In October 2014, representatives from over 30 organizations that are considered stakeholders on the subject of relative humidity (RH) in healthcare organizations met in Arlington, Virginia, at the headquarters of the Association for the Advancement of Medical Instrumentation (AAMI). Included in the group were representatives from the major accreditation and certification organizations, as well as member society organizations, manufacturers, and suppliers. The purpose of the meeting was to discuss recent events concerning the enforcement of RH levels in operating rooms and how to best inform the organizations’ constituents of the concerns and possible dangers of an operating room with too-low RH.

For some background on the subject, the change in RH started many years ago at the request of a number of healthcare delivery organizations. The ASHRAE responded by updating its national standard for humidity in operating rooms to expand the allowed range of RH, dropping the lower end of the range from 30% to 20%, while keeping the upper end of the range at 60%. The 2012 edition of NFPA 99, *Health Care Facilities Code*, adopted the ASHRAE standard on RH, and the standard has also been incorporated into the Facility Guidelines Institute’s *Guidelines for Design and Construction of Hospitals and Outpatient Facilities*, 2014 edition. The American Society for Healthcare Engineering also supported the change in the standard.

In April 2013, CMS issued S&C memo 13-25. This memo permits hospitals and critical access hospitals, through the use of categorical waivers, to utilize a selected portion of the 2012 edition of NFPA 99 and lower the RH in their anesthetizing locations provided doing so neither violates any state or local regulations nor adversely affects the performance of the ventilation.
Actually very astute—it brought to national attention that operating room. The surveyor’s observation was operating room was lower than allowed by the Instructions of 2014, a California hospital was cited by a CMS changes brought by this categorical waiver. In the summary, weather or dry environments. It’s also more expensive operationally to keep a minimum humidity level of 35% in cold weather or dry environments.

Unfortunately, not everyone was on board with the changes brought by this categorical waiver. In the summer of 2014, a California hospital was cited by a CMS state agency surveyor because the RH level in the operating room was lower than allowed by the Instructions for Use (IFU) for certain sterile products being used in that operating room. The surveyor’s observation was actually very astute—it brought to national attention the previously unaddressed issue of supplies and equipment that are not approved for use in environments of less than 35% RH.

Humidity can impact the shelf life and product integrity of sterile supplies, whose IFUs call for maintaining RH levels in the 35%–60% range. Some products, such as biologic indicators, chemical indicators, and EKG electrodes are very sensitive to humidity; in fact, they are packaged in foil pouches primarily to protect against it. Consumables for electro-surgical products also are humidity-sensitive. It is vital that operating room staff know and understand the IFUs for each of the supplies used in the operating room, and in particular know what humidity level is specified in those IFUs.

Humidity also can impact the operation of electro-medical equipment used in the operating room, especially older models that are more likely to malfunction unexpectedly. Lower humidity levels also impact calibration. And, in an environment where RH is in the 20% range instead of the 35% range, a person can more easily become charged up and receive an electrostatic shock when coming in contact with medical equipment.
Larger electrostatic discharge (ESD) pulses create a greater risk of destruction of parts, premature failure, and erratic software behavior that may be mistaken for glitches.

Manufacturers of supplies and equipment want to meet the needs of healthcare delivery organizations for lower levels of RH, but the pace of this change will depend on the products and whether the lower humidity level can actually harm their integrity. It will take some time (i.e., years or decades) for these questions to be sorted out, tested, further refined, and then assimilated into the market.

New electro-medical equipment is moving toward lower acceptable RH levels, and the lower humidity range requirement is something that should be considered in new technology assessments. If your organization continues to use equipment of various ages and from various manufacturers, it will be many years before you can assume that all of your electro-medical equipment can safely withstand lower humidity levels.

Lowering humidity levels in the operating room without doing a risk assessment first is not an option, as it puts healthcare organizations at risk by not knowing what supplies and equipment may be affected, not to mention the increased chance of being cited by surveyors. What’s more, the specter of patient safety issues will continue to lurk beneath the surface if healthcare organizations fail to consider the bigger picture of how lower humidity may affect their supplies and equipment.

The soundest approach is to do a multidisciplinary risk assessment of humidity levels in the operating room as well as wherever sterile supplies are used or stored. Patient safety and quality teams are well suited to take the needed cross-organizational systems approach to the assessment. Here are questions to consider to help you get started:

1. Determine the desired lower humidity level (e.g., organization’s position on energy use, difficulty of controlling in extreme weather, etc.).
2. Monitor actual low humidity levels for a sufficient time to know whether, when, and for how long they are below 35% due to environmental conditions.
3. Take an inventory of supplies and equipment used in the operating room and create a chart showing the allowed humidity range for each item (low and high; will be found on the IFUs).
4. Assess and manage the risk of using equipment that calls for a humidity level of 35% or higher (an especially prevalent issue with older electro-medical equipment); understand the impact on performance.
5. Find out the variance of time (or excursion boundaries) that products can be out of their designed RH range before their package integrity or performance are impacted. Learn and understand how integrity and performance are impacted when supplies and equipment are stored and used out of range.
6. Assess humidity levels on any planned new capital equipment. Include older, higher humidity requirements in cost/benefit analysis of life cycle planning for old technology still in use.
7. Using all of the information in hand from the completed analysis, do an overall cost/benefit analysis and determine whether the benefits of intentionally lowered humidity levels (below 35%) override the costs (which include risks).
8. If the decision is made to maintain humidity levels below 35%, move supplies that call for humidity levels of 35% or higher to a humidity-controlled closet.
9. Repeat the analysis periodically for new conditions and products. Note: A lot of products that call for humidity levels of 35% or higher are used throughout a hospital (e.g., EKG electrodes). While this risk assessment is specific to the operating room, the same process needs to occur in other areas if humidity levels are going below 35% by design or effect.

