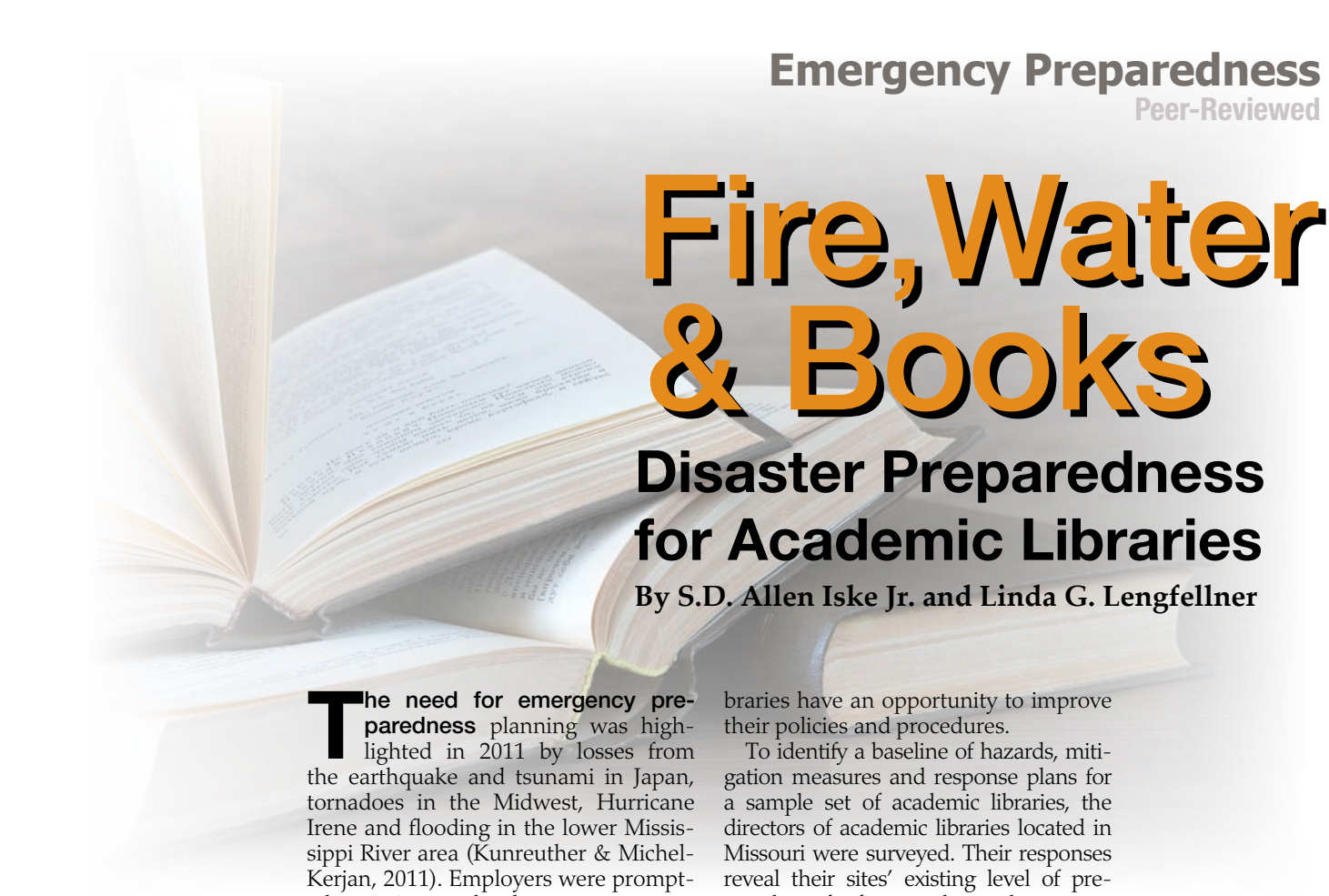

Fire, Water & Books

Disaster Preparedness for Academic Libraries

By S.D. Allen Iske Jr. and Linda G. Lengfellner

The need for emergency preparedness planning was highlighted in 2011 by losses from the earthquake and tsunami in Japan, tornadoes in the Midwest, Hurricane Irene and flooding in the lower Mississippi River area (Kunreuther & Michel-Kerjan, 2011). Employers were prompted to review or develop emergency response and business continuity plans to protect their employees and facilities from future events (Nicoll & Owens, 2013). In addition, Federal Emergency Management Agency (FEMA) launched the "Plan, Prepare and Mitigate" (**www.fema.gov/plan-prepare-mitigate**) campaign, which aims to ensure that actions taken before, during and after a disaster can be most effective.

Preparing any business for disaster involves identifying possible hazards, mitigating their effects and identifying response measures before those hazards become active threats. One business environment that has received little attention in this area is academic libraries, which house employees, visiting patrons and a high fuel load due to their diverse collections (Robertson, 2005). While most academic libraries fall under the emergency preparedness umbrella of their parent institution, a library can develop a program of self-help. Even beneath a university's master plan, by identifying gaps in preparedness, the libraries have an opportunity to improve their policies and procedures.

To identify a baseline of hazards, mitigation measures and response plans for a sample set of academic libraries, the directors of academic libraries located in Missouri were surveyed. Their responses reveal their sites' existing level of preparedness for fire, weather and earthquake hazards. By understanding the situations these facilities face and the plans they have in place, OSH professionals can conduct insightful assessments and recommend proactive solutions for improving the emergency preparedness and response actions of libraries and similar facilities.

The Study Population: MOBIUS

In 1998, academic libraries in Missouri formed the MOBIUS Consortium (2009). These libraries and their academic communities range in size and specialty. At the time of this survey, 59 libraries were MOBIUS members. Directors of these facilities were invited via e-mail to complete an online survey about their sites' preparedness procedures. Additional e-mails were sent to encourage an increased response. A total of 36 surveys were completed online for a 61% response rate.

IN BRIEF

- **Preparing any business for disaster involves identifying possible hazards, mitigating their effects and identifying response measures.**
