Look Sharp!
Safety Awareness in a Demanding Industry
Cover Photo: O’Hare Airport, Chicago, IL

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The focus of safety in our industry has been changed dramatically over the years. The fact remains that the nature of our work exposes us on a daily basis to risks identified as the “Fatal Four.” Accidents that cause injury or death have been tracked by various organizations for years and there is no mystery to the cause of these accidents. According to Elevator World’s Job-site Safety website, since 1970, the Occupational Safety and Health Administration (OSHA) has helped cut workplace fatalities in half and reduce occupational injuries and illnesses by 40%. For over 25 years the National Elevator Industry Incorporated (NEII) has been working to identify and address issues that directly affect Elevator Constructors with the utilization of the NEII Safety Committee. The International Union of Elevator Constructors (IUEC) and the National Elevator Industry Educational Program (NEIEP) have committed resources to work for the increase in awareness of safety in our trade and the reduction of exposure to worksite hazards. Although our industry has made progress, we can do better.

According to OSHA, in 2010, approximately three out of five workforce deaths (57%) can be categorized in the “Fatal Four.” The four categories are:

- **Falls**—260 out of 751 (35%) total deaths in construction in 2010
- **Electrocution**—76 (10%)
- **Struck by object**—63 (8%)
- **Caught-in/between**—32 (4%)

Former Secretary of Labor Hilda Solis explains that, “Every day in America, 12 people go to work and never come home. Every year in America, 3.3 million people suffer a workplace injury from which they may never recover. These are preventable tragedies that disable our workers, devastate our families, and damage our economy.”

In a study produced by the Center to Protect Workers’ Rights (CPWR) titled Deaths and Injuries involving Elevators and Escalators published in July 2006, the author reports 93 deaths from 1992-2003 of individuals installing and repairing elevators.

“Almost 70% of these 93 deaths involved elevator installers and repairers. At least 10 of the deaths involved workers who were unqualified—not trained in elevator repair—trying to fix jammed elevators.”
How can we increase our odds of avoiding life-altering injuries or even death while working in our industry? It begins with being aware of your environment.

Learn about potential hazards on the job site and in working with the equipment and tools needed to complete the job. Make yourself aware of the condition of your equipment. Thoroughly think through procedures and take added precautions to minimize the risk of accidents.

Educate yourself about the product you are working on, and don’t rush through the job or take shortcuts.

Safety is your responsibility and your decision. Make the right decision...work safe.

John J. O’Donnell
NEIEP National Director
Safety Challenges in New Construction and Modernization: 
Industry Changes Require New Processes
Rick Myers
In the elevator industry, technologies and techniques will never stop changing. Looking back 30 years, the things we thought were cutting edge now seem ancient. Remember when an adjustor would arrive on a job, and would have many different types of test instruments to set up the controller? There were amp meters with various size shunts to monitor motor currents, an oscilloscope to see patterns of devices and center-reading meters, and other instruments as well. Today, we use laptops or the onboard display or service tools to monitor voltages, currents, and even oscilloscope traces. Our old paper adjustor manuals have been replaced with PDF documents that mechanics can reference on portable computers or smart phones.

Along with changes in technology often come changes in work tasks. Construction and modernization crews are the first to see new products, and are often responsible for developing or adopting new installation techniques.

While some of these changes make our jobs easier, others can be very frustrating.

I have found over the years that even the best equipment gets changed. I remember working on a new door operator or controller and thinking that it had a perfect set-up. It was simple, reliable, easy to operate, and it worked very well. I couldn’t believe it when it disappeared a year or two later.

In the early days, new equipment installations included space for the machines, controllers, generators, starter panels, and dispatchers. When a modernization was done on existing equipment, it involved only overlays to the existing controller, and rarely the machine. In later modernizations, which involved complete controllers, it became necessary to remove the entire old controllers to make room for the new ones. Today’s setups are much smaller and do not include dispatchers or group controllers, which makes them easier to fit in machine rooms – and the trend is to update the entire control system, including the machine.

Many of the machines used in new equipment are also being adapted for use in the modernization of elevators. This allows the equipment to change from a DC gearless or geared machine to an efficient permanent magnet motor or an AC motor. The new equipment weighs less and is much smaller than the original, which makes it easier to fit modernized equipment into the existing machine space. The existing machine can be removed in pieces to minimize the load when moving it out of the building. The new, smaller machine can easily be disassembled, transported in smaller pieces, and reassembled in the machine room.
We used to move equipment using rope blocks, and, depending on the load, different sheave configurations. We used wood rollers to move heavy equipment from one place to another. It was normal practice to hoist a larger, cast iron chainfall into place with a smaller fall or chain jack. Many of these older hoists were never formally certified or tested after being purchased. Now, most companies require any type of hoist, including aluminum falls and chain jacks, to be certified yearly. They weigh much less than the old cast iron versions, and rope blocks are now a thing of the past.

Most of the tools we use today are much smaller and lighter than the tools used years ago, when a drill motor with a half-inch chuck had enough torque to throw even the toughest elevator man around. Today’s cordless tools have multiple speed and torque settings which weigh a fraction of what the old tools weighed. This was a change for the better - the effect of torque on our wrists from the old drills could easily break bones, and we were always reminded of this while preparing to drill holes.

Prior to the early 1980’s, ground fault circuit interrupters (GFCIs) were unheard of. Back then, it was common practice to have a standby person holding on to the power cord ready to pull the plug if something happened. I can remember using old drill motors with metal cases that shocked me when drilling. Today, using GFCIs is a requirement in our normal processes for all work with electrical tools.

In new equipment installations, we used piano wire with sash weights attached to the ends to align rails. This could be dangerous - the weights required a safety tie in case the line broke to keep the weight from going down the hoistway. Today, instead of wires, we use lasers to align rails. Though we still have to be safety conscious (as these new technologies come with different warnings like “do not stare into the beam” and require protective eye wear specifically designed for working with lasers), the process is much safer than it used to be.

Machine guarding is another example of advances in safety that have come with new technology. New equipment jobs are sent with machine guarding built onto the machine or are supplied separately. These are designed to protect us from the moving sheaves, ropes, and motors. Modernization upgrades also incorporate these features, from the extensive guarding on machines to guard rails on car tops. All of these help to mitigate injuries to elevator constructors while we are working with potentially dangerous equipment.
Many manufacturers have developed machine room-less (MRL) elevator systems that require minimal control space compared to their predecessors. This technology has made it possible for mechanics to discern the elevator’s movement and speed through a service tool or an onboard display instead of by putting themselves in a potentially dangerous position to observe a machine. This display shows inputs and outputs, allowing mechanics to “see” the brake picking and the direction and motion of the elevator. The days of eyeballing contacts on electromagnetic relays are almost gone.

By code, MRLs must have a rescue operation to move the unit in the event of a loss of power. As you can see in Figure 1, the service tool gives vital information on the position, direction, speed and door zone information during a rescue operation.