AAMI and the stakeholder organizations plan to collectively issue a memorandum advising healthcare delivery organizations what they should do to protect the safety of the patients and the integrity of their supplies and equipment in light of the lower RH limits. As of presstime, this communication had not been issued.
Editor’s note: This is another article in a continuing series to inform our readers on expected changes when the new 2012 Life Safety Code is finally adopted.

The transition to the new 2012 Life Safety Code® (LSC) will not be too difficult if you understand the reasoning behind the changes. Frank Van Overmeiren, president of FP&C Consulting, Inc., of Indianapolis, spoke at the recent Midwest Healthcare Engineering Conference held in that city, offering some basic logic surrounding the upcoming changes.

To understand the code changes, Van Overmeiren says we need to understand the accreditation process. “We have to go back to 1913 when we had the American College of Surgeons and they were the first organizational group that wrote healthcare standards,” he says. “That is where it all started from. They were writing standards specifically for surgical procedures, and until then there was no nationalized base of standards.”

In 1951, a variety of professional associations decided to merge together and created The Joint Commission for the purpose of writing national recognized standards for providing healthcare.

“In 1952, the American College of Surgeons joined the Joint Commission,” says Van Overmeiren. “In 1965, this is realistically where it all starts. Congress passed an amendment to the original Social Security Administration Act to create Medicare & Medicaid reimbursements, but they did not have any nationally recognized standards to evaluate the organizations. So they reached out to The Joint Commission and asked them to be a deeming organization to survey healthcare facilities and identify hospitals that are in compliance with, at that time, 11 different standards of healthcare.”

It wasn’t until 1970 that the federal agency in charge of Medicare & Medicaid reimbursements adopted the 1967 edition of NFPA 101, the LSC.

“With the 1967 edition, the LSC picked up all the other standards that are referenced by NFPA 101,” says Van Overmeiren. “Many are NFPA standards, but some are from other organizations as well. As an example, there are ANSI standards for elevators, which are part of the reference standard found in NFPA 101. So they are enforceable through CMS, Joint Commission, HFAP, or DNV.”

CMS changed over time to the 1985 edition of the LSC, then changed again to the 2000 edition; now it is in the process of adopting the 2012 edition. Being a federal agency, CMS must follow the federal rule-making process when adopting a newer edition of the LSC. That process started with an October 2011 notice in the Federal Register informing the public of CMS’ intent to review the 2012 edition for adoption. Adoption of a new standard is at minimum a 32-month process, and we are already in the 40th month since CMS announced its intent.

CMS conducted its due diligence to determine what it would cost the public to make this change. Then it published a proposed rule to adopt the 2012 LSC with the agency’s proposed exceptions, and the public had its time to make comments. Now CMS is reviewing those comments to determine if changes to the proposed rule are necessary. Once they finalize their rule to adopt the 2012 LSC, they will publish that decision in the Federal Register. Even though the NFPA has now published a 2015 edition of the LSC, CMS can only adopt the 2012 edition; switching editions would require them to start the entire process over.

“My projection is based on where they are in the calendar right now and their history on how they did the last time they adopted a newer edition,” says Van Overmeiren. “I think we are looking at the fall of 2015 for an adoption day.”

Since CMS adopted the 2000 edition of the LSC, the NFPA has published four more editions: 2003, 2006, 2009, and 2012. Until now, none of these editions were adopted, so any changes made during this period were not available to healthcare organizations.

“Now, within the four revision cycles, there have been hundreds of changes that have occurred,” says Van Overmeiren. “Lots of the changes were simply editorial; a number of changes were format issues; and
some changes were just clarification of existing standards.” But there have been major changes during the revision cycle as well, and Van Overmeiren spoke about some of the more important changes that the 2012 LSC will bring.

“The new 2012 LSC has Chapter 43 that addresses building rehabilitation that we did not have before,” says Van Overmeiren. “This chapter will define the different levels of renovation, modification, rehabilitation in your building. You can now say ‘I’m only renovating this small space’ and Chapter 43 will identify for you what things you have to do as part of that renovation.”

Other major changes include corridor projections, alcohol-based hand-rub dispensers, door locks, sprinkler systems, unoccupied mechanical rooms that open onto an exit enclosure, and lots of changes on suites. “I love suites,” says Van Overmeiren. “It’s my best ability to make code compliance for your facility is by the utilization of suites.”

But he warned about obstructions to sprinklers that are caused by new patient-lift systems installed in hospitals. “Many of you have gone through your facility and installed ceiling-mounted track for your patient lift systems,” says Van Overmeiren. “Now we have issues of obstructions to sprinkler heads because the patient-lift track is mounted too close to the sprinklers.”