- **One environment that has received little attention in this area is academic libraries.**
- **By understanding the situations these facilities face, OSH professionals can conduct insightful assessments and recommend proactive solutions.**

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Survey Development

At the time of the survey, author Lengfellner worked at the James C. Kirkpatrick Library on the University of Central Missouri (UCM) campus in Warrensburg, MO. For several years, she chaired the library's Emergency Operations Committee and managed regular fire and tornado evacuation drills. The Kirkpatrick Library's emergency operation plan and experiences with evacuation drills served as background for developing the survey and analyzing its results.

To further develop survey questions, the authors researched the literature. Yeh, McMullen and Kane (2010) conducted a survey to identify risks and vulnerabilities. Eden, Feather and Matthews (1994) collected more than 60 disaster control plans. Eden and Matthews (1996) then reviewed disaster management policy and practices in British libraries by comparing disaster control plans and interviewing library professionals and disaster experts. Proposed questions were discussed and further developed based on input from Lengfellner's thesis committee as well.

Once all involved were satisfied, the final version was submitted to and approved by the UCM Human Subjects Committee. The resulting 78-question survey was built using an online survey tool (Survey Monkey) and was distributed using e-mail addresses from MOBIUS. Some questions took the form of safety policy statements that focused on various emergency mitigation and preparedness issues relative to library facilities. For most questions, respondents could answer: Yes = This describes what my library has or does; No = This is not something my library has or does; or Don't know = I don't know whether or not my library has or does this. Other questions used a multiple-choice format (e.g., size of the library's collection).

Variations in Library Settings & Personnel

The first questions of the survey asked about the type of academic institution supported, size of collection and budget, number and type of employees, and number of employees assigned to do emergency planning. The libraries surveyed represented a broad range of staff levels, ranging from only 1 to 62 professional librarians. [A professional librarian holds a master's of library science degree from a school accredited by American Library Association (ALA, 2011)]. Employees involved in emergency planning ranged from 0 to 15 people.

