



**The Foundation of Freedom is Security**

On September 11, 2001, our nation's way of life changed, our country's agenda changed, and engineering and design changed. We have always been concerned about the security of our nation, but never in the history of the United States have so many resources and so much attention been devoted to security and hazards mitigation. Greenhorne & O'Mara, Inc. (G&O) has been helping our country at home and overseas by providing hazards mitigation and security services for Federal, state, and local agencies, as well as private sector clients, for more than 35 years.

Hazards Mitigation and Security Engineering has provided hazard analysis and mitigation planning and design to reduce losses caused by disasters such as floods, hurricanes, earthquakes, tornadoes, and terrorist attacks. We also continue to provide rapid response engineering support following both natural disasters and manmade disasters related to terrorist actions throughout the United States and its territories. In addition, we perform post-disaster building performance assessments that include forensic engineering analysis of building failure modes and the development of recommendations for improved building performance and hazard resistance.

Services include:

- Critical Facility and Shelter Evaluations
- Professional Publications Services
- Technical Assistance

G&O completed work on the FEMA/American Society of Civil Engineers (ASCE) study on the performance of the structures at the World Trade Center complex as a result of the terrorist attacks of September 11, 2001. The goal of the study, released in May 2002, was to expand the understanding of the performance of structures under extreme loads and utilize this knowledge to improve the design and resultant performance of future structures.

### **G&O Provides Hazard Analysis and Mitigation Planning**

For the past 30 years, Greenhorne & O'Mara, Inc. (G&O) has provided hazard analysis and mitigation planning and design to reduce losses caused by disasters such as floods, hurricanes, earthquakes, and tornadoes. We continue to provide rapid response engineering support following natural disasters throughout the United States and its territories. We perform post-disaster building performance assessments that include forensic engineering analysis of building failure modes and the development of recommendations for improved building performance and hazard resistance.

We have conducted post-disaster assessments of flood and wind damage resulting from Hurricanes Andrew, Floyd, Iniki, Opal, Fran, and Georges; tropical storms in Georgia and Texas; and tornadoes in Oklahoma and Kansas. Building on the findings from these efforts, we have developed mitigation

recommendations and designs for hazard-resistant construction for Federal, state, and local clients, which have been presented in numerous technical manuals, public information handbooks, and other guidance documents.

Services include:

- Critical Facility and Shelter Evaluations
- Professional Publication Services
- Technical Assistance

### **G&O Helps Communities Protect Critical Facilities**

Greenhorne & O'Mara, Inc. (G&O) conducts hazard threat and vulnerability assessments, and structural inspections to help communities protect critical infrastructure facilities (e.g., hospitals, schools, fire and police stations, emergency operations and communications centers) and emergency shelters threatened by all hazards and all risks.

By identifying hazards, anticipating their effects on buildings and infrastructure, and recommending preparedness, prevention, response and mitigation measures, G&O helps community officials and facility managers reduce the damages caused by floods, hurricanes, earthquakes, other natural hazard, and man-made events, and ensure continuity of essential operations.

### **Mitigating Natural Hazards in South Carolina Schools**

G&O worked with State seismic, wind, and flood hazard experts in South Carolina to assess the vulnerability of state schools and develop a technical presentation for engineers and architects who perform services for the South Carolina Department of Education.

The presentation was designed to inform design professionals about the likelihood of natural hazard events throughout the state — including floods, high winds, and earthquakes — and to describe mitigation and retrofitting measures that could be applied to both new and remodeled schools.

### **Hernando County, Florida, Emergency Operations Center Evaluation**

Hernando County's Emergency Operations Center (EOC) plays a vital role in the county's response to natural hazard disasters and other emergency events. The ability of the EOC to maintain operations throughout such events is critical to the safety of county residents and to the post-disaster recovery process.

Recognizing the need to protect the Center, Hernando County requested that G&O evaluate the structural ability of the EOC to survive the effects of a 100-year storm. G&O defined the storm event, conducted an on-site inspection, determined the effect that severe damage to the Center would have on the county's emergency operations, recommended retrofitting techniques the county could use to strengthen the building, and suggested retrofitting priorities.

### **Evaluation of Designated Public Shelters**

The Emergency Management Agencies in a number of states are designating shelter areas for natural disasters and man-made events. Most designated shelters are located in public schools, but may also be located in armories or convention centers. G&O has evaluated hundreds of such shelters for their structural capacities and operational preparedness, thereby

supporting State officials in Delaware, Florida, Kansas, North Carolina, and South Carolina identify vulnerabilities in these facilities. Each facility is evaluated for flood damage or isolation by flood waters, wind damage from hurricanes or tornadoes, structural stability in earthquake events, shelter capacity, and expected duration of stay in the shelter. The evaluations provided by G&O also help States rank their facilities in terms of readiness and costs for recommended retrofits.