Previously, the LSC was confusing at times on the issue of occupancy classification. “A more clear definition regarding occupancy classification for spaces serving inpatients was gray area in the 2000 edition on,” says Van Overmeiren. “Is the operating room a healthcare occupancy? Because we were receiving four or more inpatients for surgical procedures, that makes the OR a healthcare occupancy. But radiology may not be because you may have only one or two inpatients on a normal program basis, so it doesn’t have to be healthcare occupancy. It would probably be ambulatory healthcare occupancy if it is not healthcare occupancy.”

The 2012 LSC provides some clarification on occupancy classification issues. “The new 2012 LSC went through and identified the use of the term ‘litterborne’ in the codes and standards,” says Van Overmeiren. “Depending on which NFPA code or standard you looked at, they had different definitions for the term ‘litterborne.’ So the new NFPA 101 removed the term altogether and gets down to the point: we are defining as incapable of self-preservation. We no longer have that gray area on how we’re transporting patients; on a litter, in a wheelchair, on a gurney, or a transport bed. All that disappeared, and now it is based on whether the patient is incapable of self-preservation.”

But making the determination of occupancy classification can be difficult. “You have to be careful because if you are going to designate some areas like dialysis, for example, as business occupancies, your staff must teach your patients to turn off the machine, double-clamp the tube and clip the line,” says Van Overmeiren. “Then they are capable of self-preservation. If your staff doesn’t teach your patients that, then the patients are tied to a dialysis machine, which makes them incapable of self-preservation.”

Oncology and infusion patients are just the inverse, says Van Overmeiren. “In those locations where they are hooked up to infusion equipment mounted on wheels, the equipment can be unplugged and move on their own,” he says. “They are not classified as incapable of self-preservation. So those are examples of how the 2012 NFPA 101 is trying to clean up how we are defining occupancies.”

The new 2012 LSC further clarifies construction limitations. “Many facilities are now building their new facilities or new wings with interstitial spaces,” says Van Overmeiren. “The term interstitial space is the space above the ceiling, but is not another story. We essentially have low-combustible loading up in that space, and by definition we are not required to put sprinklers in that space. We don’t have electrical motor disconnects, and we do not have motors greater or equal to 1 horsepower, and we don’t have any fan systems up in this space. What we do have is medical gas piping, conduit, and ductwork, those kinds of things, in the interstitial space. The interstitial space is not a separate story for purposes of calculating height and divisions in our building.”

Exit enclosures have changed for the new 2012 LSC. There is now a clear definition on those unoccupied mechanical rooms that open directly onto an exit enclosure.

“How many hospitals have their elevator machine room at your top of the building with a single door from the elevator machine room into the stairway?” asks Van Overmeiren. “Realistically, most of the older buildings...
were built exactly that way. Under the 2000 LSC, that was not permitted. The 2012 LSC made changes allowing existing mechanical spaces that open directly onto a stairway to remain, as long as there is no fuel-fired equipment, there is no storage, and the entire building is protected with sprinklers. The key for this provision is there is no storage. Be careful with that. You can’t be having pallets of air filters, and you’re not allowed to create a repair shop in that space. You can’t be using that space for contractor staging when you’re doing renovations. For new construction, you need to create a vestibule or corridor to the mechanical room that essentially has two sets of doors between the stairway and the mechanical room.”

Van Overmeiren points out that hospitals can use this portion of the 2012 LSC now under the CMS categorical waivers. Issued in August 2013, CMS allows the use of certain sections of the 2012 LSC provided the hospital complies with all of the requirements. (See the November 2013 issue of HLSC.)

“There are lots of changes regarding door locking,” says Van Overmeiren. “Under previous editions of the LSC you basically could not lock doors in the path of egress in healthcare facilities, with very few exceptions. One exception is based on the clinical needs of those patients requiring specialized security measures for their safety; we can lock the doors in that space. So for Alzheimer patients or dementia patients, we can lock the space and arrange it so the activation of the building fire alarm system does not release the locks.”

The previous LSC did not allow locking doors in the path of egress for infant or pediatric security, or protection from outside forces in the ER or ICU. “The 2012 LSC allows infant or pediatric spaces, ERs, and ICUs to have systems to lock the doors for their safety,” says Van Overmeiren. “The staff has to have the ability to unlock those doors; there must be complete smoke detection within the space—or you must have the ability to unlock the doors remotely from a constantly attended location within the space; the building has to be fully sprinklered throughout; the locks fail in an unsecured mode on a power loss; and the doors unlock upon a building water-flow or smoke detection activation. Manual fire alarm stations do not have to unlock the doors.”

One of the caveats pertaining to doors locked for safety needs is the option to have a switch that unlocks the doors, remotely located in a constantly attended location. While that may seem like the typical nurse station, double-check with your staff. Constantly attended means there is always someone at that location. Unless the unit has monitors that need to be observed, it is not uncommon for a nurse station to be unattended at times, which would not qualify for this condition. As Van Overmeiren indicated before, with the use of the CMS categorical waivers, hospitals now have the ability to lock the doors in those areas.

Under the old provisions of the previous LSC, you were only permitted one delayed egress lock within any given path of travel. “Leaving a room, a suite, or an area and entering a stair or discharging out of the stairs could be multiple potential situations of being in the same egress path to getting to the outside public way,” says Van Overmeiren. “The 2012 LSC eliminated the limitation of only one. We are now permitted to have as many as we want. The LSC says the delay is to be 15 seconds or up to 30 seconds when approved by the authority having jurisdiction.” Note, though, that while some states permit the 30 seconds, not all national authorities do. Therefore, hospitals must comply with the most restrictive interpretation, which means delayed egress locks are only permitted to delay for 15 seconds, not 30.

