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TSIG NEWS

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Inside this issue:

DAMPER TESTING WAIVER FOR CMS

Did you know that CMS has not formally adopted TJC's allowable 6 year interval for testing of dampers in hospitals?

They will however accept a waiver for 1-2 yrs from hospitals requesting to remain in bilateral compliance with the two agencies. The waiver is actually quite simple to complete and must be submitted to your CMS regional office. For those interested in instructions and a copy of the waiver form, please email your request to: info@tsigconsulting.com

Fire Plan Design

By Ode Keil

Every hospital has to have a fire response plan. Codes, accrediting bodies, and licensing authorities all require one. Many hospitals use the elements Rescue, Alarm, Contain, and Extinguish or evacuate (RACE) as the basic fire plan. The RACE acronym is a handy memory tool but does not really address the requirement for a formal "Fire Plan". A Fire Plan is simple in concept but often challenging in reality. Development of an appropriate Fire Plan using RACE as a foundation requires a risk assessment of each area of the hospital to evaluate several factors.

The purpose of a risk assessment is to assure a qualitatively consistent method of evaluating any given situation. The fire response risk assessment described in this article is designed to evaluate the specific challenges any area of a hospital faces when a fire occurs. The factors that you may wish to consider when conducting a fire response risk assessment include the following:

1. **Worst case ratio of patients to staff.**

   The ratio of patients to staff is critical. If the ratio is high, the small number of staff available will likely result in a slow or incomplete response if no other resources are brought to the area to assist with a response. Beyond looking at the ratio of patients to staff on a specific unit the worst case overall ratio needs to be considered. This is especially important during evening and night shifts when there are very few support staff and the overall number of clinical staff is low. During a recent evaluation I found that the number of staff on duty at night was roughly 20% of the number on the day shift. This created the situation that there was no feasible way to pull a significant number of staff from any area to support evacuation of any unit of the hospital.

2. **Worst case condition of patients on a *regular* basis**

   I look at patients as being in one of four conditions:

   a. ***Alert and mobile***

   These patients are fully capable of self evacuation with only verbal instruction. They are relatively low risk as they can move either horizontally or vertically without physical support from staff, without any equipment, and can be tended in any generally safe area away from the fire scene.

   b. ***Alert with limited mobility***

   These patients are capable of assisting to some degree with their evacuation. They may require a cane, walker, wheel chair or other device to move. They may be impaired to a degree that staff assistance is required to relocate or evacuate them in a timely manner. They can often self rescue if the path of travel is horizontal but require substantial assistance if the route involves stairs or ramps.

   c. ***Not mobile***

   Regardless of the level of alertness patients who are not mobile require complete staff support to move to an area of safety. These patients range from disabled persons to ICU patients in a coma. The level of support can be a basic need to lift the patient on to a stretcher or into a wheel chair and to move them horizontally to an area of safety where they need little or no immediate medical support. It can also be a full out ICU evacuation team carrying IV pumps, monitoring equipment, ventilating equipment, etc. down a stairs. A single patient could require the support of six or more staff to effectively manage the move to an area of safety and additional staff to continue to care for the patient after evacuation.

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Fire Plan Design

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d. Not movable

Patients in some ICU and other units are simply not movable. Either they are so dependent on a variety of medical devices for life support or so medically fragile that moving them creates a very real risk that they will sustain an injury that can have permanent consequences or even cause death.

Knowing and recognizing the actual condition of patients is essential for determining what number of staff are required to support the relocation and evacuation process. It is also essential for determining when units must be true to 'defend in place'- as some patients cannot actually be moved. Patient mobility is the most important factor to consider when designing a fire response program. The less mobile patients are the slower relocation or evacuation will be. Time during a fire is the single most important factor as the rate of fire growth. The more time spent reacting to a fire situation the greater the probability that conditions for flashover will be met and the greater the probability of fire deaths.

3. Unit geography – Corridors and exits

I look at unit geography from a variety of perspectives. First is the layout of the unit. I evaluate whether corridors are simple and linear or chopped up with sub- corridors that are hidden behind doors. Linear corridors are much easier to navigate when relocating or evacuating patients. If patients have to be moved along a path of travel with many doors and 90 degree turns it slows down evacuation and can lead to confusion and backtracking to locate an area of refuge or exit.

I also look at the number and type of exits accessible from any given unit. The general minimum number is two per building story. There are many variations on this so careful analysis may be required to evaluate exit capacity, travel distances and other factors. In the hospital business a floor that is served by horizontal exits is very desirable as it provides an evacuation route that does not require the use of stairs. The time factor difference between a stairwell evacuation and evacuation on the same building level is enormous.