Based on that information, a mechanic’s focus must still be on the safety of themselves, their co-workers, and the public in the same way it is with traditional installations, but without being in a direct visual contact with the machine. Before attempting to move the elevator, a mechanic must always confirm visually and with two-way communication that it is safe to do so.

In addition to the MRLs not having a machine room, in some of the newest models, the controller closet has been eliminated. Instead, the controller is now moved into the hoistway and there is a small service panel mounted in a door jamb from which a mechanic can service and troubleshoot the controller. Again, this is a change from the traditional machine/control room space we are used to working in.

Figure 1: MRL service tool display

It’s important to remember that while these changes make our jobs safer, we still need to be cognizant of potential risks to curious onlookers in public spaces.

We must make sure that all access doors are locked to prevent unauthorized access to the interface box. In closed sites, we must always verify the proper device needed to lock out and tag out disconnects for elevator and cab lighting. Typical main line disconnects have been replaced with breakers that may require a different type of device to properly lock them out.
Performing machine, brake, or motor work on a machine room-less model requires different processes than it does on a traditional machine. For example, landing the counterweights may be the only operation needed on a traditional machine repair or maintenance routine. The motor is removed, the brake is serviced, and most machine bearings are replaced. Any work requiring removal of the drive sheave will require hanging the elevator to be able to remove the hoist ropes. This is done using a machine room hoisting beam, or, if a beam is not available, a portable gantry.

Mechanics must always be aware of the floor load rating when moving heavy loads in the machine room or from the machine room to a loading dock. Remember, the floor load rating in pounds per square foot will be posted in the machine room. In contrast, the same repair on a machine room-less configuration is done from the top of the elevator, with the car frame secured with blocking devices (some companies may require additional rigging for back up). The risk of injury to the elevator constructor is lower this way.
Take a look at the following MRL installations from a variety of manufacturers, and imagine the process you would use to replace the brake shoes or motors. What additional steps will be required for you to safely perform your work?

**Figures 5 & 6:** The machine on the left replaced a geared machine pictured at right.

**Figure 7:**
Duct was the only part re-used in the above project.
Figure 8: Top of hoistway, belted gearless machine.

Figure 9: Side of hoistway, roped gearless machine with disc brakes.

Figure 10: Top of hoistway, roped gearless machine.

Figure 11: Rail mounted gearless machine.
If you’re called to work on these machines, you’ll need to use the car top for access and employ non-traditional methods to secure the elevators, along with mechanical blocking means to keep the car from moving while you’re servicing brakes or removing hoist ropes or belts. Special rigging may be provided from the manufacturer along with a standard work process to safely remove motor, service brakes, or replace the deflector sheaves – be sure to follow directions carefully.

Whenever you’re working on any equipment, you must take all necessary precautions with other elevators in the group that are in close proximity. This may mean that you’ll have to remove adjoining elevators from service for safety measures while completing the repair.

Some car frames have no easy means to hoist from, so mechanics must consider carefully when choosing the appropriate pick point to lift the elevator. Many of the new units are under slung and have no crosshead to pick off of, or if there is a crosshead, it may have no lifting allowed due to its minimal size. In cases like

**Figure 12:** Top of rail mounted belted gearless machine.

**Figures 13 & 14:** Different types of MRLs use different variations of mechanical blocking devices. All are equipped with an electrical switch to prevent movement when engaged.
these, special slings and brackets should be used to pick off of a substantial structure component of the elevator. If the canopies of the cab cannot support the weight of the machine being removed from the hoistway, special rigging may be required to move the machine out of the hoistway without landing it on the canopy or lowering it directly onto the platform.

Most of the installation processes for new MRLs are based on the platform being the temporary run platform. These use separate hoists to lift and lower the unit for installation. The process is as follows: the elevator sling and platform is installed in the pit, after which the governor rope is installed and then hoisted up to install the rails. Once a mechanic is able to access to the top of the hoistway, the machine installation may begin. This method eliminates the use of a temporary elevator or scaffolding. Other MRL installations use a working platform built across the top landing. These do require scaffolding to access the area of the machine. Scaffolding certification may be required for the construction and use of the scaffolding. Rails may be set after the machine is set and running on temporary operation.

Using a false car or temporary hoists can compound potential safety issues on the site. Lifts or hoists must be inspected daily, and inspections, problems, and resolutions (including verification of the operation of the safeties, run box and the integrity of the hoist ropes) must be documented in a written log. Mechanics should also be familiar with the proper use of the lift or false car before operating, and should always be aware of loading limitations.

The requirements for our personal protective equipment (PPE) have not changed much in recent years. Manufacturers still require fall protection on all new equipment sites along with hard hats, safety glasses, gloves, and proper safety shoes.

**When working on scaffolding, it’s safest to always use the more stringent rules for fall protection.**

**OSHA** requires fall protection over 10 feet, but most companies require it when there is a hazard of more than six feet. Gloves are a must – don’t forget them. And once a job has started, a continuous hazard scan process should become a natural habit. This means being aware of and responding to any changes that could put you in danger.

Imagine this: you are driving down a familiar road on your way to work and you notice something that is out of place, like a delivery vehicle parked in an area that limits your vision. Would you just ignore it and keep going? No! You would automatically reduce your speed and look for any potential safety issues. It’s common sense - safety should always be part of your planning process in any job you perform, no matter what area of the industry you work in.

While the equipment being installed on construction and modernization has changed radically over the years, the basic principles of safety have not. Remember - wear your PPE, keep an eye out for potential dangers, and keep your knowledge up to date on the ever-changing spectrum of equipment and techniques - **do the job right the first time!**

After all, we got into this business for a better life, not a shorter one.

*Photography provided by Rick Myers*
It’s 2:17 AM on a Wednesday.
Your work phone rings, and it’s the company’s answering service telling you that you have an entrapment. Since you work in the service department, it is part of your responsibility to be available for after-hours call backs. You struggle to understand what you’re being told. You have been working all day, taking calls since your regular quitting time, and just got home and to bed at 12:48 AM. You haven’t even had an hour of sleep and now you have to go on an emergency call. Not only do you have the responsibility for your own safety, but also of those trapped inside the elevator. You figure it’s going to be an hour or more for you to reach the building, then add to that the time needed to extract the trapped passengers. After that, you have to get the elevator back in service. By the time you find the problem and get the car working, it’s 4:53 AM.

What do you do now?
If you drive back home, it’s time for you to get up and get ready for your regular workday. If you drive to your route, it’s still two or three hours before your regular workday begins. Do you take a nap? Do you find a 24-hour coffee shop and get something to eat and drink coffee so you can stay awake and alert to perform your duties of the day safely? Do you go home and sleep and endure the wrath of your coworkers as they have to cover for you? Not to mention that you have two more days of the regular work week to get through. No chance of going home and getting a nap after work. You have family waiting for you and the kids have functions they want you to attend. Your wife has a “honey do” list to be completed before the weekend, because the weekend schedule is busy with activities. No chance of getting extra sleep then.