### **Daytona Speedway Evacuation Plan, FDOT**

#### **Daytona Beach, FL**

G&O was tasked to develop an Emergency Evacuation Plan for the Daytona Speedway to accommodate the movement of up to 250,000 fans from their seats to safe areas, and then to their cars for evacuation from the speedway area. The development of the Plan required extensive coordination between stakeholders from the Speedway corporation, NASCAR, city and county police and fire, Daytona Beach Airport Authority, Florida State Troopers, and city and county Emergency Management agencies. Challenges to developing this Plan included the adjacent international airport, predominance of satellite parking, and challenge to assist the mobility impaired. The final Plan serves as a national model for large venue considerations.

#### **Delaware**

G&O conducted hazard vulnerability studies assessments of critical infrastructure facilities for towns in coastal communities in Delaware to identify and provide goals for prevention, preparedness, response and mitigation of all hazards, and to enable local, State, and Federal agencies to

better coordinate overall hazard reduction programs, grants, and policies.

#### Lewes, Delaware, Beebe Medical Center Evaluation

G&O analyzed the ability of nine buildings at the Beebe Medical Center to withstand the effects of both flooding and high winds from a 100-year storm and to remain operational during the event. The analysis included a study of the impact on the community that would result from an interruption of operations at the Center, on-site inspections of the nine buildings and the entire medical center complex, structural evaluations of the buildings and building envelopes, and the development of hazard mitigation techniques and cost estimates.

#### **Professional Publications Services**

Greenhorne & O'Mara, Inc. (G&O) provides comprehensive services in technical writing and editing, graphic design, and document compilation for the entire publication process — from concept development to the delivery of pre-press electronic files and camera-ready copy for black-and-white, two-color, and full-color printing.

G&O has designed, written, illustrated, and compiled technical guides, design documents, engineering and scientific reports, procedures manuals, brochures and flyers, public information handbooks, and newsletters for both technical and non-technical readers, including design professionals; Federal, state, and local officials; builders and contractors; and homeowners.

In addition to preparing documents for publication, G&O designs and produces 35 mm and computer-based slide shows, Internet web pages, interactive CD ROMs, and presentation displays for workshops and conferences.

Our technical writers, editors, and graphic artists have extensive experience in the design and production of engineering and scientific reports and other publications concerning floods, hurricanes, earthquakes, tornadoes, and other natural hazards; post-disaster forensic engineering; building science; structural and civil engineering; vulnerability of critical facilities and infrastructure; emergency response and preparedness; hazard mitigation; and retrofitting and rehabilitation.

### **Technical Assistance**

Greenhorne & O'Mara, Inc. (G&O) has a team of national experts that provide engineering analysis and structural engineering services for Hazards Mitigation and Security Engineering issues.

G&O conducts applied engineering research projects in hazards mitigation and security engineering to develop and disseminate technical guidance regarding hazard-resistant construction.

Our services in this area include reviewing and developing structural design standards; designing structural systems for resistance to flood, wind, and earthquake forces; and producing guidance documents for use by design professionals, community officials, and homeowners.

Guidance documents prepared by G&O range from one-page hazard mitigation fact sheets for homeowners and businesses to detailed design guides aimed at professionals in the public and private sectors. An example of the latter is Design and Construction Guidance for Community Shelters (FEMA 361). G&O completed a fully illustrated, comprehensive flood protection retrofitting guide specifically for homeowners, Homeowner's Guide To Retrofitting: Six Ways To Protect Your House From Flooding (FEMA 312).

G&O is currently researching disaster resistance, land planning and zoning issues, and cost-efficiency for affordable housing. The research is focused on a prototype city, but the findings are expected to be applicable to any area. Issues being considered include construction materials, modular versus site-built homes, local zoning issues concerning the construction of homes in existing neighborhoods on in-fill lots versus community development with new urbanism concepts, and disaster resistance recommendations for site-specific hazards.

Greenhorne & O'Mara, Inc. (G&O) has been helping our country at home and overseas by providing hazards mitigation and security services for Federal, State, and local agencies, as well as private sector clients, for more than 35 years.