4. Unit geography – Smoke zones

I evaluate smoke zones separately. Many hospitals have life safety drawings that indicate many small areas as smoke compartments. When the drawings are analyzed it quickly becomes clear that the zones do not meet code requirements for clear floor space for adjacent zones. This is particularly true on floors where ICU, surgery and other high intensity care are housed. Beyond the code requirements I always look at the typical patient footprint in an ICU or surgery suite and base my floor area requirements on what actually goes on rather than the code minimum.

Once the fire plan risk assessment is completed the specific instructions related to RACE can be developed for each area evaluated. Many areas will be similar. For example most business areas will be evacuation and self rescue following available routes of travel to horizontal exits or to exit stairs. Some patient care units will be self and assisted evacuation without a need to provide immediate medical support at the end point of the relocation or evacuation. Other patient care units will require large numbers of staff to move the patient in a bed with equipment to an area where power, medical gases and other resources are available to meet the medical needs of the patient. The RACE plan for each area must address all these factors as they are in the space.

The Joint Commission standards require that the plan covers roles and responsibilities of staff and members of the medical staff at or near the point of fire origin and in area distant from the fire. They also require that the staff knows how to activate alarms, how to contain the fire to rooms or compartments, proper use of portable fire extinguishers, and how to evacuate. These components of the fire plan align with RACE. The element of performance EC.02.03.01.10 that lists the requirements, also delivers the message that the plan needs to be as specific as possible for each area of each accredited facility.

A copy of a sample fire plan evaluation sheet is available upon request by emailing:
info@tsigconsulting.com

For additional information see Ken Gregory's article on page 6

Understanding Hazmat Responsibilities and Requirements (Part 3)

PERSONAL PROTECTIVE EQUIPMENT

Specialized equipment, known as PPE, is required to adequately protect rescue personnel and healthcare providers from secondary contamination. The type of PPE used depends entirely on the situation and the level of training of the user. HAZMAT workers required to enter the hot zone require a greater level of protection than medical personnel providing care to contaminated patients.

Levels of protection for work involving hazardous materials

Four levels of protection have been defined for work involving hazardous chemicals. Although these levels originally were intended for work at hazardous waste disposal sites, they have been adopted widely in other situations, such as rescue work.

- Level A is the maximum level of protection and usually is required only of HAZMAT personnel and others working in areas of very high concentrations of toxic agents, such as those entering the hot zone. It consists of a fully encapsulating chemical-resistant suit, positive-pressure self-contained breathing apparatus (SCBA), double layers of chemical-resistant gloves, and chemical-resistant boots. Airtight seals should be in place between the suit and the inner layer of the hands, face and feet protection.
- Level B is used when full respiratory protection still is required but dangers to the skin are less. It consists of a SCBA and a chemical-resistant suit with resistant gloves and boots. No airtight seals on the face, hands and feet are necessary.
- Level C is required when air concentrations are expected to be much lower and less likelihood of skin exposure exists. It consists of a full-face air purification device and a nonencapsulating chemical-resistant suit with gloves and boots.
- Level D level of protection is used only when no danger of chemical exposure exists. It consists of standard work clothes and no respiratory protection.

Most HAZMAT rescue workers require Level A protection, which is very expensive, bulky, and requires specialized training. The typical Level A HAZMAT suit costs several thousand dollars and must be cleaned between uses. Manual dexterity is poor, and the suits are very hot, limiting the amount of time that they can be worn.

HAZMAT teams usually use Level B or C PPE for decontamination. This takes place away from the hot zone and when the amount of chemical present on a patient is significantly less than those that exist in the hot zone. Also, sufficient quantities of chemicals to present physical hazards, such as explosions, should not be present on a patient. EMS workers and other healthcare providers require less protection than HAZMAT workers, but they still must be protected adequately when attending to contaminated patients. The level of protection required is usually Level C or B. This includes a chemically resistant suit, gloves and boots; respiratory protection; face protection; and disposable boots.

OSHA is still unclear on the level of protection that is recommended for medical personnel performing decontamination. The recommendations previously discussed suggest that Level B should be used in this situation. A considerable difference exists between Level B and Level C. Level B requires an external air source, either by SCBA or by a forced air supply through hoses. Either of these adds considerable expense and training compared with the use of air-purifying respirators used in Level C protection. Several research studies have concluded that Level C protection is sufficient for hospital decontamination.

Recommendations for PPE to be used in situations of radiation contamination suggest only Level D–type protection plus a dust filter for respiratory protection.