Working on the service end of the elevator industry can take a toll on one’s self. It is more likely that in the current work environment, you will be required to work long hours. We probably don’t think about or realize what the consequences are to ourselves or to those around us, whether it is our family, coworkers, or the riding public who use the elevators we repair and maintain.
A 2012 study by the CDC (Centers for Disease Control) shows that 30% of American workers sleep less than six hours a night. This is obviously far less than the eight hours of recommended sleep. According to an article posted on WebMD.com, reducing your nighttime sleep by as little as 1.5 hours for just one night could result in a reduction of daytime alertness by as much as 32%. Wow, think about how much that percentage goes up when you may only get 1.5 hours of sleep in one night!

Decreased alertness and excessive daytime sleepiness can impair your memory as well as your ability to think and process information. How many times have you been working “tired” and noticed your memory isn’t what it should be? Or, that you are having trouble trying to do a simple task?

Statistics from the US Department of Labor show that Elevator Constructors have a higher than national average of injuries and deaths. That is just based solely on the overall type of work we perform, and does not take into account what happens when we’re working tired. While there are no statistics to show if tiredness or sleep deprivation contributes directly to these numbers, it has been proven that excessive sleepiness doubles your risk of sustaining an occupational injury in any work environment.

Think about how fatigue may affect you as you work long hours over a long period of time. What if you are working on call for a week at a time, or if you are working seven days, 12 hours a day? Sleep deprivation causes serious problems not only in the workplace, but in your personal life as well. It has also been cited as a reason for a five year high in unscheduled absenteeism. Ever take the morning off work or perhaps the whole day after working a long night of call backs?

Obviously, the safe thing to combat sleepiness is to sleep - getting a good night’s sleep whenever you can is a good first step toward combating fatigue. The Mayo Clinic’s website suggests some foods that may help you to get a good night’s rest are oatmeal, cereal with low fat milk, and yogurt with granola. If you have diabetes, please consult with your doctor as to a healthy food regimen.
The site goes on to say that you should avoid alcohol and caffeine prior to bed. Also, do not drink too much liquid of any kind, because it will interrupt your good night’s sleep when nature calls. But if call backs are part of your job and you do have to drive to work when you’re less than well rested, there are some suggestions that may help you to be more alert and make it safely to your destination:

- Keep your vehicle well ventilated.
- Avoid caffeine or other products to “keep you awake.” The “crash” after these wear off is worse than the lack of sleep.
- Listen to the radio - especially talk radio, which can keep your mind stimulated.
- Eat lightly, avoiding heavy fatty foods.
- Eat fresh fruits or vegetables.
- Eat nuts.

Now that you have a better understanding of sleepiness and what its effects are, you’ll be more prepared for long days following long nights. Make sure to get the sleep you need and eat the proper foods to help you get good night’s sleep. Also, eat the foods that will help you to be more alert during your waking hours.

SAFETY FIRST, BE ALERT!
HOMEWORK:
SAFETY DOESN’T STOP AT QUITTING TIME
Chuck Black
What is safety? Primarily, safety is the avoidance or prevention of accidents. It is important to notice that I did not say that safety is the avoidance of injuries, although that is certainly very important. The goal of safety is to prevent damage to anything or anyone. Not only do we want to avoid damage to our bodies, we also want to avoid damage to property - whether it be ours, our employer’s, our customer’s, or anyone else’s. The goal of safety is to prevent damage to anything or anyone.

I have spent the greater part of my career dealing with energy. Moving energy from one place to another, or controlling energy in a manner that was beneficial to the task at hand was a goal that was understood, if not expressed, in our daily efforts in the field. Most of the accidents I witnessed or heard about were caused by uncontrolled energy. In many cases, damage to persons or property occurred because a worker failed to properly control the energy.

In the first stage of my career as a pipefitter, I saw first hand the destructive capability of acetylene, natural gas, fuel oil and steam. If misunderstood or misused, any of these can cause injury, death or destruction of property. One of the saddest situations I witnessed was the death of an entire family due to the explosion of a gas-fired water heater. It seems that the safety valve on the water heater had begun to leak and soil the carpet. Rather than replace the leaking safety valve, someone decided to install a plug at the outlet port, thus rendering the safety valve inoperative. The water heater was gas fired but could have been electric with the same result. The thermostat failed to stop the heat source at its designed temperature setting. Energy continued to pour into the confined vessel until critical temperature and pressure were reached. The vessel ruptured. The resulting explosion left nothing of the home but the concrete slab. Kinda graphic, huh? I’ll bet you all go check your water heater safety valves.

So what does this energy thing have to do with safety? Think about an accident... any accident. What happened? Something possessing potential energy caused damage to something else...
maybe even to itself. Now I know what you are thinking - what on earth is potential energy? Potential energy is stored energy. A mousetrap with its spring set has potential energy. With respect to accidents, this release of energy results in damage. This is where thinking about safety from a different perspective begins to become apparent. Be aware of the possibility of the unintended (and unexpected) release of energy. This can take many forms, such as stored tools equipment and material that can shift or fall, fluids confined or under pressure that can spill or be released, electricity... the list goes on.

When possible, leave things in their lowest state of energy. Does that pipe roller need to be leaned up against the wall, or can it be safely stored on the ground? Can it be secured to the wall? How long does it really take to remove the regulators from the oxygen and acetylene tanks and install the caps? How about at home? Many of you do your own home repairs and improvements. How about installing a GFCI in the kitchen, bathrooms, and garage? If you are using a ladder, is it possible to employ some kind of fall protection? You get the picture. Defuse the bomb before it can go off.

**The most effective deterrent to the damage uncontrolled energy can cause is awareness.**

What is around me? What can happen? What might happen if I do this? I am here alone - if I am injured and cannot communicate, how long might it be before someone becomes aware of my predicament? There are many things that can exacerbate a dire situation. There are others that can ameliorate the same circumstance. Most of the time, it is up to you. Your perception of your surroundings and situation and your subsequent actions (or lack thereof) will determine the outcome.

I am fortunate enough to live in south Florida on the intercoastal waterway connecting the Atlantic Ocean to the Gulf of Mexico. One of my hobbies is sailing a small catamaran sometimes called a “beach cat.” Unfortunately, I do not live on the beach! My boat is twelve feet wide when set up to sail. It can be demounted for transport, then reassembled at the boat ramp. This is a four-hour ordeal and not something I relish doing. Being the well trained and resourceful elevator man that I am, I designed and built a small hydraulic crane to pick my boat up from the back yard and set it ever so gently over the seawall into the salt water.