The 2012 LSC has other changes for the provisions of door hardware. “Specific arrangements for power-operated doors used as entrances to rooms or suites do not have to have positive latching hardware,” says Van Overmeiren. “You can use the power operator as equivalent to positive latching keeping the door closed. You cannot select the switch to have the power operator holding the door open. And the LSC requires a minimum of 5 foot-pounds of force on the power operator keeping the door closed.”

The 2012 LSC has changed to specifically permit automatic flush bolts on the inactive leaf of double door assemblies. “This basically came about because we have lots of door openings where we had to widen them up for bariatric patients, with a secondary leaf of doors,” says Van Overmeiren.

Prior to the 2012 LSC, protective plates on doors were limited to the maximum size of 48 inches. “Realistically what happened was Underwriters Laboratories came up with a new listing for what they identified as cladding material,” says Van Overmeiren. “It’s a material of high-
density plastic, and it can be used to apply to a door for aesthetic purposes to hide non-structural damage of a fire-rated door. It is UL listed as a cladding material and they also have it for frames. So if your doors or frames are all goobered up and banged up over time, you can adhere this plastic material and it does not invalidate the UL listing of the fire door or frame. This change did away with the limitations on the height.”

In other changes with doors and hardware, the 2012 LSC addressed vision panels, or windows in fire-rated doors. “The limitations of fire-rated glass were greatly modified by UL, and now the 2012 LSC essentially no longer permits the use of wired glass in new door assemblies,” says Van Overmeiren. “You can put wired glass back in on existing door assemblies, but any new openings need to be fire-rated glass. And with the use of fire-rated glass there is not a size limitation. With wired glass we had the 100-square-inch size limitation. The 2012 LSC no longer has any limitations based on the UL listing for fire-rated glass.”

In the previous editions of the LSC for new construction in new healthcare facilities, there was no requirement on the common path of travel. “With the adoption of the 2012 LSC edition, that will be cleaned up as part of the modifications for suites,” says Van Overmeiren. “The bottom line: We still have rules for common path of travel. Existing healthcare facilities are grandfathered in, but for new construction we now have a maximum 100 feet of common path of travel. This is an example of a change that is more restrictive than the previous editions of the LSC.”

The new 2012 LSC has multiple changes affecting corridor width and projections. “The 2012 LSC allows wall-mounted items, such as alcohol-based hand-rub dispensers, to project up to 6 inches into the corridor,” says Van Overmeiren. “Wheeled equipment that is strictly related to patient care may be left unattended in our healthcare corridors. The portable patient lift, the wheelchair, and the accessory equipment that relates to patient care that is on wheels is all allowed to be left unattended. Before we had to worry that the surveyors would go around and chalk the wheels and come back in 30 minutes to see if the equipment moved. That is no longer an issue. Now the equipment must be kept on one side of the corridor, and they cannot extend into the corridor for more than 3 feet, so you still have 5 feet clear width in the corridor.”

In the event of a fire alarm, staff has to be trained to put all the equipment in designated storage locations, and get the corridors clear for evacuation or to receive patients. Hospitals must develop a management plan to train and teach staff, who must be capable of relocating the equipment during emergency situations or simulations like fire drills.

“The 2012 LSC now permits us to have fixed furniture in our facility corridors,” says Van Overmeiren. “This is a new change in the LSC where healthcare providers want to get people up out of bed for patient care and therapy as soon as possible.”

In order to utilize fixed seating, the 2012 LSC requires the following: the furniture must be securely attached to the wall or floor; it cannot reduce the clear width of the corridor to less than six feet; it may only be located on one side of the corridor; each grouping of fixed furniture cannot be more than 50 square feet; groupings of fixed furniture must be separated by 10 feet; fixed furniture cannot obstruct access to building service and fire protection equipment; corridors throughout the smoke compartment must be protected by smoke detection, or the grouping of fixed furniture must be arranged to allow direct supervision by the facility staff; and finally, the smoke compartment must be protected throughout by automatic sprinklers.

“There clearly have been many changes to hazardous rooms,” says Van Overmeiren. “Fifteen to 18 years ago we finally got rid of locker rooms being classified as hazardous rooms. That was eliminated because we no longer permit smoking in our spaces. We used to have lots of locker room fires, but they were the high frequency/very low severity type—commonly didn’t leave the locker room of origin, made the room messy and the corridor messy but really didn’t go anywhere outside of that. Gift shops are no longer considered hazardous rooms. Soiled utility rooms and trash collection rooms with less than 64 gallon capacity of trash or soiled linen are no longer considered to be hazardous rooms. You may still want to treat those areas as hazardous rooms, with smoke-resistant partitions around the room, and closers on the door, but the 2012 LSC does not require fire-rated enclosures.”

EDITOR’S NOTE
Van Overmeiren’s discussion will conclude next month.
Due-date stickers on medical equipment: A surveyor myth?

During one hospital’s recent triennial survey by an accreditation organization, a surveyor observed that the medical equipment in use did not have a sticker indicating when the next inspection due date was scheduled. The surveyor asked the end user of the equipment how the hospital verified that the equipment was properly maintained, but the end user could not explain the process for proper maintenance of the equipment.