Protective suits and gloves

For medical applications, inexpensive ($50-100) and disposable chemical-resistant, multilayer polymer suits are available. Suits much more expensive than this commonly are used for surgery involving patients with HIV or other infectious diseases. One common misconception is that Tyvek suits, which are very inexpensive and readily available around hospitals and laboratories, are suitable for decontamination work. This material provides no chemical protection, and most chemicals can penetrate this material immediately, although it suffices for work with dusts, including radioactive dusts and biological agents. These suits are recommended for training exercises but should not be relied upon for chemical protection.

Glove material also is an important consideration, because the hands have the most contact with the patient. Unfortunately, no single glove material provides adequate protection against all chemicals. To counter this situation, most HAZMAT workers use several gloves of different materials. An ideal combination is nitrile and Viton. However, this is bulky and markedly limits manual dexterity. Because patients should be washed immediately with large quantities of water during decontamination, actual contact with pure chemicals is generally minimized.

Understanding Hazmat Responsibilities and Requirements (Part 3)

Continued from page 3

Typical latex gloves used in most hospitals offer little chemical protection. Nitrile has much better chemical resistance than latex and is now available in a thin, flexible, disposable glove that permits good manual dexterity. This is presently the ideal glove material for use when providing medical care to a patient who has undergone chemical contamination.

Aldehydes, halogenated hydrocarbons, ketones, aromatic hydrocarbons, nitro-organic compounds, and carbon disulfide rapidly can permeate nitrile. Unfortunately, most common solvents consist of chemicals within these classes. If these are encountered, use a thicker overglove, preferably made of Viton, until the patient at least is partially decontaminated. Most chemicals are removed just by removing the clothes. Once no chance exists of coming into contact with large quantities of pure chemical, such as during removal of the patient's clothes, disposable nitrile gloves should be sufficient.

Boots should be worn, since the feet are in constant contact with contaminated water during patient decontamination. Because chemicals are diluted, inexpensive disposable boots should suffice. Boots also provide slip resistance on wet floors. Avoid leather and cloth footings since these materials may wick up contaminants and are impossible to clean.

Respiratory exposure to vapors is an additional risk to the healthcare worker. The small quantity of materials present on a patient makes generation of toxic concentrations of vapors unlikely. Respiratory protection especially is important when working in enclosed spaces, such as transport vehicles or medical care rooms. While inhalation of toxic fumes and vapors can be prevented, it does require some degree of advance planning and training to provide adequate protection.

Available types of respiratory protection - Cartridge respirators and supplied air respirators

Air-purifying cartridge respirators function by allowing the wearer to inhale air through a canister filled with a special sorbent material that binds chemical vapors. Cartridge respirators are inexpensive, portable, and easy to use and store. However, drawbacks exist to their general use. The type of cartridge used must match the chemical vapor in question. Different cartridges must be used to protect from organic vapors, acid gases, chlorine, ammonia, and methylamine. The sorbent materials also have a breakthrough phenomenon, in which chemicals elude off the sorbent after a period of use and then expose the user. Multisorbent cartridges are available that do not require matching with the vapor in question. In general, these have a shorter breakthrough period. These factors limit cartridge respirators to short-term use and to low concentrations of chemicals in the air. This is the situation that exists when patients require decontamination.

Cartridge respirators depend on an airtight seal against the face. They require a good fit and cannot be used with facial hair. A moderate amount of work is involved when inhaling across the pressure resistance of the cartridge. All of this requires that any individual using this type of respirator be fitted properly and trained in its use. Cartridge respirators are very versatile for short-term use. They require adequate training of all personnel who may be expected to use them and require someone available at all times to decide which type of cartridge to use. Cartridge respirators are ideal for performing decontamination outside the ED.

To overcome many of the problems with air-purifying cartridge respirators, battery-operated cartridge respirators were developed. These use a battery-operated pump to draw air across the sorbent cartridge and pump it into a hood that surrounds the user's head. These do not require an airtight fit and can be used with facial hair. They do not require the user to work to draw air across the cartridge and, thus, are much cooler and less anxiety provoking. They also require less individual training. They still depend upon the cartridge to remove the vapor in question; thus, the cartridge must match the vapor. The time of use must be limited because of both chemical breakthrough in the cartridge and battery life. Since a clear shield surrounds the face, they provide better eye contact with the victims. These are probably the simplest and most versatile form of air purification device for hospital decontamination use. Use of supplied air respirators also requires training, although proper fit is less critical, at least with the continuous flow type. Because of the necessary air supply and hoses, supplied air respirators are impractical for use with outside decontamination. Some HAZMAT teams use this method for personnel providing decontamination close to a supply vehicle that can pump the necessary air. If a decontamination room is to be established inside a hospital, supplied air respirators are the ideal choice.

Most respiratory protection can be obtained using a half-face design, which covers the nose and mouth, or a full-face design that also covers the eyes. If the half-face design is used, goggles also must be worn to protect the eyes from splashes. However, the eyes are still exposed to vapors that can be irritating or toxic. If respiratory protection is to be used, choosing the full-face version to protect the eyes and entire face makes much more sense.