The surveyed libraries supported public and private, 2-year and 4-year institutions. Collections ranged in size from less than 25,000 items to more 3 million items. Library budgets ranged from less than $500,000 to more than $16 million per year.

Identifying Hazards for Libraries

Libraries come in many shapes and sizes, but most typically feature open areas filled with book stacks, small study or meeting rooms, staff workrooms, utility rooms and similar areas. Some buildings may be large, architectural wonders with picture windows for walls, while others may be small, specialized nooks crammed into a space originally designed for offices. Some libraries house materials such as videos, discs, games, puppets or artwork in addition to books and journals.

Libraries are susceptible to the same hazards faced by most businesses in their vicinity, and like them, may be underprepared for many emergencies (Topper, 2008). "When it comes to disasters, the question usually is not if, but when" (Clareson & Long, 2006, p. 39). Clareson and Long (2006) found that 33 libraries in Arkansas, or nearly 40% of those surveyed, had suffered at least one disaster since 1994. These included fires, tornadoes, flood, leaks, construction incidents, equipment failures and mold.

Table 1

Fire Detection, Alarms & Sprinkler Systems

Fire detection, alarms and sprinkler systems: Questions and results	Yes (%)	No (%)	Don't know (%)
Heat detectors are located throughout the building and stacks	27.8	50.0	22.2
Smoke detectors are located throughout the building and stacks	72.2	19.4	8.3
Audible alarms are loud and can be heard anywhere in the building	77.8	8.3	13.9
Visual alarms (such as flashing strobe lights) alert hearing-impaired occupants	63.9	25.0	11.1
Pull-style or break glass-style alarms are located throughout the building and stacks	71.4	25.7	2.9
Automatic fire sprinklers are located throughout the building and stacks	51.4	42.9	5.7
Automatic fire sprinklers, when triggered, will douse the entire building with water	0	72.2	27.8
Automatic fire sprinklers, when triggered, will douse only the area within which heat or smoke was detected	28.6	40.0	31.4

The inner entrance to the Kirkpatrick Library, showing the glass doors and the entrance to the glass rotunda.

As Arkansas's northern neighbor, Missouri libraries should reasonably prepare for similar disasters. Thus, the current survey inquired about respondents' preparedness measures for fire and smoke, tornadoes, ice and snow, power outages, water damage and earthquakes, as well as communication. For this article, the responses are summarized into fire hazards, evacuations, weather hazards and earthquake hazards.

Fire Hazards: Findings & Recommendations

As storehouses of mostly flammable collections, libraries have a long history of fire damage. Robertson (2005) discusses "postponing Alexandria," referring to the Great Library at Alexandria and how the knowledge and literature of the ancient world collected in that library were destroyed by catastrophic fires more than 2,000 years ago." Even with modern fire detection and suppression tools, libraries have suffered from fire damage (Muir & Shenton, 2002; Robertson, 2005).

In this survey, respondents reported that most of their facilities have smoke detectors, loud audible alarms as well as visual alarms, and pull- or break-glass alarms; however, most do not report that they have heat detectors. Most of the libraries represented have automatic fire sprinklers located throughout the building and stacks (Table 1).

Although a few respondents were uncertain, most respondents said that their facilities' automatic sprinklers would not douse the entire building, just the area where a fire was detected. This is significant because using water to extinguish the fire can cause additional problems in a library. Paper and electronics react poorly to water. Wet paper must be dried quickly and carefully to prevent mold growth. How does this relate to safety? Besides destroying materials, mold can rapidly become a health hazard to library employees and visitors and to those hired to clean up the mess (Carlson, 2005; "Mold-afflicted Missouri library reopens," 2006; Mold cleanup tips, 2006).

Rare items might be irrecoverably damaged by water sprinklers, so libraries can use FM-200 (also known as heptafluoropropane, HFC-227ea, FE227) or similar fire suppression agents. People must evacuate the room when such systems activate so the systems are programmed to allow occupants sufficient time to exit before the suppressant is released. First aid for exposure includes flushing eyes with water for 15 minutes, removing clothes, washing skin with soap and water, removing people to fresh air and securing medical attention to treat symptoms. Most of libraries surveyed do not have such a system (Table 2), and those that do post signs alerting occupants to evacuate when the alarm sounds (Forssell, Robin, Ginn, et al., 2007).