The surveyor reviewed the hospital’s policy on medical equipment maintenance, which explained that the hospital did not use stickers on the equipment to identify the next inspection due date, but rather relied on the asset tag identifying the equipment as part of the hospital’s inventory. The policy also noted that the end user of the equipment must conduct a visual inspection of the cords and leads to determine they are in good working order prior to using the equipment. The policy concluded by stating that the bio-medical department will properly maintain all medical equipment according to its maintenance program, and that the end-user will know, by virtue of the equipment placed in use with an asset tag, that the equipment is properly maintained.

This hospital received a citation from the surveyor—not for failing to have stickers identifying the next inspection date, but for not complying with its own policy for verifying maintenance of its medical equipment. The hospital appealed this finding, stating that its bio-med records proved the equipment in question was properly maintained, but the accreditation organization held the surveyor’s finding as valid since the hospital’s policy required the end user to know that the equipment was properly maintained by virtue of the hospital’s asset tag and the bio-medical maintenance management plan. The end user could not speak to this; therefore, the hospital was deemed noncompliant with its own policy, and its appeal was denied.

This situation raises the old question: Are stickers that identify the next inspection date required on medical equipment? The overwhelming answer appears to be no, based on replies from CMS, The Joint Commission, HFAP, and DNV-GL Healthcare. While CMS does not require inspection stickers, it does expect the hospital to have policies and procedures that ensure the equipment is being maintained as required.

Likewise, Randy Snelling, chief physical environment officer at DNV-GL Healthcare, Inc., says preventive maintenance (PM) stickers can be useful tools in controlling some aspects of equipment management. “While there are no NIAHO® or ISO requirements for PM stickers to be placed on medical equipment, most DNV client hospitals rely, at least partially, on equipment labeling,” says Snelling.

But DNV-GL enforces requirements that state the organization shall ensure that products not conforming to their own requirements are identified and controlled to prevent their use or delivery. “DNV interprets this to mean that the clinician, the end users of the medical equipment, must be alerted and/or notified of nonconforming equipment to prevent its use and/or delivery,” says Snelling. “This includes equipment that has not been maintained according to hospital procedure, or equipment that is overdue for scheduled maintenance.”

George Mills, MBA, FASHE, CEM, CHFM, director of engineering at The Joint Commission, spoke at a recent Association for the Advancement of Medical Instrumentation conference and was asked if there were any requirements to use inspection stickers on biomedical devices.

“The short answer is that there is not any requirement by The Joint Commission or any other agency that I am aware of requiring stickers on medical equipment,” says Mills. “It is up to the organizations to define and evaluate the process that is in use. The Joint Commission evaluates compliance based on the organization’s policy. The organization has the ability to evaluate the use or non-use of stickers. This process could be evaluated using any of the process evaluation tools available today.”

When Mills was asked if he was aware of any hospitals that have opted to not use PM stickers, he said yes. “I can remember a several-hospital system—I think it was eight hospitals—that decided to go ‘stickerless’ back in 2000 or so,” says Mills. “What a concept, to not have a green sticker on a piece of equipment saying when it was going to be due for service again. They did
it, and they were very successful. Then the person who ran the program left the organization, and the sad thing is they went back to stickers after he left. They couldn’t sustain it, because they lost the vision.”

A representative from HFAP stated that while HFAP does not require PM stickers or next inspection due-date stickers on medical equipment, it does require the end user to be able to speak to how he or she knows the equipment is properly maintained. Whatever process is utilized by the organization will be evaluated by the surveyor to determine the presence of a procedure whereby end users are informed of the proper maintenance (or non-maintenance, as the case may be) of the equipment they are using.

This may be accomplished with next inspection due-date stickers, but it may also be accomplished with other forms of notification or by equipment alarms. Much of today’s electronic medical equipment has alarms that can be programmed to alert end users that PM activities are needed. This is a much more effective process than stickers, which may fall off or not survive equipment cleaning. When these alarms are relied upon, end users must be properly trained on how to interpret the alarms and who to notify.

Another method of end users knowing that the medical equipment is properly maintained is to actually place the maintenance documentation on the medical equipment itself. However, this would only work for large pieces of equipment, such as MRI, nuclear medicine, or other radiological equipment, and it does not address how the documentation would be maintained if the overall PM system is electronic.

But possibly the most important aspect of PM stickers is the intent attached to them. Often, it appears, surveyors have mistakenly assumed that as long as the medical equipment is within its window of maintenance, as attested to by the sticker, it is safe to use. This was disputed by Russell Furst, biomedical engineering manager at Lakeland Regional Health System in St. Joseph, Minnesota. Furst talked about his experiences with PM stickers just isn’t high on his or her list of priorities, nor should it be. It’s just not reasonable to expect clinicians to perform this function.”

That may be where the misconception lies with surveyors: The common myth is a piece of equipment that has an up-to-date inspection sticker is considered safe for use by the clinical staff. In addition, most of the surveyors who are enforcing this issue are not bio-medical technicians or otherwise experienced in that field. The accreditation organizations and the state agencies surveying on behalf of CMS need to educate their surveyors on what their standards actually require and what is permitted pertaining to equipment maintenance.