Protection of healthcare workers from hazardous materials exposures can be achieved with some degree of advance planning and training. Chemically protective suits that are inexpensive and disposable are available. Respiratory protection also can be obtained without significant expense; however, the least expensive type, cartridge respirators, requires some additional training.

The recommended PPE for decontamination of victims of radiation exposure, usually consisting of a filter-type dust mask and Tyvek or surgical scrub suit, was intended to protect the healthcare provider from radioactive dust particles. Unfortunately, this PPE is completely inadequate to protect from chemicals in the liquid or vapor states. Alternatively, PPE designed for chemical protection is more than adequate to provide protection in the case of a patient exposed to radiation. To avoid confusion and simplify the protocol, only one type of PPE is recommended. This may be more elaborate and expensive than that needed for a radiation protocol; however, it can be used in all situations involving persons exposed to hazardous materials.

DECONTAMINATION

Decontamination is the process of removing or neutralizing hazardous materials on people or equipment. Removal of chemicals on skin is important for 2 reasons:

- To prevent further absorption and subsequent toxicity because many substances disrupt the integrity of the skin and then become systemic toxins following absorption
- To prevent other persons or equipment from becoming contaminated with substances on the patient's clothes or skin (secondary contamination)

The type of decontamination procedure used depends on the situation. Removing all clothes will also remove most of the contaminants. Most decontamination can be accomplished by simple high-volume dilution with water. Occasionally, mild soaps are required to remove oily or greasy substances. Phenol can be removed better with polyethylene glycol if available. If not available, use water.

Avoid water in the presence of metallic sodium, potassium, lithium, cesium, and rubidium because these react on contact with water. Dusts of pure magnesium, white phosphorus, sulfur, strontium, titanium, uranium, yttrium, zinc, and zirconium ignite on contact with air. If burning, many of these explode if exposed to water. If these substances are suspected, remove residual metal with forceps and store it in a container of mineral oil. If radioactive particles are on or embedded in the skin, remove them by forceps. The radiation safety officer should dispose of them. Some HAZMAT teams use 4 special solutions recommended by the National Fire Protection Association for patient decontamination. Little evidence exists that these solutions are more effective at decontaminating human skin than water alone. In addition, none of the solutions can be used on open skin, mucous membranes, or eyes.

Collect the water runoff from the decontamination, and do not allow it to enter parking lots or storm drains. However, if a drain is readily available and arranging a collection system will require considerable time, decontaminating the patient and allowing the water to enter the drain may be prudent. Although this action theoretically can result in a fine from the EPA for an unscheduled discharge, this situation has not happened to date.

The collected water should be considered to be contaminated with a hazardous substance. If it is allowed to spread into an open area, it likely will be tracked off-site into private vehicles and homes. Collection of the decontamination runoff is accomplished by using a series of collection pools, which can be specially designed devices or can be as simple as inflatable children's pools. For ambulatory patients, a series of 3 collection pools usually is used, with contaminated patients or workers always starting in the most contaminated pool and finishing in the least contaminated pool. For non ambulatory patients, specialized runoff collection litters are available.

Remove clothes and place them in a plastic bag, and mark it as contaminated. Give priority to decontaminate the eyes, mucous membranes, and severely affected areas of the skin. Take care not to wash contaminants onto unaffected areas of the skin. Thoroughly irrigate areas of skin where the surface is broken. Avoid abrasive cleansing.

For radioactive materials, a Geiger counter can be used to detect any residual contamination. Unfortunately, no simple instrument is available for the wide range of chemical contaminants. Portable handheld monitors are available for detecting hydrocarbon vapors, but these usually are not available in hospitals. Copious irrigation is the standard rule; however, this should not be to the point of irritating or denuding the skin.

DEVELOPING A HOSPITAL EVACUATION PLAN
by Ken Gregory

If there is anything a medical center hopes it never has to do is a full evacuation of the facility(s), but unfortunately that risk is always present. Having a solid, well fitted, evacuation plan is the 1st step in easing those concerns. Major disasters in recent years including the floods of 2001, floods from Hurricane Allison, the September 11, 2001 Terrorist attacks and of course, Hurricanes Katrina and Rita in 2005, have made it clear how important the ability to safely and efficiently evacuate has become. The remainder of this article is some brief examples for guidance to the development of an evacuation plan that can be engaged in any emergency situation necessitating either a full or partial evacuation of the hospital. The evacuation plan should be a part of your facility's overall Emergency Operation Plan (EOP).

Identification of the Alternate Site(s)

Identify alternate/receiving facilities capable of providing the space and utilities necessary to care for the type of patients to be served by the site(s).