Fire extinguishers differ based on anticipated use. Most of the library directors reported having Type A or multipurpose fire extinguishers for paper and Type C fire extinguishers for areas with computers or electrical equipment (Table 3). OSHA's Evacuation Plans and Procedures eTool includes a section on fire extinguisher use (**www.osha.gov/SLTC/etools/evacuation/portable_use.html**).

Evacuations: Findings & Recommendations

Because of material security, most library buildings are not designed for easy egress. Funnel points past checkout counters allow for material control but create pinch points during evacuation. Most libraries must simply adapt to a building's design, leaving administrative procedures as the primary safety tools. Evacuations for fire involve getting everyone out of the building safely. During a tornado, evacuating everyone to designated safe spots in the building

Table 2
Special Fire Suppression Agents

Special fire suppression agents: Questions and results	Yes (%)	No (%)	Don't know (%)
Special fire suppression agents, such as FM-200, are used in special collection areas to prevent water damage to rare items	8.6	74.3	17.1
Areas with non-water suppressants, such as FM-200, are clearly marked to evacuate the room when the alarm sounds	18.8	56.3	25.0

Most of the facilities surveyed have smoke detectors, loud audible alarms as well as visual alarms, and pull- or break-glass alarms. Most also reported having appropriate fire extinguishers. However, most do not have systems that disperse special fire suppression agents.

Table 3
Fire Extinguishers

Fire extinguishers: Questions and results	Yes (%)	No (%)	Don't know (%)
Fire extinguishers designed for paper fires (Type A for ordinary combustibles or a multipurpose type) are located throughout the building and stacks	86.1	5.6	8.3
Fire extinguishers designed for use with electrical equipment (Type C) are located near computers and electrical equipment	54.3	17.1	28.6

Note. *Extinguisher details from www.usfa.dhs.gov/citizens/home_fire_prev/extinguishers.shtm.*

Disaster Preparedness Planning Steps

- Evaluate your environment.
- Identify hazards and assets.
- Mitigate hazards.
- Develop and prepare responses to various hazards.
- Set up recovery assistance.
- Re-evaluate

becomes the priority. Survey responses reveal that not all libraries conducted drills (Table 4).

Library employees normally interact one-on-one with patrons. During an emergency, crowd control can rapidly become a priority. Thus, training in crowd control is an important step, as are involving employees in examining existing procedures, practicing via drills, analyzing their experiences and developing improvements. This becomes a cycle of continuous improvement. "Plan the work . . . work the plan . . . test the plan" (Lindtveit, 2011b, p.14).

Evacuation & Building Design: One Library's Experience

Because training everyone visiting the building is not possible, the staff and faculty of the James C. Kirkpatrick Library have invested in alternative measures. The library has trained its personnel, and has conducted evacuation drills for both fire and tornado scenarios. Improvements discovered as a result include the need for better, more clear signage, and obvious paths to designated safe zones. The facility also must find better ways to motivate students who are reluctant to move even in the face of an emergency (e.g., tornado warning).

The library also faces another issue: its primary entrance is a three-story glass rotunda containing two glass elevators and stairs made of glass blocks. This is the only entrance/exit the public uses. Four areas of the building have reinforced emergency stairwells, however, line of sight to these exits is blocked by walls and book stacks. The four stairwells all allow egress to the outside of the building, but the basement is another matter. The library's basement is large and L-shaped, passing under the outer edges of the building's north and east sides. This was done to ensure that the book stacks in the center core of the building were over solid ground rather than over an open expanse. Therefore, the southwest stairwell does not go all the way to the basement.