“The vast majority of failures [to medical equipment] happen without warning and simply cannot be prevented with a PM,” said Furst. “Most of what constitutes a PM these days is not preventive at all anyway. Sure, there are some devices that still benefit from scheduled maintenance where parts are replaced preventively or filters are cleaned, but the list is getting smaller and smaller. PM stickers simply do not add any safety value.”

But wouldn’t a PM sticker make it easier to identify items that are due for maintenance? After all, the clinical staff can remove the devices from service when they notice the expired date on the sticker. Unfortunately, Furst busted this myth too. “In my experience with using stickers, this rarely happens,” he said. “Of all the things a clinician has to worry about, looking for outdated PM stickers just isn’t high on his or her list of priorities, nor should it be. It’s just not reasonable to expect clinicians to perform this function.”

If an organization’s culture successfully makes use of PM stickers, then it should feel free to continue. However, it should know that there are other options.
Editor’s note: Each month, Senior Editor Brad Keyes, CHSP, owner of Keyes Life Safety Compliance, answers your questions about life safety compliance. Our editorial advisory board also reviews the Q&A column. Follow Keyes’ blog on life safety at www.keyeslifesafety.com for up-to-date information.

Questions & Answers

Force to open a fire door
Q What is the permitted force to open a fire door? What kind of means can be used to test this on-site?

A The answer to your question is found in section 7.2.1.4.5 of the 2000 edition of the Life Safety Code® (LSC), which says: “The forces required to fully open any door manually in a means of egress shall not exceed 15 lbf to release the latch, 30 lbf to set the door in motion, and 15 lbf to open the door to the minimum required width. Opening forces for interior side-hinged or pivot-swinging doors without closers shall not exceed 5 lbf. These forces shall be applied at the latch stile. Exception #1: The opening force for existing doors in existing buildings shall not exceed 50 lbf applied to the latch side. Exception #2: The opening forces for horizontal sliding doors shall be as provided in Chapters 22 and 23. Exception #3: The opening forces for power-operated doors shall be a provided in 7.2.1.9.” I am not an expert in the available tools to measure pounds of force, but a good old-fashioned fish scale should do the job. Since you asked specifically about fire doors, I looked at NFPA 80 but did not find anything that would contradict the above section.

Fully ducted HVAC system
Q I have never been able to understand what a fully ducted heating system is and when a damper is not required. Can you explain this matter to me?

A “Fully ducted” HVAC systems are those in which the air in the HVAC system travels from the air handler to the room diffuser in ducts. The alternative is open return-air plenum ceilings or open supply-air plenum ceilings. Those types involve the open space above the ceiling for the movement of air, and there is no HVAC duct in that area. The return-air plenum ceilings are much more common than supply-air plenum ceilings, and would have an opening at the smoke compartment barrier (above the ceiling) to allow the movement of ventilation air without being inside ducts. The LSC is saying that if you have a fully ducted HVAC system from the air handler all the way to the room diffuser on both the supply and return sides, and it penetrates a smoke compartment barrier, then the LSC does not require that you have a smoke damper in this barrier if the building is protected with sprinklers. While this is a huge benefit for facility managers, if you are required to comply with the International Building Code, note that it does not allow this exception, and you would have to have smoke dampers at the barrier.

Evacuation chairs
Q Are stairway evacuation chairs required in all high rises, or business occupancies in general?

A According to the LSC, there is no requirement to provide stairway evacuation chairs in any specific occupancy, high rise or otherwise. However, the LSC (as well as any of the accreditation organizations, such as The Joint Commission, HFAP, and DNV) requires you to have a fire safety plan that includes plans for evacuation. If your organization chooses not to use stairway evacuation chairs to evacuate your patients, then you must have an alternative method of evacuation. Incidentally, the LSC does not restrict the storage of evacuation chairs inside a stairwell, as long as it does not interfere with egress.
The only place that qualifies for “not interfering with egress” is usually at the top of the typical stairwell. As usual, please check with your state and local authorities to determine their regulations concerning evacuation chairs.

**Engine block heaters**

**Q** A consultant told me that emergency generator rooms are required to be maintained at 40°F at minimum. Do I need to maintain that temperature if I have block heaters on the engine?

**A** Yes, you do need to maintain at least 40°F ambient room temperature, especially when you have engine water jacket heaters that maintain the temperature of the engine water at a minimum of 90°F. Section 5-6.7 of NFPA 110 (1999 edition) clearly states that the emergency power supply (EPS) room temperature must be at least 70°F unless you have water jacket heaters that maintain the water temperature of the engine at 90°F; then you are allowed to lower the EPS room temperature to 40°F. So, this would mean the room needs to be maintained at a minimum of 40°F.

**Oxygen storage**

**Q** A local fire inspector approved our outdoor storage shed for full oxygen cylinders. Now a surveyor says it is not compliant because the shed is made of wood, and the accumulative total of oxygen stored exceeds 20,000 cubic feet and must meet NFPA 50 for bulk oxygen storage. Who is correct?