Secure written confirmation of the commitment of these facilities (Memorandum of Understanding, Contract, etc.), including communication means to ascertain availability at the time of the emergency.

Evacuation Plan Activation:

Define who makes the decision to activate the plan (typically the incident Commander), and assign an alternate if the primary person is not available.

Describe the process of implementation (i.e. Communication, Resources & Assets, Safety/ Security, Staffing, Utilities Management and Patient Support activities). This should address the main facility and alternate care sight(s).

Securing the Facility(s)

Define the lockdown plan for the main facility including ambulance diversion and control of media and visitors.

Define the procedures in place for securing the facility's infrastructure such as the Pharmacy, Administrative offices, Critical Utilities, Vehicles, etc.) both during and after the evacuation if completed.

Resources for Performing the Evacuation

Identify resources/equipment necessary to relocate patients from rooms/floors and have procedure in place for inventory control. Define the protocol for staff training on equipment use.

Define the protocol to be utilized for on-going assessment of the patient status for equipment and resources.

Coordinate transportation vehicle needs/resources with patient needs (I.E.: patient acuity level, wheelchairs, life support, etc.) and secure written documentation that confirms the commitment (Memorandum of Understanding, Contract).

Describe measures taken to protect patient confidentiality during transport.

Define the protocol for the transfer of patient specific medications and records to receiving facility

Continuity of Care

The plan must address how continuity of care will be maintained during an evacuation for patients at all levels of clinical complexity and disability treated in the hospital including:

How to maintain continuity of care if the usual equipment is not available during the evacuation process?

What resources are available to maintain isolation precautions for the safety of staff and patients?

Patient Tracking

Describe the process to be utilized to track the arrival of each patient at the destination, as well as, the plan for patient return to the original facility when the hospital is operational.

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The tracking form should contain key patient information, such as the following:

- Medical Record Number or other Identifier
- Time left the facility and time arriving at the alternate care site
- Name of transporting agency
- Was the original chart sent with patient (yes or no)?
- Were medications sent with patient (yes or no) ?
- Was equipment sent with patient (list) ?
- Has family been notified of transfer (yes or no) ?
- Has Admitting and/or Primary Care MD notified of transfer (yes or no) ?

Evacuation Confirmation

- Define the process for verifying that all rooms have been evacuated (i.e. tape/chalk on door, colored tags etc.).
- Describe the protocol to account for staff, visitors and non-employees (i.e., vendors, contractors) that may be on site during an evacuation.

Return to Facility

- Define protocol used to determine the main facility is capable of re-entry of patients after the emergency
- Define the methods described above to physically return to the main facility
- Define process for the critique of all activities involved in the evacuation to improve planning for future evacuations.

These are only a small amount of protocols to consider when planning for an evacuation and meant to be a guide. Your plan has to be specific to your facility and the patients served. For additional information or planning assistance, please feel free to contact TSIG Consulting at (877) GET-TSIG or info@tsigconsulting.com

WHATS NEW AT TSIG

By Ralph G. Heiman, CEO

As CEO of TSIG Consulting, Inc. I am proud to announce the following promotions within our firm:

- Karim Bhimani—President
- George A. Rivas, CHSP—Senior Vice President
- Ken Gregory—Vice President of Accreditation and Marketing
- Todd Lao—Senior Vice President-CAFM and Governmental Services
- Pedro Mejia—Vice President-CAFM Services

We also welcome David Page who joined TSIG Consulting as Vice President of Business Development. David has over 30 years experience in the acute healthcare industry providing products and services that positively influence patient satisfaction and safety. He is a trained expert in effective asset utilization resulting in positive cost controls for healthcare institutions.

He served the New England, Southwest, and West Coast markets during his tenure transcending to national responsibilities as VP Sales for a $200 million division of a privately held manufacturer and distributor of medical products. He holds numerous Achievements Awards for managing and developing successful business relationships with primary emphasis on customer satisfaction.

David holds an A.S. Degree in Business Administration with coursework toward his B.S. in Marketing at Western New England College. He achieved his Certified Medical Representative status from Northeastern University and Basic Textile Engineering Certification from North Carolina State University.
He served his country during the Vietnam Era; USAF Computer Operations, Top Secret Clearance; Pentagon, Washington D.C.; he received the Air Force Commendation Medal for service to his branch and country.

We are also pleased to announce that two of our Architects Olga Pankova and Gabriel Villegas have received LEEDs Certification—congratulations to both.