At this point, I want to emphasize that engaging in the construction of anything makes you the manufacturer and thus liable for the misfortune of anyone coming to grief as the result of using your product - whether or not that was your intention.
Besides the legal ramifications, it becomes incumbent upon one to eliminate anything in the design or construction that might result in loss of life, limb or property. Sounds pretty imposing, does it not? The idea, of course, is to protect John Q. Public... you know... the ones that move your barricades so they can run up an escalator which is out of service and missing steps. They might miss their flight! If the guys in the cockpit of the airliner that they are trying to board with reckless abandon had the same disregard for safety, our aviation safety record would be so abysmal as to give pause to those contemplating air travel.

OK. I admit that I have digressed a bit from the original subject. But not much.

We in the elevator industry sometimes lose sight of the fact that John Q. Public is as dependent upon our experience, judgment, and integrity to provide safe and dependable transportation as they are on those other uniformed guys in the front of the aircraft.

So what about the sailboat crane in my backyard, you may ask? As a typical elevator constructor, I overbuilt all of the critical structure. I knew that there was the possibility that someone other than myself would someday be operating this creation of mine, and that someone would most likely be one of my friends or a family member. During my initial test of the crane everything went well - except when lowering the boom. Sound familiar?

Moving the boom up is slow and predictable... a great trait in something this powerful. However, if the control handle is moved to the full-down position, the boom comes close to free fall. This, obviously, is unacceptable. The solution was to install a small and inexpensive flow control valve similar to the blowout preventer installed on oil wells in the Gulf of Mexico. Now the boom can only come down slowly.

Again, one of the most effective avenues to safety is awareness. Where am I? What am I doing, or what is the activity in which I am engaged? What could possibly go wrong and result in personal injury or property damage?

Many of us, including myself, enjoy riding motorcycles. I have enjoyed this activity since I was introduced to trail riding at the ripe old age of ten. Like most lifelong motorcycle enthusiasts, I have a few battle scars. One of the many advantages of youth is that injuries heal quickly and pain is soon forgotten. I enjoyed that blissful period right up to the age of twenty-one. I was riding a friend’s street bike on a four-lane boulevard with no traffic around me. I was speeding. I learned that day that you have no control over the actions of others.
Ahead I noticed a car creeping very slowly from a side street onto the boulevard. I thought that I would be past this vehicle before it blocked my path. (I was wrong). Just as I was close to the car, the driver sped up to get into the lane opposite mine. The motorcycle I was riding collided with the left front fender of the car. Luckily, I flew over the hood and landed in the median. My “red S” began to fade. I was lucky, but I was prepared... I was wearing a helmet. I slid along the pavement long enough to grind the face shield rivets off the helmet. My nose, left wrist, and pride were broken, but I survived.

Many of us consider riding without a helmet to be the epitome of freedom. I am reminded of a line in a song by Kris Kristofferson that goes, “freedom’s just another word for nothing left to lose.” It’s your life. Be aware.

Everything that makes you who you are resides between your ears. Jumble that and you become something different. You cannot unscramble an egg. I knew an avid biker who came to grief one Saturday morning while riding solo down a winding country road. He lost control in a patch of wet leaves in a curve. The bike went down and his head hit the guard rail. He suffered a concussion. He made a full recovery... sort of. He became suspicious of his friends and family, and argumentative. A couple of months after the accident I met one of his closest friends and asked about his recovery. He replied, ”he ain’t right, and I doubt he ever will be again.”

It’s your choice.

I have had similar experiences with bicycles. You might ask, how could you possibly come to any serious grief while riding a bicycle? I have been a bicyclist longer than I have been a motorcyclist. As a youngster in the hills of Kentucky, I learned early on the importance of a coaster brake. Some of my flatlander cousins learned right after they crashed into the wooden gate before the barn. Luckily, they weren’t going fast enough to cause themselves or the bike any major damage. At that time, bicycle helmets were unheard of. We also enjoyed diving boards, swinging on grape vines, diving off cliffs... but that was another life.

Aviation has been a big part of my life for many years. I soloed at the ripe old age of sixteen. Flying is not inherently dangerous. However, it is very unforgiving of inattention and ineptitude. Aviation enjoys the best safety record in the transportation industry. With so much that can go wrong, how is that possible? There are several contributing factors to this admirable record; one of these is strict adherence to the FAR (Federal Aviation Regulations), which is a book of rules covering every aspect of operating an aircraft. These rules were compiled quite literally “by accident” over the years since the Wright brothers’ famous flight. Originally, the governing authority was the Civil Aeronautics Board (which is now the Federal Aviation Administration). Every aviation related incident (departure from the FAR) or accident (damage to the airframe) was investigated, and regulations were written to address the situation and prevent its recurrence.
Speaking of recurrence, another major effort contributing to aviation safety is recurrency training. Every private pilot is required to spend two hours with a flight instructor at least once every two years, no matter how long they have been a pilot or how many hours they have flown. This helps keep flying skills sharp and keep pilots up to date on any changes in the FAR. Additionally, the FAA offers an interactive online program with the same goal in mind... safety. Participation is voluntary, kinda like the Mechanic Courses offered by NEIEP (hint, hint).

Ultimately, aviation safety comes down to the person doing the flying, the pilot. It is often said that a superior pilot is one who exercises his superior judgment to avoid situations requiring the use of his superior skills. You can’t fix it in the air. To this end, we employ a checklist. Preflight, landing, emergency and shutdown checklists are written for every certificated aircraft and are found in the Pilot Operating Handbook along with other information pertinent to the safe operation of the aircraft. My daughter memorized the preflight checklist for my aircraft as a little girl. It’s pretty embarrassing to be reminded by your five-year-old that you missed something on the checklist. Ever since that happened, I have done the preflight with the checklist in my hand. I also have a checklist for the sailboat. Forgetting to install the drain plugs can lead to a long slow wet day.

Diving is a sport that some of you enjoy. SCUBA is very rewarding and enjoyable if practiced safely. Once you have earned your “C” card (certification), you are pretty much on your own. No agency demands that you stay current with skills and knowledge. That’s up to you.

There are certain physiological factors associated with diving. All certificated divers are trained in the prevention of DCS (decompression sickness) or “the bends.” The deeper the dive, the greater must be the pressure of the air being breathed by the diver. The air that we breathe is about 70% nitrogen. Normally we breathe nitrogen in and out with no effect. However, when the pressure is increased, some of the nitrogen is absorbed by body tissue around joints and other places. All is well until the pressure is reduced when the diver returns to the surface. If the diver went too deep or stayed too long, he or she might experience DCS. This has been studied thoroughly, resulting in the development of “dive tables” which determine how long a diver can be at a particular depth. It is important that a dive be planned using the tables (or a dive computer).
It is also important that the plan be followed. Hence the phrase, “plan your dive and dive your plan.” Having a diving buddy is also highly recommended for safety considerations. It’s a major plus if your buddy will also corroborate your fish stories, too.