Table 4
Evacuations

Evacuations: Questions and results	Yes (%)	No (%)	Don't know (%)
All building occupants evacuate during a fire drill	55.9	14.7	29.4
Exceptions are granted on a case-by-case basis for people who do not evacuate during a drill (e.g., people with mobility issues, classes taking tests)	15.2	51.5	33.3
People with mobility issues are forewarned about the upcoming evacuation drill	26.5	35.3	38.2
Occupants with mobility or other issues are notified in advance of a fire drill so they can use the elevators to move to the first floor before the alarm sounds	20.6	44.1	35.3
All library employees play active rolls in an evacuation, directing or leading occupants out of the building to a safe area	57.1	22.9	20.0
All emergency exit doorways and routes are checked daily to ensure that they are kept free and clear of clutter, tripping hazards, stored items, book trucks, etc.	51.4	31.4	17.1
The fire department needs access to areas immediately around the building, therefore, the library employees lead everyone to an established meeting point away from the building and out of the way of the fire trucks	68.6	14.3	17.1
Employees let coworkers know when they are leaving the building so if there is a fire, no one will go back into the burning building to find someone who is not there	37.1	37.1	25.7
A current list of employees is included in your emergency kit so you can have roll call for employees	30.6	52.8	16.7

Special Populations

During drills at the Kirkpatrick Library, the entire building is evacuated, including the tenant offices (e.g., The Honors College, The Arthur F. McClure II Archives & Museum). To minimize disruption, drills are scheduled around special events and they are announced in advance.

People who have trouble with stairs are notified to move to the first floor in advance of a weather warning (during the watch phase) or an evacuation drill. Standard procedures call for people who cannot manage stairs to remain on the floor where they started, but within the fire-resistant, reinforced emergency stairwell. Employees are expected to notify first responders where people who need help with stairs are located. According to the survey, only about half of the libraries said that they notify occupants with mobility issues before a drill.

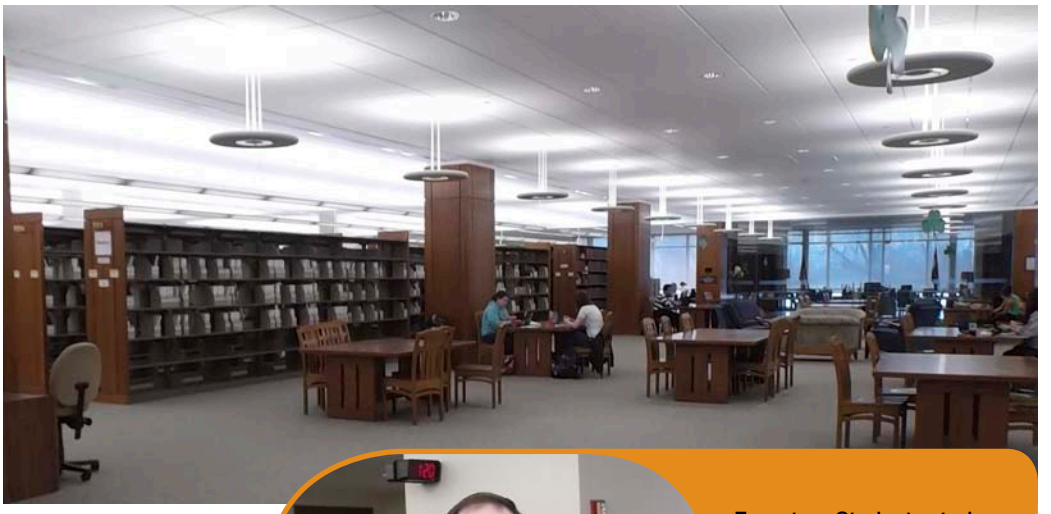
In the case of power outages, for patrons as well as special populations, Kirkpatrick Library staff notifies everyone by following alternative procedures such as use of megaphones/bullhorns, or visiting all the study/meeting rooms to notify patrons of an emergency, weather alerts or evacuation drills.

Help From First Responders

The Kirkpatrick Library has worked closely with local first responders. These groups are an excellent source of assistance with fire response, alarms, evacuation routes, drills and other issues related to a fire emergency. In addition, local fire department personnel can help identify hazards and liabilities that the university may be able to correct. Fa-

miliarity with a location also helps first responders know, for example, which stairwells do not go all the way to the basement level, a detail that could be crucial during an emergency.

