers at the Natural Hazards Laboratory perform a wind uplift test on a roof membrane to determine if it meets rigorous property loss prevention standards. Such testing helps FM Global clients determine which products will best prevent or minimize property losses due to windstorms.



Natural Hazards Laboratory



Windstorms, floods and earthquakes pose major threats to property, but the loss potential of these natural hazards can be greatly reduced. FM Global research following Hurricane Andrew in 1992 led to recommendations that lowered our clients' overall losses by an estimated US\$250 million six years later when Hurricane Georges struck. Today, the new Natural Hazards Laboratory helps researchers further understand what causes building materials to fail and the best ways to design buildings to resist the effects of Mother Nature.

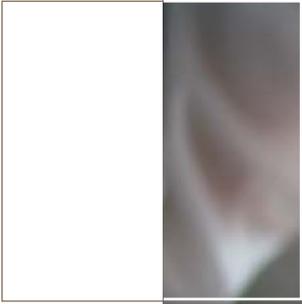
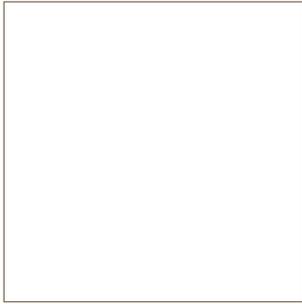
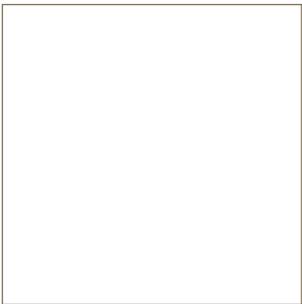
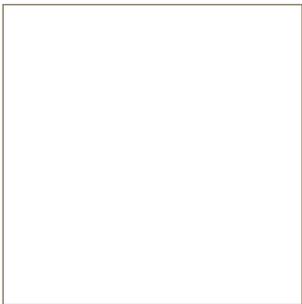
Researchers can now replicate even the toughest weather phenomena, and recreate hurricane-force winds of 160-mph (258 km/h). Winds this strong truly test the strength of glass and the endurance of building materials, particularly roof systems.

Inside the laboratory, a hail gun launches ice balls of varying sizes, to simulate moderate and severe hail storms, and a debris cannon shoots simulated wind-blown wood projectiles at speeds matching those of a real hurricane to determine impact resistance of doors, windows and siding. The laboratory also is equipped with a powerful xenon arc ultraviolet (UV) accelerated weatherometer to measure the effects of the sun's UV radiation on building materials that have been exposed for long periods. And, testing includes accelerating the weathering of all types of building materials to determine more precisely how to design and install them for long-term performance.



1. A slope-burn test in the materials laboratory replicates the impact of wind-blown fire on a sloped roof.
2. The wind machine at the Natural Hazards Laboratory churns up hurricane-force winds to test the durability and strength of building materials.
3. A piece of lumber easily impales a .5-in. (13-mm) sheet of plywood when shot from a debris cannon.

Electrical Hazards Laboratory



Electrical ignition sources are consistently identified as one of the top three causes of fire and explosion in buildings containing flammable gas, liquid and combustible dust. At the Electrical Hazards Laboratory, FM Global applies scientific study and improved testing capabilities to learn more about conditions that cause losses to equipment in these hazardous environments.

The laboratory's state-of-the-art gas-flow instruments and monitoring systems allow engineers and technicians to accurately prepare various size enclosures for explosion testing, and provide FM Approvals the capacity to run numerous tests simultaneously on some of the largest electrical equipment in the world. Researchers here test a range of products, including process-control instrumentation, test and measurement equipment, lighting fixtures, and industrial material-handling equipment.