G&O develops crisis management, emergency response and emergency operations plans and programs, and evacuation plans; conducts vulnerability assessments; and designs and conducts training and exercises nationally and internationally for our public and private sector clients. Through the use of

multidisciplinary teams, including physical security specialists and intelligence agents, we effectively identify multi-hazards, assess system vulnerabilities, and identify and design alternative countermeasures. Our services include:

- Threat and vulnerability assessments
- Counter terrorism measures
- Evacuation planning
- Hazard mitigation assessments, preparedness, planning and engineering
- Post-event damage assessment and response evaluation
- Emergency Operations Center (EOC) design support
- Training and exercises
- Public outreach
- Business and operation continuity
- Geographic Information System (GIS) services
- Grant funding and management
- Anti-terrorism Force Protection (ATFP)

G&O has supported high profile clients like DHS, FEMA, National Imagery and Mapping Agency (NIMA), U.S. Army Corps of Engineers (USACE), Bureau of Alcohol, Tobacco and Firearms (ATF), and the American Society of Civil Engineers (ASCE) to identify threats, perform vulnerability/risk assessments, evaluate and prioritize alternatives, design solutions, and prepare response and recovery plans. We help prevent and deter terrorist attacks and protect against and respond to threats and hazards to our clients. We provide our unique services to other architects and engineers in support of their design efforts.

Our all-hazards, all-risk approach helps our clients plan and

prepare for natural disasters, technological emergencies, internal and external risks, and terrorist threats. Our diverse staff of emergency planning and response specialists, planners, and engineers supports a broad range of multi-discipline security services relevant to your organization.

### **G&O's and FEMA's MAT Program**

In response to floods, hurricanes, earthquakes, and other disasters, FEMA often deploys Mitigation Assessment Teams (MATs), formerly known as Building Performance Assessment Teams (BPATs), to conduct field investigations at disaster sites. MATs inspect disaster-induced damages incurred by residential and commercial buildings and other structures; evaluate local design practices, construction methods and materials, building codes, and building inspection and code enforcement processes; and make recommendations regarding design, construction, and code issues.

With the goal of reducing the damage caused by future disasters, the MAT Program is an important part of FEMA's hazard mitigation activities. The ability to quickly form and deploy MATs whose members have the required skills and expertise is essential to the success of the MAT process. Therefore, FEMA created a national database of experts who are available for rapid deployment (within 48 hours of notification). The database is maintained by Greenhorne & O'Mara, Inc. (G&O). G&O also provides technical and administrative support required for the MAT process. Private sector members of MATs work as consultants to G&O.

The MAT database also serves as a source of experts who can help support FEMA's other hazard mitigation activities, such as conducting research and providing technical support to state and local governments in structure vulnerability assessment, hazard-resistant design and construction, and hazards awareness and mitigation training.

FEMA MAT objectives are to:

- Inspect buildings and infrastructure
- Conduct forensic engineering analyses to determine causes of structural failures and successes
- Recommend actions that state and local governments, the construction industry, and building code organizations can take to reduce future damages and protect lives and property in hazard-prone areas.

FEMA MATs typically include the following types of members:

- Representatives of FEMA Headquarters and FEMA Regional
- Offices
- State and local officials
- Public-and private-sector experts in technical disciplines
- such as structural and civil engineering, architecture,
- building construction, natural hazards research, and code
- development and enforcement.

### **In Support of FEMA's MAT Program, G&O Assembles and Deploys Teams of Technical Experts**

When disasters occur, FEMA deploys Mitigation Assessment Teams (MATs) to conduct field investigations. These teams of experts study building performance in response to natural and manmade hazards.

In support of FEMA's MAT Program, Greenhorne & O'Mara, Inc. (G&O) assembles and deploys teams of technical experts in disciplines such as structural engineering, building science, and natural hazards research, who inspect and assess the performance of buildings affected by floods, hurricanes, and other hazard events.

Findings regarding building failures and successful building performance help FEMA focus its hazard mitigation efforts. The findings of each MAT are disseminated to both the public and private sectors through a technology transfer process that relies in part on formal MAT reports prepared for FEMA by G&O. The reports describe observations and conclusions and provide recommendations for reducing future damage.

Photographs that document observations made in the field are included, as are illustrations prepared by G&O graphic artists to clarify building design and construction details. G&O also provides administrative support for the MAT Program.

### **Consultants Can Participate by Being Listed in the MAT Expert Database**

FEMA is currently recruiting qualified members for the MAT Expert Database. Members are needed in several areas of expertise. Expert consultants can participate by being listed in the MAT Expert Database and by ensuring that information in the database is accurate and current.

If you would like to take an active part in FEMA's efforts to make construction more resistant to damage from the effects of natural hazards, we would like to add your name to the MAT Expert Database. Here are just a few of the areas in which FEMA is looking for expertise:

- Structural and Civil Engineering
- Geotechnical Engineering
- Environmental Engineering
- Coastal Engineering
- Retrofitting
- Shoreline and Coastal Erosion
- Flood-Resistant Design and Construction
- Floodplain Management
- Wind-Resistant Design and Construction
- Historic Preservation
- Earthquake-Resistant Design and Construction
- Water Resources
- Hurricane-Resistant Design and Construction
- Building Code Analysis and Evaluation
- Forensic Engineering
- Architecture