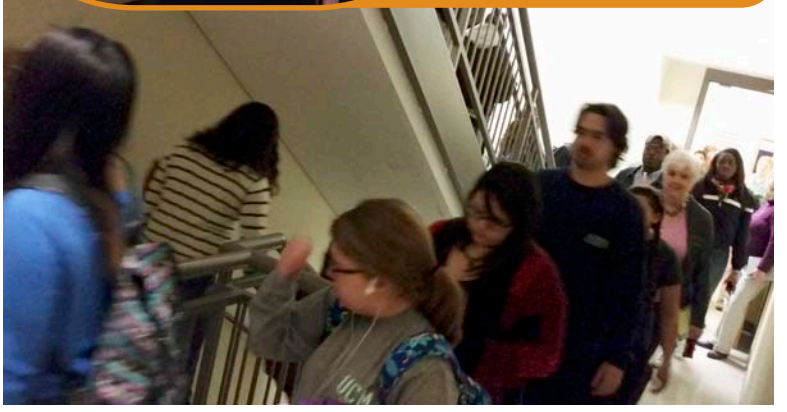
Local fire personnel have toured the library and met with the library dean, the Emergency Operations Committee and UCM's EHS manager to discuss vulnerabilities and emergency assets. During those meetings, library personnel provided information about sprinkler and alarm systems, floor plans and other details.



From top: Students studying at the Kirkpatrick Library just before the state-wide tornado drill, held on March 3, 2015.

Librarian Anthony Kaiser preps a megaphone before the drill.

Library staff and students evacuate during the drill.



Weather Hazards: Findings & Recommendations

Weather in the Midwest runs the gamut from drought to floods, from ice and snow to thunderstorms and tornadoes. Table 5 (p. 44) details survey responses related to weather hazards and mitigation responses.

Public Address Systems

Communication can limit the effects of hazardous situations. However, about 64% of the libraries surveyed did not have a public address system. These systems help quickly reach all areas of the library, including study rooms, restrooms and classrooms. Warrensburg, MO, and the UCM campus now have siren systems with public address capability, but the Kirkpatrick Library still uses megaphones.

Emergency Kits

Weather evacuation shelters should be equipped with emergency kits that provide first-aid supplies, food and water, and similar resources to occupants. (FEMA provides information about the contents of such kits at **www.ready.gov/business**.)

Water Damage

Carlson (2005) and Clareson and Long (2006) describe the plight of water-damaged libraries after Hurricane Katrina. Moist conditions from weather can create mold. While mold may not seem like an emergency, it can destroy valuable collections and create serious health concerns for workers and visitors.

Plumbing problems can also allow mold growth, such as when a pipe leaked in the University of Missouri's journalism library ("Mold-afflicted Missouri library reopens," 2006). Moisture alarms can alert staff about leaks before they damage materials and create mold blooms. American Library Association offers guidelines for dealing with water damage at **www.ala.org/tools/cleaning-after-water-damage**.

Earthquake Findings & Recommendations

The New Madrid Fault Line is located in the bootheel of Missouri, which means an earthquake can occur in the central U.S. Table 6 (p. 45) presents responses about earthquake preparedness measures at the surveyed libraries.

The Kirkpatrick Library has shelving on movable tracks to provide compact shelving for periodicals and government documents. After some discussion about these shelves and the stability of stationary shelves, employees concluded that despite claims that the building and shelving are resistant to earthquake damage, personnel will move themselves and visitors away from the shelving as soon as possible to be safe.

Various agencies and organizations offer resources related to earthquakes, including FEMA (**www.ready.gov/earthquakes**); American Red Cross (**www.redcross.org/prepare/disaster/earthquake**); and California-based Earthquake Country Alliance (**http://earthquakecountry.org/sevensteps**).