**A** Sometimes it doesn’t matter who is correct, but more importantly what the standards and regulations require. First, I would disagree that oxygen stored in cylinders in quantities exceeding 20,000 cubic feet requires compliance with NFPA 50, *Standard for Bulk Oxygen Systems at Consumer Sites*. NFPA 50 is for a bulk oxygen system, which is defined as an assembly of equipment including cylinders, pressure regulators, safety devices, vaporizers, manifold, and interconnecting piping. It does not appear that you have that assembly, just the full cylinders of oxygen. However, oxygen stored inside the building in quantities exceeding 3,000 cubic feet must be stored in one-hour fire-rated enclosures that are constructed with non-combustible materials, according to NFPA 99 (1999 edition), section 4-3.1.1.2. But a storage shed outdoors that is at least 10 feet from the healthcare facility is not required to be fire-rated. Keep in mind that even though a local authority having jurisdiction (AHJ) approved this arrangement, that does not mean it will be (or must be) acceptable to all AHJs. Each AHJ has the right to interpret the situation to its own understanding, and you need to comply with the most restrictive of those interpretations.

**Storage in stairwells**

**Q** Is there any specific regulation that addresses storing items under stairwells, and if so, does it differentiate between public stairs and stairs that are utilized to access areas not open to the public?

**A** Yes, section 7.2.2.5.3 of the 2000 edition of the *LSC* specifically says there must be no enclosed, usable space within an exit enclosure, including under stairs, nor shall any open space within the enclosure be used for any purpose that has the potential to interfere with egress. There is an exception that says enclosed usable is permitted under the stairs, provided that the space is separated from the stair enclosure by the same fire resistance as the exit enclosure, and entrance to that enclosed usable space is not from within the stair enclosure. The common conclusion of this (and other sections) is general storage is prohibited in stairwells. The concept of an exit enclosure is to provide an egress environment that is free of safety hazards. It is recognized that general storage usually ends up (or has the potential of being) a hazardous area, and exiting through a hazardous area is not permitted. From that point of view, this makes perfect sense. However, the *LSC* does not prohibit safety items stored in the stairwell as long as they do not interfere with egress. As mentioned in a previous answer, evacuation chairs stored at the top of the stairwell could be considered to not interfere with egress. Hospitals have such a difficult time finding adequate useful storage space that I believe a safety item (such as patient evacuation chairs) should be permitted inside an exit enclosure provided it does not interfere with egress in any way.
**Quick tip**

**The building tour, by the numbers: Part 1**

The following chart lists many of the life safety requirements that one may use during the building tour of the healthcare occupancy. This information is based on codes and standards referenced by the 2012 *Life Safety Code®*. Next month, we will present the second half of this list.