FIRE/SMOKE RESISTIVE CONSTRUCTION IBC AND NFPA 101

OVERVIEW AND CLARIFICATION

There remains some confusion among many Facility Managers, Safety Officers and even Life Safety surveyors as to the true definition of fire-rated and smoke-resistive construction. Both the 2000 International Building Code (IBC) and the 2000 Edition of NFPA *101- Life Safety Code* (*LSC*) require the installation of fire and/or smoke resistant construction to provide:

- Building separation
- Fire area separation
- Hazardous area enclosure
- Protection of means of egress
- Smoke compartmentation

Both have new, more explicit requirements for fire and smoke resistant construction.

These requirements are found in Chapter 7, Fire-Resistance-Rated Construction, of the IBC; and Section 8.2, Construction and Compartmentation, of the *LSC*. Fire and smoke resistive construction are broken into different classifications based on their use.

Terminology is critical when applying the correct code requirements. The classifications are:

- Fire walls
- Fire barriers
- Fire partitions
- Smoke barriers
- Smoke partitions

Table 1 below provides a general comparison of some of the different classifications of fire and smoke resistant construction and their respective applications. Keep in mind that occupancies can sometimes differ.

Classification	Fire-Resistance-Rating (Hours)	Smoke Resistant	Opening Protection	Application
Fire Walls	2, 3 or 4	No	Fire Dampers, Fire Doors, Fire Shutters, Fire Glazing and Firestopping	Building Separation
Fire Barriers	2, 3 or 4	No	Fire Dampers, Fire Doors, Fire Shutters, Fire Glazing and Firestopping	Fire Area Separation Protection of Means of Egress Hazardous Area Enclosure
Fire Partitions	1/3, 1/2, or 1	No	Fire Doors, Fire Shutters, Fire Glazing and Firestopping	Protection of Means of Egress Tenant Separation, Hazardous Area Enclosure
Smoke Barriers	1/2 or 1	Yes	Fire/Smoke Dampers, Leakage Rated Fire Doors, Leakage Rated Fire Shutters, Leakage Rated Fire Glazing and Fire/Smokestopping	Smoke Compartmentation
Smoke Partitions	0	Yes	Smoke Resistant Doors, Safety Glazing and Smokestopping	Protection of Means of Egress Hazardous Area Enclosure

DIFFERENCES IN FIRE RESISTIVE CONSTRUCTION

Fire resistive construction is broken into different classifications based on their use. Terminology is critical when applying the correct code requirements. The classifications are:

- Fire walls
- Fire barriers
- Fire partitions

Unfortunately, the terminology applied to fire resistive construction becomes muddied in actual application. Many in the construction, engineering and architectural fields still refer to fire partitions or fire barriers as fire walls.

Fire walls are technically defined as fire-resistance rated walls, which restrict the spread of fire and are continuous from the foundation to or through the roof (inferring a vertical application only). In addition, fire walls must have sufficient structural stability under fire conditions to remain in place while allowing the collapse of construction on either side.

Fire walls are permitted (with certain exceptions) to have protected openings, though the aggregate width of openings at any floor level cannot exceed 25 percent of the wall length. When fire walls are located on property lines (party walls), fire walls must be constructed without openings.

Each portion of a building separated by one or more fire walls shall be considered a separate building, when the fire walls provide a complete separation. Fire walls are necessary when constructing an addition to an existing building that already meets the maximum allowed height and area limitation of Table 503 of the IBC. In some instances, the construction of fire walls can be a cost effective alternative when certain active fire protection systems (i.e. sprinkler systems) are required by code.

The 2000 edition of the IBC provides a list of the required fire-resistance rating of fire walls dependant on use group of the building. The 2000 edition of NFPA 101 is not as specific regarding fire-resistance ratings for fire walls other than they must have a 2-hr minimum rating. NFPA 101 refers to NFPA 221, *Standard for Fire Walls and Fire Barriers*, for specific construction requirements.

Fire barriers generally have similar fire-resistance ratings as fire walls; however, they do not have the structural stability of a fire wall. Fire barriers can be vertical or horizontal fire resistance rated assemblies. Vertical fire barriers extend from the floor/ceiling assembly below to the underside of the floor or roof slab or deck above and are securely attached thereto.

Fire barriers are continuous through concealed spaces (i.e. above ceiling spaces). Fire barriers are used for separation of means of egress including:

- Vertical exit enclosures
- Exit passageways
- Horizontal exits

Single occupancies can be separated into multiple fire areas, also called compartmentation, by fire barriers. A fire area is defined as a floor area enclosed and bounded by fire walls, fire barriers, exterior walls or fire-resistive rated horizontal assemblies of a building. The use of compartmentation can be a cost effect alternative to active fire protection systems (i.e. sprinkler systems) in large fire areas exceeding 12,000 sq ft (1,115 m2) in area.