Earthquake Drills

Although many of the library directors surveyed have worked in Missouri for many years, the belief that an earthquake can occur seemed to be diminished. The researchers hope addressing this topic on the survey sparked some discussions across the state. That fact that only one library reported having one earthquake in the past 5 years shows that "out of sight, out of mind" often hinders emergency preparedness planning.

Workplace Violence & Terrorism

Missouri Governor Matt Blunt formed a statewide Campus Security Task Force after the Virginia Tech shootings in 2007. All higher education institutions in the state were required to develop an all-hazard

Table 5
Weather Hazards

Weather hazards: Questions and results	Yes (%)	No (%)	Don't know (%)
The library employees keep aware of weather conditions enough to know when a tornado watch is in effect	97.2	2.8	0
If the library is notified that the area is under a tornado watch, do the library employees alert the patrons?	72.2	27.8	0
Inside the library there is a public address system to announce a watch or a warning	36.1	63.9	0
In addition to civil defense sirens, your city or university has a public address system to notify people outside that there is an emergency	47.2	38.9	13.9
The library has a designated storm shelter, such as a basement	86.1	13.9	0
There are signs in the library building to show occupants unfamiliar with the building where to find the shelter	69.4	30.6	0
Your storm shelter includes access to a safe bathroom for use during an emergency	58.3	25.0	16.7
Your storm shelter has ways to communicate such as a land-line phone, walkie-talkies, or cell phone access	68.6	17.1	14.3
Your storm shelter has ways to receive weather updates such as a battery-operated radio or computer with Internet connection, etc.	62.9	25.7	11.4
Your shelter and the route to it is supplied with emergency lighting and/or employees have flashlights with extra batteries and bulbs	75.0	19.4	5.6
Signs in the library directing people to the emergency exits are lighted even if the power goes out	66.7	16.7	16.7
Your shelter contains first-aid kits and blankets	25.7	65.7	8.6
Elevators are used immediately upon the announcement of a tornado warning, but not for long	17.1	48.6	34.3
Occupants (especially those with mobility or other issues) are notified of tornado watches so they can use the elevators to move to the first floor before the watch becomes a warning	38.2	38.2	23.5
All library employees play active rolls in an evacuation, directing or leading occupants through the building to the designated shelter	75.0	16.7	8.3
Roll is called for employees at the shelter (Employees let coworkers know when they are leaving the building so that during an emergency, no one will go back to find someone that isn't there)	30.6	47.2	22.2
You protect computer assets during an electrical storm by having surge protectors on public and employee computers and library servers	85.7	8.6	5.7
Your library's servers have regular backups, either on-site or to remote storage	91.7	0	8.3
If there is a power outage, your library has a backup generator(s)	33.3	52.8	13.9
Emergency kits with first aid kits and flashlights are kept at each service desk	52.8	38.9	8.3
Your library has water/moisture alarms located in the basement (or lowest level) and under the roof	8.3	69.4	22.2
Building utilities and structure receive regular maintenance and inspections	80.0	5.7	14.3
You have a recovery plan for water damage	41.7	52.8	5.6
Your library has made contracted arrangements, in advance, with one or more professional salvage companies in case of extensive water damage	8.3	86.1	5.6
Someone ensures that your sidewalks and steps are cleared, sanded and/or salted as needed	100	0	0
Someone ensures that your parking lot is cleared, sanded and/or salted as needed	100	0	0
The library is closed when classes are canceled due to weather	65.7	31.4	2.9
When snow and ice threaten to fall off the roof, signs are posted and the sidewalks are blocked on that side of the building	29.4	47.1	23.5
In addition to radio and TV announcements, university closings are announced via a text messaging service that students and employees can request	80.6	13.9	5.6