There have been many changes in the construction industry during my career. I was very fortunate to serve my apprenticeship in a pro-labor part of the country, where there was strong cooperation and coordination among the business agents of the various crafts. This gave me the opportunity to work with journeymen plumbers, iron workers, sheet metal workers, and boilermakers if there was no work for me as a pipefitter and one of the other crafts needed help. More than once, I helped a boilermaker repair boiler insulation by mixing up an asbestos paste in a bucket with no gloves, mask, or safety glasses. Back then, no one in the field was aware of the hazards associated with such activity. PPE (personal protective equipment) was sometimes available, but its use was not mandatory.

We like to complain about OSHA regulations, but they are like the FAR. They were created “by accident.” There’s a reason for the rules. Actually, there are several reasons. The one most often touted is that the rules keep you from the pain of injury. OK. That seems obvious. The other reasons have to do with money. For most of us, if we don’t work, we don’t eat, not to mention the debilitating effect this has on our families. The government wants you healthy so you can be productive, earn money and pay taxes. The company employing you wants you healthy and productive so it can make a profit from your labor. The company also has an interest in having no work related accidents. Their safety record impacts their cost of insurance and their ability to bid or win certain contracts. Society in general wants you to help pull the load, not be part of the load. The bottom line here is use your superior judgment and wear your PPE!
I have always enjoyed tinkering in the garage, and like many of you, I have acquired many tools over the years. Some of them are powered by electricity or compressed air. When my daughter was very young, she was my shadow. I always had to look before taking a step back for fear of stepping on her. Kids have that stealth mode, too. I once climbed a ladder to prune a tree when I felt the ladder move ever so slightly. I looked down and sure enough, she was right there on the next rung down. When I insisted that she wear safety glasses in the garage, she asked, “Daddy, where are your safety glasses?” From the mouths of babes...

I was presented with a pair of safety glasses the next Father’s Day. She has since graduated from college and moved to Denver. I still wear my safety glasses in the garage and every place where eye injury is possible.

Thankfully, I have never had a serious injury. I sometimes kid myself that my personal safety record is due entirely to planning and awareness. I have to admit that some of it is pure dumb luck. I have tried to analyze those “close encounters” and change my behavior accordingly. When it occurred to me that most of my little cuts and scrapes occurred not at work but at home, I then began to apply my work mentality to my home projects. I mentioned the safety glasses already, but today I also wear gloves and hearing protection if the task suggests it. The home environment presents its own set of hazards. Did you ever read the warning label on a can of carburetor cleaner? There’s some nasty stuff in that can! Follow the directions and you’ll be OK. First ya gotta read ‘em. Also, it seems that most plants here in south Florida have thorns or barbs. A little caution goes a long way towards the prevention of blood loss. Did I mention safety glasses?

I hope that you have been enlightened and perhaps entertained by my approach to safety. It is important to understand the critical nature of our job. We are providing safe and dependable vertical transportation for the general public and a good life for our families. If nothing else, let’s not lose sight of the fact that what we do is very important and how we do it is even more important.

Be safe.
We are all depending on you.
NEIEP has recently introduced an exciting development in the way we deliver information to our students – the QR code. You may have seen these little black and white squares in magazines, on products, and in stores and wondered what they were. Now you’ll see them in magazines, newsletters, and new courses from NEIEP.

**WHAT IS A QR CODE?**

A QR - or "Quick Response" - Code is a type of barcode that contains data able to be read by a camera in your smartphone, iPad, or other mobile device.

Most smartphones that you buy today come with software that allows them to download a QR Code reader from the internet. When a QR Code Reader is downloaded, the camera in the phone is able to "read" the barcode. This sends a URL, contact information, SMS, or similar link directly to your phone.

In order to read a QR code, your mobile device will need to have a code reader. You can find a number of readers to download to your phone with a simple app search.

**WHAT IF I DON’T HAVE A SMARTPHONE?**

If you don’t have a smartphone or other mobile device with a QR code reader, you can still view the web content by typing the URL that’s listed below the QR code into your browser.

**HOW IS NEIEP USING QR CODES?**

The QR Codes you’ll find in NEIEP publications will link your mobile device directly to content on the NEIEP website. Just scan the code with your reader, and the information will pop right up on your device.

Our new course on Advanced Hydraulic Valve Operation (CE024) includes a number of QR Codes in the text. To develop the video content the QR Codes link to, NEIEP worked with mechanics from around the country as well as representatives from valve manufacturers Maxton and EECO. Together, they produced a series of videos that detail real life experiences of working with valves and troubleshooting strategies.

Alternatively, students who don’t have QR Code equipped mobile devices can type in the web address provided with the code to see the videos.

**THAT SOUNDS NEAT. CAN I TRY THIS OUT?**

Yes! Here’s a QR Code that links to a video on power tool safety. Try it out with a scanner on your smart device, or type in the web address to view the video.

Search for ‘QR Code Scanner’ in:

Available on the Phone

or visit:

http://www.neiep.org?safe_pts
ELEVATOR CODES AND STANDARDS
AND THEIR ROLE IN SAFETY
BY NORMAN B. MARTIN
In the elevator industry, it is common to hear the phrase “to meet the code.” In order for there to be an “elevator code” to be enforced by a local jurisdiction, there must first be a standard. That standard is usually developed by a national organization such as the American Society of Mechanical Engineers (ASME) or the National Fire Protection Association (NFPA). Once a national standard is decided upon and published, local jurisdictions will look to these standards as a basis for being adopted on the local or state level.

What is ASME?

ASME was founded in 1800 as the American Society of Mechanical Engineers. The organization is based in New York City. The organization has developed over 600 technical standards. These standards are meant to improve the safety and efficiency of elevators, but also other important products such as boilers, nuclear energy and pipelines. ASME publishes these standards under the general auspices of the American National Standards Institute (ANSI).

The Role of ASME in Elevator Standards Development

The elevator standard development process is a group effort. The ASME A17 standards committee has over 200 individuals who work to develop a document through the consensus process. The process is a joint USA and Canadian effort. This has resulted in one industry standard to serve the majority of the North American continent. The process begins in the sub-committee level where technical revisions and interpretations are reviewed by persons who specialize in a distinct area of the elevator industry. Some of those sub-committees include:

- Mechanical Design
- Electrical Design
- Earthquake Safety
- Existing Installations
- Emergency Operations
- Maintenance, Repairs, and Replacements
- Hydraulics
- Hoistways
- Editorial
In addition, there are a number of sub-committees specializing in various types of elevators referenced by the standards, such as:

- **Escalators and Moving Walks**
- **Limited Use, Limited Access Elevators (LULAs)**
- **Dumbwaiters and Material-lifts**
- **Mine Elevators**
- **Special Service Elevators**
- **Sidewalk Elevators**
- **Elevators Used for Construction**
- **Private Residence Elevators**
- **Inclined Elevators**

These sub-committees report their recommendations to the ASME A17 Main Committee. This committee is currently at about 32 members. These members represent major elevator manufacturers, consultants, specialists, labor and authorities having jurisdiction (AHJs). The ASME A17 Main Committee meets about three times per year in various portions of the country in order to allow for greater access to the code development process. It should be noted that the technical merits of each change to the standard is debated and voted through a consensus process, not a majority vote process. This ensures that all opposition to an item is addressed to a level of having their technical merits addressed. If a member does not agree that a consensus has been achieved, they may appeal the proposed change through a structure process that is established by ASME. The bottom line is that all members who participate in the committee proceedings are dedicated to elevator safety and to the advancement of the industry.