Fire barriers are also used for separation of different occupancy types and incidental use areas. When used to separate different occupancy types into individual fire areas, only the code requirements for that occupancy type are applicable to that area. Each fire area of a separated mixed-use building must comply with the height limitations based on the use of that area and the type of construction. In addition, the building area of each story must be such that the sum of the ratios of the fire area of each use divided by the allowable area for each use does not exceed 1. Table 302.3.3 of the IBC provides a useful matrix in determining the required hourly rating of fire barriers between adjacent use groups. Again, the *LSC* is not as specific regarding fire-resistance ratings for fire barriers other than they have a 2-hr maximum rating.

DIFFERENCES IN FIRE RESISTIVE CONSTRUCTION (continued from page 9)

Fire partitions are limited to vertical fire-resistance rated assemblies only. Fire partitions are used for construction of exit access corridors and tenant separations as follows:

- Walls separating dwelling units
- Walls separating guestrooms in R-1 occupancies
- Walls separating tenant spaces in covered mall buildings

Fire partitions have a maximum 1-hr rating and are not required to go to the underside of a floor/roof slab or deck, provided they are securely attached to a fire-resistance rated floor/ceiling or roof/ceiling assembly of the same or higher rating (other exceptions to continuity may be applicable). In addition, fire partitions do not need fire-resistance rated supporting construction, when used as tenant or guestroom separation walls or exit access corridor walls in unprotected construction types (i.e. Types IIB (000), IIIB (200) and VB (000)). The *LSC* does not distinguish between fire partitions and fire barriers, however, it does permit fire barriers to stop at the bottom of an interstitial space (i.e. above ceiling space), provided the construction assembly forming the bottom of the interstitial space has a fire-resistance rating not less than that of the fire barrier.

DIFFERENCES IN SMOKE RESISTIVE CONSTRUCTION

There continues to be confusion in the design and construction industries when referring to fire rated and smoke resistive construction. This is the third and last in a series of three articles that are meant to provide a refresher to code requirements for fire and smoke resistant construction and clear up the misunderstanding. Part 1 provided an overview of the different classifications of fire and smoke resistant construction. Part 2 addressed the differences in fire resistant construction in the codes. This article addresses various smoke-resistant construction and their respective application for code compliance.

Smoke barriers are defined as a continuous membrane, such as wall, ceiling and/or floor assembly, that is designed and constructed to restrict the movement of smoke. Smoke barriers are used to provide smoke restrictive compartmentation and are common place in occupancies that use a defend-in-place approach for occupant safety (i.e. health care facilities, detention/correctional facilities and underground buildings).

Section 709 of the IBC and Section 8.3 of NFPA 101 contain the requirements for smoke barriers. Both the IBC and the NFPA require smoke barriers to be continuous from one exterior wall to another exterior wall or from smoke barrier to another smoke barrier, or a combination thereof. Similar to fire barriers, vertical smoke barriers extend from the floor/ceiling assembly below to the underside of the floor slab or roof deck above and are securely attached thereto. Smoke barriers are continuous through concealed spaces (i.e. above ceiling spaces), unless the construction assembly forming the bottom of the concealed space provides equal protection against the passage of smoke. While not specifically stated by either code, by requiring the vertical smoke barriers to be continuous from floor slab to floor slab, it is inferred that the floor slabs themselves will also restrict the passage of smoke.

The IBC mandates that any required smoke barrier must have a 1-hour fire rating with the exception 0.10-inch thick steel smoke barriers used in correctional/detention facilities (Group I-3 occupancies). NFPA has no general fire resistance requirement and any required fire rating for smoke barriers is occupancy specific. Where a fire rating is required for the smoke barrier, both codes require that the smoke barrier must also be constructed as a fire barrier with one exception. Similar to fire partitions, smoke barriers do not need fire-resistance rated supporting construction, when installed in unprotected construction types (i.e. Types IIB (000), IIIB (200) and VB (000)).

Smoke partitions are a fairly new assembly, in that only since the 2000 Edition of the NFPA have smoke partitions had specific requirements (Section 8.2.4). Previous editions of 101 referenced smoke partitions without giving much guidance in how to construct them. The IBC is similar to the older editions of 101, making references to smoke partitions for curtain wall enclosure of atriums and enclosure of certain fully sprinkled incidental use areas per Table 302.1.1. However, the IBC does not have a specific section for smoke partitions requirements. Smoke partitions can only be used in specific areas where complete fire suppression is provided in the room or area enclosed with smoke partitions as follows:

- Atriums (glass curtain wall must be constructed as a smoke partition)
- Specific hazardous areas

Smoke partitions only limit the passage of smoke, whereas smoke barriers restrict the passage of smoke. The purpose of smoke partitions is to create an enclosure that will allow heat from a fire to build up within the enclosure to activate the fire suppression system – usually an automatic sprinkler system.