Table 6
Earthquake Hazards

Earthquake hazards: Questions and results	Yes (%)	No (%)	Don't know (%)
Library personnel are aware of which areas of the building are relatively safer in an earthquake in order for them to protect themselves and patrons	11.1	25.0	63.9
Through signs and public service announcements, library personnel and patrons are made aware that falling books and stacks are hazardous enough to require moving away from them before "dropping and covering"	42.9	31.4	25.7
Library personnel are aware of the dangers of aftershocks and will evacuate the building once the initial tremor has stopped	16.7	75.0	8.3
The library has procedures for who to call to evaluate the safety of the building before re-entering	41.7	30.6	27.8
Elevators are inspected by elevator professionals after an earthquake	55.6	38.9	5.6
You have a recovery plan for earthquake damage including contracting arrangements made in advance with professional structural engineers, repair contractors, salvage experts, etc.	5.6	83.3	11.1

emergency response plan, conduct regular emergency training, and designate coordinators and representatives. Institutions must also conduct regular emergency training (Kennedy, 2008; Kumar, O'Connell & Hampel, 2007).

Academic libraries should develop specific protocols for bomb threats, intruder-on-campus warnings, acts of violence, explosions and disturbances at student activities (Nichols & Nichols, 1992). Yeh, et al. (2010), found that measures such as additional lighting, a web-based surveillance system, and panic buttons for both staff and patron use can resolve some security issues. While not covered specifically in the authors' survey, further studies based on human behavior during hazards present an opportunity to investigate an important set of issues in emergency response.

Inspiring Libraries to Take Action

While some hazards identified cannot be eliminated, library and university personnel can identify the risks and develop effective response measures. Library personnel must be motivated to accept the challenges of emergency preparedness and be trained to respond effectively (Robertson, 2005).

Major libraries are showing that they take emergency preparedness seriously. The Library of Congress has a Preservation Directorate (**www.loc.gov/preservation**) that focuses on preservation through preparedness, response and recovery. Heritage Preservation and FEMA cosponsor the Heritage Emergency National Task Force (**www.heritagepreservation.org/programs/taskfer.htm**), which provides resources on disaster planning, response and recovery for library collections.

Role of Library Staff

By working with employees, libraries can adapt their facilities to help mitigate the effects of various disasters, and practice responding effectively to various threats (Todaro, 2009). Like other businesses, libraries should develop business continuity plans to prepare to meet and recover from possible worst-case scenarios (Morganti, 2002).

Lindtveit (2011a) maintains that all employees must be educated in the issues and involved in the process in order to develop a functional emergency plan. "The more your facility and personnel know and are prepared for, the easier the professional responder's job becomes," (Lindtveit, 2011a, p. 37). In some settings, this may require a change in the culture of the workplace itself.

Muir and Shenton (2002) identify several important variables for developing such a culture: management commitment, well-maintained facilities, training on and testing of procedures, and actively aware and involved employees who take ownership of the process. Employees who understand the possible threats and have the tools to deal with them form a proactive, attentive team working toward a common goal: mitigate hazards and prepare responses.

Before making any changes, a library should establish a baseline of existing emergency procedures. The researchers hope that as a result of completing the survey, the participating library directors are more aware of their facilities' preparedness issues. Awareness creates an incentive to improve policies, train staff and be more receptive to changes suggested by safety professionals.

Kostagiolas, Araka, Theodorou, et al. (2011), proposed that academic libraries in Greece form a cooperative body focused on risk management and disaster planning to foster collaboration, and share costs and innovative ideas. In Missouri, the MOBIUS Consortium can be such a body. Members already share resources and information, and the results of the current survey were presented at the group's annual conference (Lengfellner, 2011a).

Role of OSH Professionals

OSH professionals can use the survey results as an introduction to the library environment. They can help library administrators recognize hazards that could affect their facilities and staff, analyze risks and take proactive steps to reduce the effects. As teachers and guides, safety professionals help library personnel to take ownership of the procedures they help develop (Eden & Matthews, 1996; Muir & Shenton, 2002).

OSH professionals can provide comprehensive, effective, proactive planning and show how this is far more effective than reactionary responses. They can help library administrators to assess risk, establish effective communications protocols, train personnel, develop general and specific operating procedures, and develop recovery plans (Nichols & Nichols, 1992). This represents a tremendous opportunity for OSH professionals to help an underserved market (Robertson, 2005). **PS**

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