**Other Stakeholder Input**

The ASME A17 Standards Committee also has a number of ad-hoc committees that are formed for special projects or committees that allow for additional public input. Examples of groups that provide additional input include: members of the National Interest Review Committee (NIRC) and the Regulatory Authority Council (RAC) that provide a separate perspective to the code development process. Prior to any standard being issued by ASME, there is a public review period that allows for additional input.

**The Various ASME Standards Used by Local Jurisdictions**

The current ASME A17.1 standard that is published and available for adoption by jurisdictions is the 2010 edition. This edition is meant to be applied to new elevator equipment only, with the exception of a few sections, which mainly include requirements for testing, maintenance and alterations contained in part 8.
Although the ASME A17.1 – 2010 standard was available as of January 2010, there have been seventeen other editions that preceded the 2010 edition. In addition to the first standard published in 1921, the other new editions were published in 1925, 1931, 1937, 1945, 1960, 1965, 1971, 1978, 1981, 1984, 1987, 1990, 1996, 2000, 2004, and 2007. There were also numerous addenda and even a supplement published in the years between the various edition dates. That is a lot of different “standards” to be able to be held in a complete elevator code library.

Although there are a vast number of A17.1 elevator standards and updates published, there are even more standards used by governmental units (AHJs) and the elevator industry. Some of the typical standards that are used include:

- **ASME A17.2** – Guide for the Inspection of Elevators and Moving Walks. Although not a “standard” it is the de facto publication for inspectors and mechanics to use when conducting elevator inspections and testing.
- **ASME A17.3** – Safety Code for Existing Elevators and Escalators. This standard is adopted by many AHJs to be applied retroactively to existing elevators in order to bring the elevator device up to a higher level of safety. Many AHJs use the standard only in conjunction with an alteration, if at all.
- **ASME A17.4** – Guide for Emergency Personnel. This guide provides guidelines and safety precautions for the typical methodology to remove persons who may be entrapped in elevator cars during emergency conditions. Many times emergency personnel such as firefighters must have the ability to conduct rescues. This document provides a framework to be able to conduct the appropriate process.
- **ASME A17.5** – Elevator and Escalator Electrical Equipment. This standard allows for manufacturers to build electrical components and enclosures to an agreed upon standard. This is not the “electric code.”
- **ASME A17.6** – Suspension Standard. This is the newest of the ASME standards. Its focus is on the three major types of suspension means that are used in the industry today. The standard outlines the requirements for traditional wire rope, but also for new smaller diameter wire rope in the 8 mm, 6 mm, and 4 mm classifications. The other two sections provide requirements for the new coated steel “belts” as well as for the Aramid product.
- **ASME A17.7** – Performance Based Safety Code for Elevators and Escalators. This is the elevator industry’s future. This standard allows for new technology approaches that can be confirmed to meet equivalent safety approaches via a third party engineering process. This allows for greater flexibility for design and product development without compromising safety. *(Editors Note: The subject of the performance-based standard was covered heavily in the Fall 2011 issue of Lift Magazine regarding the adoption of new technology and systems in the North American market.)*
• **A18.1** – Safety Standard for Platform Lifts and Stairway Lifts. This standard address access to buildings by the use of equipment that is limited in size, rise and speed and assist the mobility impaired to gain access to and within buildings and facilities.

• **ASME A117.1** – This is a standard that addresses specific architectural issues related to accessibility.

• **NFPA 13** – This standard is published by the National Fire Protection Association (NFPA). It is the standard for sprinkler installation and it provides the interface standards for sprinklers when used in association with elevators.

• **NFPA 72** – This is the standard that is used for smoke and heat detectors (fire alarm initiating devices) that are used in association with elevator emergency operations and sprinklers.

• **NFPA 70** – also known as the National Electric Code. All elevator devices must comply with this standard, specifically Section 620 and the related first four parts of the code.

• **QEI** – The Standard for the Qualification of Elevator Inspectors. This is the certification standard used by accredited organizations such as the National Association of Elevator Safety Authorities (NAESA) and the Elevator Industry Work Preservation (EIWP) for the certification of elevator inspectors. This certification is required by most AHJs in order to conduct an inspection or witness a test.

• **ANSI 10.4** – This is the standard for construction hoists.

• **ASME A90.1** – The Belted Manlifts standard is still used by many AHJs.

Recent changes in the ASME A17.1 standard include incorporating MRL issues in the 2005 supplement to the 2004 edition; the movement of periodic testing to section 8.6; power saving features for escalators; updated maintenance items and incorporating national building code changes; as well as the introduction of programmable electronic/electric (E/E/PES) SIL devices to the standard for usage in elevator equipment. The recent publication of the 2010 edition of A17.1 was in parallel with the creation and publication of ASME A17.6 Suspension Standard. The new 2010 edition of A17.1 effectively depends upon both documents being adopted by local jurisdictions, or by accepting the reference from ASME A17.1 to the usage of the new suspension standard.

**The Role of the AHJ**

The good news: Most of the new ASME A17 Standards are now going to be published just every three years without having additional addenda.

The bad news: Most AHJs continue to adopt these standards as their local “codes,” but with many changes, additions or deletions. This can cause a significant challenge for manufacturers who attempt to market products throughout the various states and provinces.
How do Jurisdictions (AHJs) Differ, and What is Their Role in Adopting Standards?

Some local jurisdictions have adopted a standard that may be multiple “editions” behind the most currently published edition. The local adoption process can be very cumbersome. In order to update reference standards, many times an AHJ will have to seek legislative approval. The complexities of that political process prior to adopting the standard as a code can create many delays. Many jurisdictions utilize a less complicated process of using an established “elevator safety board,” a building department or sometimes the Fire Marshall office that would allow for adoption of new standards without legislative approval.