Smoke partitions are required to go to the underside of a floor slab or roof deck, through any above ceiling spaces, and through interstitial structural and mechanical spaces. Smoke partitions may also terminate at the underside of fire rated floor/ceiling and roof/ceiling assemblies provided a smoke tight joint is provided. NFPA 101 permits smoke partitions to terminate at the underside of a monolithic (i.e. gypsum wallboard ceiling) or suspended ceiling system where all of the following conditions are met :

- The ceiling system forms a continuous membrane
- A smoke tight joint is provided between the top of the smoke partition and the bottom of the ceiling
- The space above the ceiling is not used as a plenum

NFPA 101 considers a suspended-grid acoustical tile ceiling with penetrations for sprinklers with escutcheon plates, ducted HVAC supply and return air diffusers, speakers, and recessed lighting fixtures as capable of limiting the transfer of smoke.

Hopefully this article serves to better define the different types of fire resistive and smoke resistive construction and their respective application in the IBC and NFPA and reduces the confusion.

HEALTHCARE ORGANIZATIONS: IN THE NEWS

LONG BEACH - Three people were killed Thursday June 16th after a hospital worker opened gun fire at Long Beach Memorial Medical Center. Fifty year old pharmacy technician, Mario Ramirez of Alhambra, shot and killed two of his supervisors before the father of four turned his weapon on himself. Long Beach Memorial Medical Center officials identified the victims as Kelly Hales, 56, of Redondo Beach and Hugo Bustamante, 46, of Cypress. Hales was the executive director of the pharmacy in the outpatient center, and Bustamante was the department's supervisor, hospital officials said. Many witnesses described how the gunman shot his co-workers before killing himself.

Ed Collins, a hospital X-ray technician, said he was in the elevator when he heard an alert go out on the hospital's PA system followed by the sounds of screams. As the elevator doors slid open, a scene of chaos unfurled, Collins said. A friend and co-worker ran up to him, tears streaming down her face as she told him their co-worker had shot another employee at the pharmacy. She turned and began to scream pleas to Ramirez not to kill himself as he turned the weapon toward his own head, Collins said.

Lisa Hernandez, a patient's relative, said doctors and other hospital staff herded patients into bathrooms and exam rooms where they took cover behind furniture.

Neighbor Gina Marquez described Ramirez as a family man who was quiet and polite. He would often go jogging with his wife, she said. Another co-worker, Melo Dotski, radiology department clerk, said she was stunned when she heard the identity of the gunman.

"I couldn't believe it was him. He was the sweetest man," she said. "Everybody knew him as the hospital's George Lopez because he was always cracking jokes." Police Chief Anthony Batts said the motive remained under investigation, but noted it came amid a flurry of recent shootings in the U.S. "This is a trend of active shooters that you have seen nationwide," Batts told a press conference. "This is becoming a national trend, probably because of the tension that's going on in our society today." Hospital spokeswoman Stacie Crompton-Hime said the hospital did not have any plans for layoffs. The hospital, however, did have cutbacks in March, but Ramirez's job was not affected, she said.

Calls of the incident began flooding over police and fire radios at 11:47 a.m. and an officer near the hospital was on scene within a minute of the call, said Sgt. Dina Zapalski, a Long Beach police spokeswoman. "That officer who was first on scene actually heard the shots ... outside," the sergeant said. Homicide Lt. Lloyd Cox said none of the officers witnessed the shootings, but they did recover two guns at the hospital.

Cox said police had not yet confirmed both guns belonged to Ramirez. Batts said officers responding to the shooting found one victim inside the hospital and then found a second victim outside on the north side of the hospital outside the emergency room. Ramirez was found dead outside on the north side. At an evening press conference, Memorial appointed CEO Diana Hendel told reporters it was with a heavy heart she was addressing them. "Our first priority was to ensure our patients' safety and that they are well cared for," Hendel said. "My heart is with everyone affected today." Hendel said the families of the victims were receiving care through the hospital's chaplain service.

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Dear Sir:

I cannot begin to thank you, we appreciate all the efforts of your team of consultants lead by Mr. George Rivas and Mr. Ken Gregory for making our recent survey such a successful outcome. There is no way possible that I could have been as prepared in advance without the aid of TSIG in such short of time since I came on board here at St. John's Episcopal Hospital. The work that your staff prepared from the Statement of Conditions, organizing all our Environment of Care, Life Safety & Emergency Management documentation, and providing on-site support during the survey itself was quite impressive and deserves recognition. For that, I personally would like to thank you and TSIG.

Thomas A. Farzetta

Director of Construction and Facilities

St. John's Episcopal Hospital