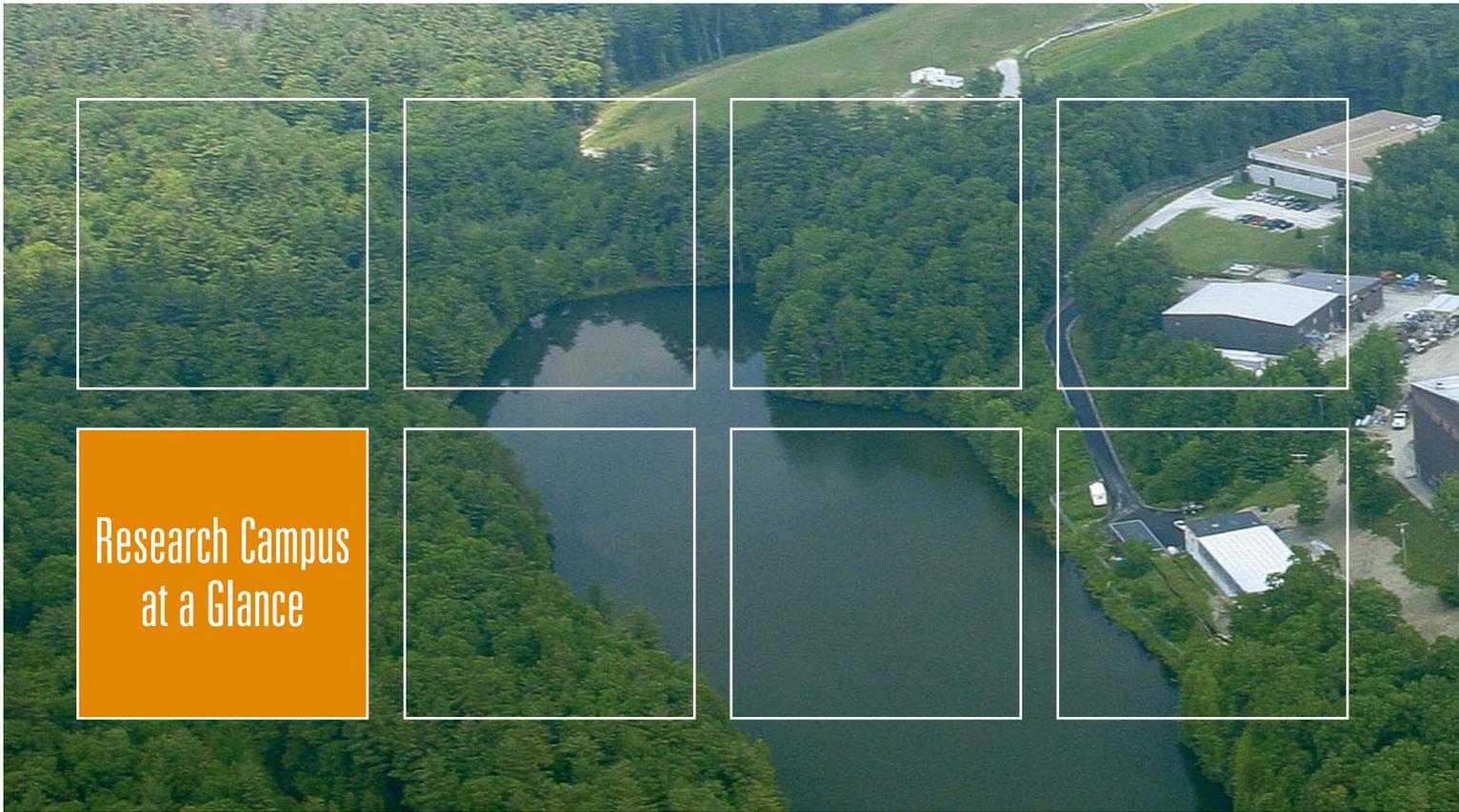
These tests ensure that, when designed to meet FM Approvals or other recognized standards, the equipment will not ignite dust or any type of gas during normal operation. The explosion test cell area is spacious enough for testing of larger enclosures and motors—such as mining equipment. Another test cell is dedicated to hydrostatic overpressure testing, and a salt fog chamber accelerates the process of metal corrosion to produce valid research conclusions at a fraction of real time. Our clients are assured the testing conducted here will protect their properties from explosion and other catastrophic loss that can result when equipment does not operate properly, or is not adequate, in a hazardous environment.

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1. Many different types of gas are used in testing equipment for explosion-proof and dust-proof design.
2. The laboratory's gas-mixing system allows for explosion testing in larger enclosures and delivers faster results.
3. All gas-flow instruments are computer-controlled for the most accurate explosion testing and results.



The Electrical Hazards Laboratory's salt-spray test accelerates the process of metal corrosion to produce valid research conclusions at a fraction of real time.



Research Campus at a Glance

Fire Technology Laboratory

- A 108,000-ft.² (10,036-m²) facility with a 33,000-ft.² (3,066-m²) large-burn lab
- Two major fire test areas, including one with a 40-ft. (12-m) high fixed ceiling and one with a 60-ft. (18-m) high movable ceiling
- A 20-megawatt, 35-ft. (11-m) diameter fire-products collector (FPC), and three smaller FPCs for small- and intermediate-scale testing
- Five building materials fire-test areas
- State-of-the-art environmental controls
- Closed-loop water system for continuous recycling; water tanks and pumps capable of replicating any facility conditions
- Entire facility is serviced by the most environmentally friendly technology available and the most sophisticated air-handling systems

Hydraulics Laboratory

- A 22,300-ft.² (2,072-m²) laboratory test area
- Seven vertical turbine pumps capable of producing a combined flow of 10,000 gal. (37,854 L) per minute at 125 psi, (862 kPa), or 3,500 gal. (13,249 L) per minute at 250 psi (1,724 kPa)
- High-pressure flow capability of 750 gal. (2,839 L) per minute at 500 psi (3,447 kPa)
- 100,000-gal. (37,854-L) water supply



Natural Hazards Laboratory

- A 12,000-ft.² (1,115-m²) facility for testing building materials
- Ability to replicate up to Category 5 hurricane-force winds of 160 mph (258 km/h)
- New testing services, including tests of wind uplift, wind-driven rain, impact resistance, weathering, shingle uplift, fatigue, and dynamic analysis

Electrical Hazards Laboratory

- A 6,000-ft.² (557-m²) laboratory to test and Approve explosion-proof and flameproof electrical equipment for use in hazardous locations
- Associated test capabilities, such as water and dust penetration

Dust-Explosion Bunker

- Allows for impressive educational demonstrations of dust explosions resulting from a variety of combustibles, including metal, wood, grain and plastics



Expanding
Knowledge

Expanding Knowledge Through Careful Research

FM Global recognizes that every company is unique. Yet, despite diverse concerns, the company's commercial and industrial clients share a common goal: preventing and controlling property loss. With more than 100 years of scientific research and product testing experience, FM Global delivers both developmental cost savings and improved reliability of research conclusions.

With the new Research Campus as an extraordinary resource, FM Global is expanding its capabilities to use scientific research as a foundation to advise clients and industry of property hazards and solutions *before* these hazards emerge.

The visitor-friendly Research Campus features meeting and training facilities for up to 150 people, with easy viewing of the laboratories and testing areas. To schedule a campus tour or to learn more about FM Global's research and testing capabilities, contact your FM Global engineer or a member of your client servicing team.







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