It is more common for an elevator standard to be amended or altered regardless of the process. This varies from jurisdiction to jurisdiction. Many AHJs add language to clarify a requirement. Many AHJs will delete certain sections to prohibit the usage of a particular type of equipment such as LULAs or machine room-less elevators (MRLs). Many AHJs will develop their own periodic testing requirements or testing frequency, as well as differ on who can witness the safety tests. There are differences on how some jurisdictions address older single bottom cylinders; adding firefighter emergency service to an existing elevator; or applying the ASME 17.3 standard retroactively. There may be different firefighter emergency service keys; or maintenance control programs (MCPs) may or may not be required based upon local rules. This information can be obtained by simply contacting the local AHJ where the work is being performed. Organizations such as Work Preservation, National Elevator Industry, Inc. (NEII) and NAESA may have recent updates of jurisdictional surveys.

Code Coordination

As has been discussed earlier, AHJs and the industry use a wide variety of codes and standards. For many years, there were extensive conflicts on the construction site between inspectors of cross-cutting inspection trades and disciplines. The classic example was the dispute over the placement of sprinkler heads in elevator machine rooms. The local fire inspector would require the sprinkler to be present. The elevator inspector would order the sprinkler head to be removed. The contractor did not know who to satisfy, and the contractor sometimes even attempted to remove and reinstall the sprinkler head depending on which inspector was going to be on the construction site that day.

There is good news. The ASME A17 standards committee is very proactive in obtaining code “coordination” between other standards development groups such as NFPA and the national building code. The standard now “reads the same way” if discussing sprinkler head placement and “shunt trip” operation if looking at either the elevator code, the NEC or the NFPA standards for sprinklers and fire alarm monitoring. The ASME A17.1 standard refers to the
local building code adopted by the AHJ as the definitive guide for fire resistive construction and ventilation of the hoistway.

The NEC is considered the final word for conductor/wiring installation and electrical items. The ASME A17 standards committee is involved through a committee liaison process with many other standards organizations. This involvement provides effective coordination for all involved in the elevator industry.

**The Future and Summary**

One additional type of elevator device impacting the various AHJs are the numerous wind turbine structures that can be typically 300+ feet in height with a unique application for those specific structures. Part 5 of the ASME A17.1 Standard is being updated to address that equipment. The complicated but very important maintenance control program portion of the ASME A17.1 standard is under review. In addition, the standards committee is discussing the potential of allowing for the conducting of periodic load tests without weights based upon a very comprehensive set of conditions. The building code will continue to evolve, and those updates will need to be incorporated into the various elevator standards to cause elevators to be more capable when functioning during emergency operations.

Regardless of the AHJ, it is likely there is some variation in the national published standard to meet the local community or state’s needs. The number of standards that it takes to design, install, maintain and inspect an elevator device is extensive. Keeping up with these ever changing documents is a challenge for anyone in the elevator industry, including elevator mechanics. But it is a necessary challenge to be a safe and efficient industry that will continue to provide one of the safest forms of transportation to the public.
Splitting Atoms: Lessons Learned from the Nuclear Power Industry

Don Knapik
The nuclear power industry has a lot to teach the elevator trade about safety and safe work practices. Theirs, like ours, is a unique industry where one individual’s decisions can have vast and long-lasting ramifications. In the nuclear industry, the emphasis is on creating a “culture of safety” where everyone understands that safe operation 100 percent of the time is the standard, not the goal.

Everything about a nuclear site is designed to slow you down. This is done for two purposes: first, so the security guard has time to shoot you if you’re up to no good, and second, to make you think about what you are doing. While the first prospect is simultaneously disconcerting and comforting, the second point has the most relevance to the elevator trade. Taking the time to think about what you are doing before taking action emphasizes how important it is to be aware of your surroundings. Before you begin a task, it is critical that you are sure your environment and work site are safe and will allow you to perform your tasks in a safe manner. If you are unsure about a process, procedure, task, or the potential outcome of your work, ask someone who has experience before continuing on and making a potentially life threatening error.

In the nuclear industry, these points and procedures are referred to as Human Performance Tools (HPTs). The following HPTs are adapted from the Department of Energy Human Performance Improvement Handbook, Volumes 1 and 2. The complete texts are available through the DOE website, doe.gov, and are referred to as DOE-HDBK-1028-2009.

**HPT #1 - QUESTIONING ATTITUDE**
The only dumb question is the one that is not asked, and a questioning attitude can make the difference between a dull, safe day at work or one that has unforeseen excitement. By questioning your actions, those of the people around you, your environment, and procedures, you overcome the temptation to shrug off a gut feeling that something is not right. You also challenge dependence on unsubstantiated assumptions or subjective opinions. This leads to a discovery of facts or hazards which otherwise may not have become known.

Mindless compliance with procedures, or “cook booking,” and over reliance on rules of thumb tend to promote an unthinking response to simple problems, and may lead to rule-based errors. Questioning yourself, your environment, co-workers, and procedures keeps you thinking about what you are doing - and doing it safely.

**HPT #2 - SELF-CHECK**
Your attention must peak when the risk is greatest— such as when altering a component’s status. Performing a self-check will help you focus attention on the appropriate component or activity. It helps you take a moment to think about your intended action and be aware of potential outcomes before acting. After you take action, self-checking to verify your results can help you reinforce your decision. This strategy is particularly effective for skill-based, repetitive tasks, which people usually perform without a lot of conscious thought.
HPT #3 - PEER CHECK
Peer-checking is a procedure where two people (usually working together) will check each other’s work before it is performed. Anyone can call for a peer-check at any time before or during a task. When both agree that the action is correct, they are assured that the action they are about to take is appropriate. This is particularly important during critical steps in a process, such as removing or returning a unit to service or performing an irreversible action.

HPT #4 - TWO-MINUTE DRILL
The Two-Minute Drill is a technique used either individually or in a group to determine if a safe condition exists. Upon reaching a work site, all workers stop and take account of their situation. Is everything where they left it? Is the equipment where they expect it to be? Are all the switches in the proper position? Are all barricades in place and locks appropriately applied? Is there a tripping, fall, or overhead hazard that did not previously exist? Is anyone else working in the area? After a complete go-over, and if there are no changes (or any changes that affect safety are addressed), then work on the job can continue.

HPT #5 - S.T.A.R.
STAR is an acronym for Stop, Think, Act and Review.

- **Stop** - Pause before performing a critical task and focus on the activity at hand.
- **Think** - Understand what you are doing before doing it and the consequences of your actions.
- **Act** - Perform the correct action on the correct component.
- **Review** - Verify that the outcome was as expected, and if it was not, how it can be changed to achieve the correct outcome.

One interesting industry practice is that honesty in all aspects of your work life is primary to building and maintaining the teamwork needed to keep a nuclear facility operating safely. In fact, there is no retaliation if you turn yourself in for violating a safety practice. This is called self-reporting, and is the most valuable tool in evaluating whether a procedure performed could compromise the integrity of the nuclear reactor or supporting equipment. But - if you do not self-report, or if you deny that you were part of a violation or a prohibited practice, you will be walked out the door.