<table>
<thead>
<tr>
<th>Number</th>
<th>Unit of measure</th>
<th>Requirement</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4</td>
<td>inch</td>
<td>The maximum abrupt change in elevation permitted on walking surfaces</td>
<td>NFPA 101 (2012) 7.1.6.2</td>
</tr>
<tr>
<td>3/4</td>
<td>inch</td>
<td>The maximum distance between the bottom of a fire-rated door and the bottom of a smoke compartment barrier door, and the floor</td>
<td>NFPA 101 (2012) 8.5.4.1</td>
</tr>
<tr>
<td>1</td>
<td>inch</td>
<td>The minimum distance an upright sprinkler head must be from a ceiling or deck</td>
<td>NFPA 13 (2010) 8.6.4.1.1</td>
</tr>
<tr>
<td>1</td>
<td>each</td>
<td>The number of alcohol-based hand rub dispensers allowed per room that does not contribute to the total aggregate quantity of product in dispensers</td>
<td>NFPA 101 (2012) 19.3.2.6</td>
</tr>
<tr>
<td>1</td>
<td>inch</td>
<td>The minimum distance an alcohol-based hand rub dispenser may be mounted from an ignition source</td>
<td>NFPA 101 (2012) 19.3.6.5.4</td>
</tr>
<tr>
<td>1</td>
<td>foot-candle</td>
<td>The minimum illumination required for the means of egress in existing construction, as measured at the floor</td>
<td>NFPA 101 (2012) 7.8.1.3</td>
</tr>
<tr>
<td>2</td>
<td>each</td>
<td>The number of exit access doors required in a sleeping suite larger than 1,000 square feet, and in a non-sleeping suite larger than 2,500 square feet</td>
<td>NFPA 101 (2012) 19.2.5.7.2.2, 19.2.5.7.3.2</td>
</tr>
<tr>
<td>4</td>
<td>inch</td>
<td>The minimum distance that an upright or pendant sprinkler must be from a side wall</td>
<td>NFPA 13 (2010) 8.6.3.3</td>
</tr>
<tr>
<td>5</td>
<td>foot</td>
<td>The maximum distance a smoke detector may be from a door held open with magnetic hold-opens, unless the entire corridor is protected with smoke detectors</td>
<td>NFPA 72 (2010) 17.5.6.6.1</td>
</tr>
<tr>
<td>5</td>
<td>pound</td>
<td>The amount of force required that is applied to the latch edge of a power-operated non-fire-rated corridor door, in lieu of positive latching</td>
<td>NFPA 101 (2012) 19.3.6.5.7</td>
</tr>
<tr>
<td>6</td>
<td>foot</td>
<td>The minimum width of a corridor before an alcohol-based hand rub dispenser may be mounted</td>
<td>NFPA 101 (2012) 19.3.2.6</td>
</tr>
<tr>
<td>6</td>
<td>square foot</td>
<td>The maximum size of a hospital patient room closet before sprinklers are required</td>
<td>NFPA 101 (2012) 19.3.5.10</td>
</tr>
<tr>
<td>6</td>
<td>inch</td>
<td>The maximum projection for items mounted on walls of corridors that are at least 6 feet wide, in healthcare occupancies</td>
<td>NFPA 101 (2012) 19.2.5.5.4</td>
</tr>
<tr>
<td>6</td>
<td>foot</td>
<td>The minimum distance permitted between sprinklers without the use of baffles</td>
<td>NFPA 13 (2010) 8.6.3.4.1</td>
</tr>
<tr>
<td>6 - 8</td>
<td>foot - inch</td>
<td>The minimum headroom required on stairs</td>
<td>NFPA 101 (2012) 7.1.5.3</td>
</tr>
<tr>
<td>7</td>
<td>inch</td>
<td>The maximum projection of a door leaf into the corridor when the door is fully opened</td>
<td>NFPA 101 (2012) 7.2.1.4.3.1</td>
</tr>
<tr>
<td>7 - 0</td>
<td>foot - inch</td>
<td>The minimum headroom required in the means of egress for existing construction</td>
<td>NFPA 101 (2012) 7.1.5.1</td>
</tr>
<tr>
<td>7 - 6</td>
<td>foot - inch</td>
<td>The minimum headroom required in the means of egress for new construction</td>
<td>NFPA 101 (2012) 7.1.5.1</td>
</tr>
<tr>
<td>8</td>
<td>foot</td>
<td>The required width of corridors in new construction healthcare occupancies</td>
<td>NFPA 101 (2012) 18.2.3.4</td>
</tr>
<tr>
<td>9</td>
<td>person</td>
<td>The maximum occupant load served by automatic sliding doors before the doors are required to be side-hinged and capable of swinging open</td>
<td>NFPA 101 (2012) 19.2.2.2.10.2</td>
</tr>
<tr>
<td>10</td>
<td>foot-candle</td>
<td>The minimum illumination required for the means of egress in new construction, as measured at the floor</td>
<td>NFPA 101 (2012) 7.8.1.3</td>
</tr>
<tr>
<td>12</td>
<td>inch</td>
<td>The maximum distance that a smoke detector may be mounted below a ceiling or deck (some exceptions apply)</td>
<td>NFPA 72 (2010) 17.7.3.2.1</td>
</tr>
<tr>
<td>12</td>
<td>inch</td>
<td>The maximum distance that a pendant or upright sprinkler head may be mounted below a ceiling or deck (some exceptions apply)</td>
<td>NFPA 13 (2010) 8.6.4.1.1.1</td>
</tr>
<tr>
<td>18</td>
<td>inch</td>
<td>The minimum distance that items may be stored or located below a sprinkler head</td>
<td>NFPA 13 (2010) 8.5.6.1.1</td>
</tr>
<tr>
<td>20</td>
<td>square inch</td>
<td>The maximum area of an opening for pass-throughs in corridor walls located in smoke compartments that are not fully protected with automatic sprinklers</td>
<td>NFPA 101 (2012) 19.3.6.5.1</td>
</tr>
<tr>
<td>20</td>
<td>percent</td>
<td>The maximum area of wall, ceiling, and door permitted for combustible decorations in a space located in a smoke compartment not protected with automatic sprinklers</td>
<td>NFPA 101 (2012) 19.7.6.6</td>
</tr>
<tr>
<td>24</td>
<td>inch</td>
<td>Height of wall above door(s) held open on magnetic door-holds, before smoke detectors are required on both sides of the door(s)</td>
<td>NFPA 72 (2010) 17.7.5.6.6.5.1</td>
</tr>
</tbody>
</table>

Source: Brad Keyes, CHSP, Senior Consultant, Keyes Life Safety
Quiz questions

1. (T) (F) The 1999 edition of NFPA 99 has its lower limit for relative humidity (RH) in anesthetizing locations set at 30%.

2. (T) (F) CMS S&C memo 13-25 permits the use of categorical waivers by hospitals to utilize 20% as the lower limit for RH in anesthetizing locations.

3. (T) (F) Some supplies and medical equipment are not designed to operate in environments with less than 30% RH.

4. (T) (F) According to Frank Van Overmeiren, the American College of Surgeons (ACS) joined with The Joint Commission in 1913.

5. (T) (F) CMS has published a proposed rule that it will adopt the 2015 edition of the Life Safety Code® (LSC).

6. (T) (F) In order for a dialysis treatment area to be designated as a business occupancy, staff need to teach the patients to turn off the dialysis machine and clamp and clip their lines.

7. (T) (F) All national authorities have allowed delayed egress locks to delay the unlocking of the door for 30 seconds.

8. (T) (F) CMS, The Joint Commission, HFAP, and DNV do not require stickers on medical equipment identifying the date of the next inspection.

9. (T) (F) The maximum amount of force required to set a fire-rated door in motion is 15 lbs.

10. (T) (F) Block heaters are required on generator engines when the ambient room temperature is below 70ºF.
1. False. The lower limit for RH in the 1999 edition of NFPA 99 is 35%.

2. True.

3. True.


5. False. CMS’ proposed rule discusses the adoption of the 2012 edition of the LSC.

6. True.

7. False. None of the national authorities have allowed 30 seconds; therefore, delayed egress locks can only delay unlocking the door for 15 seconds.

8. True.

9. False. The maximum amount of force required is 30 lbs.

10. True.