**Safety is truly taken seriously.** This is just a small sampling of the safety-related practices nuclear workers follow every day and what the elevator trade can take away from their experience. Of course, everyone’s goal is to go home at the end of the day... **we, at least, don’t have to worry about glowing.**
Late Night Call Backs

Dave Morgan
As trained elevator constructors, we are constantly reminded of the fact that our work can be extremely dangerous. Construction, modernization, and service jobs all pose safety issues during the regular work day, and the call back mechanic faces even more safety challenges after the sun sets. These hazards can jeopardize even an experienced, trained elevator constructor’s ultimate goal of returning home safely after each and every shift.

Occupational Safety and Health Administration (OSHA) statistics tell us that in 2010, 631 deaths were attributed to transportation in the private sector service industry, and that transportation accident fatalities as a whole accounted for nearly 40% of all on the job deaths in 2010. Late night travel to and from a call back can be an especially dangerous undertaking, as the roadways are filled with other drivers who may be impaired mentally or physically. This impairment can range from someone who had a bad day at the office to a person who is driving under the influence of drugs or alcohol, and everyone in between.

While we can’t control what the other guy is doing, we can be alert and aware of our own surroundings, and learn to navigate the roadway in a defensive manner. How do we do this? First, look for that other guy. Take extra caution at stop signs and traffic lights, and remember that tailgating an erratic or impaired driver is just not worth the risk. Defensive driving will certainly increase your chances for a safe trip to and from the job.

Also, be aware of your own physical condition before making the trek out to the call site. Are you awake enough to make the trip safely while navigating your course to the job in a defensive manner? According to the National Sleep Foundation (NSF), if you have trouble keeping your eyes focused, can’t stop yawning, or can’t remember driving the last few miles, then you are probably too drowsy to drive safely. The National Highway Traffic Safety Administration (NHTSA) estimates that 56,000 motor vehicle accidents and 1500 deaths are caused by driver fatigue each year. Napping or caffeine can combat drowsy driving, which helps reduce the risk of a motor vehicle accident.

Forbes magazine recently published an article titled “Most Dangerous Times to Drive.” The article pointed out that although most roadway accidents happen during the evening rush hour, the most dangerous time to be on the road is between the hours of 12AM and 4AM. This four hour stretch of the early morning – which happens to be a common time to be on the road to or from an overtime call - holds the highest rate of fatalities per vehicles on the roadway. Why is it such a dangerous time? These statistics are largely impacted by impaired drivers and misuse of seat belt restraints. Much like a hard hat or safety lanyard, a seat belt restraint in a motor vehicle is a form of PPE and should always be worn to achieve your ultimate goal of arriving home safe at the end of your shift.
Driving is not the only risk when it comes to late night call backs. If you are not well rested and alert to your surroundings on the jobsite, any job can be more dangerous after hours. The hazards contained within an elevator system, be it a two-stop hydraulic or a high-speed traction unit, multiply exponentially when the mechanic responding to the call back is tired or drowsy. Your decision making process is clearly compromised when your brain is tired. When you mix in the fatigue with bad decision making, lack of concentration, and potential moodiness, a tired mechanic makes for a certain safety concern. He or she may miss hazards that we think as obvious during regular working hours, or may not use the proper PPE or lock-out tag-out procedure that is a constant on all jobs. A fatigued mechanic may also be less aware of the fall, electrical, and crushed-by hazards that are always present on a job site.

While fatigue may play a part of potential dangers in after-hour call backs, the fact that many of these jobs are taken under the cover of darkness poses even more potential problems once on the job. The human element can change during the middle of the night for many reasons, and the mechanic must always be aware of his or her surroundings. People on a dark sidewalk, alleyway or stairwell can certainly become more dangerous at night. It is important to avoid dimly lit and suspect areas whenever possible and to pay attention to what is going on around you. A basic self defense class would be a great tool to add to your tool bag, not solely for the physical aspect of defense but also to sharpen your senses to the awareness of a dangerous situation.

Improper lighting on a job site can also pose a physical problem for the on call mechanic. The trip and fall hazards on a dark roof top or inside of a building without proper lighting could turn a routine call into a tragedy. When faced with inadequate lighting on a job, mechanics must be ready with something as simple as a quality flashlight with good batteries in the tool bag. In some instances, a flashlight may not provide enough light and the mechanic should notify the proper authority before beginning their work. Falls are not the only risk working in the dark; the simple task of walking across the roof of a building can become treacherous if you can’t see what’s in front of you. Any mechanic who has unknowingly come across a black vent pipe protruding from a roof top with their knee cap will surely agree that it’s best to remove hazards in advance whenever possible.

Our ultimate goal as qualified and educated elevator constructors should always be to return home safely at the end of each shift. We can only increase our chances of reaching that goal by being aware of the potential dangers that hide around every corner and addressing them in advance whenever we can. Awareness comes from education, and education comes from the National Elevator Industry Educational Program. Log on today and become aware.
The Expectations of AHJs When Conducting Periodic Full Load Safety Tests

Norman B. Martin
Elevators do not run on magic.

The public typically does not know what occurs “behind the curtain” that permits their elevator ride to be safe and secure. It is the efforts of skilled elevator mechanics that ensure the extensive engineering that was designed into the elevator system is operating correctly.

One of the methods used by mechanics to ensure the safety of the public is to conduct “full-load safety tests” on a periodic basis. The testing requirements that are necessary for a mechanic to follow are usually established by the local Authority Having Jurisdiction (AHJ), also known as the elevator inspectors, through the adoption of the national elevator safety standard, usually the ASME A17.1 Safety Code for Elevators and Escalators. The purpose of this article is to review the general requirement and expectations of AHJs when witnessing or conducting these periodic full-load safety tests of traction elevators.

The local elevator inspector (state, county or city) will normally require periodic safety tests of traction elevators to be conducted every five years. The expectations of the AHJs are typically extensive. Safety tests are more than just loading and unloading “the weights.” Safety tests involve testing all of the electrical and mechanical safety devices of an elevator system. In order to conduct these tests to meet the national and local standards, a mechanic will need to follow three general steps:

1. Preparation
2. Calibration
3. Testing and Reporting

**Preparation**

- Review the structural components in the machine room and hoistway
- Confirm testing procedures in the MCP
- Confirm any safety practices established by the company and the EIFESH
- Review testing guidelines in ASME A17.2 Inspector Guide
- Establish rated speed of the elevator
- Secure any adjoining car from operation during the tests

**Calibration**

- Clean and calibrate over-speed governor
- Conduct “pull-through” tests and “pull-out” tests
- Inspect oil buffers
- Inspect elevator to confirm all EPDs function

**Testing & Reporting**

- Conduct 125% brake tests
- Conduct full-load safety tests
- Confirm car is level after application of safeties
- Confirm slide distance complies with the elevator standard
- Conduct full-load buffer tests
- Conduct unintended car movement tests and ascending car protection tests
- Conduct remaining applicable tests for inner-landing zones and any MCP specific tests
- Complete documentation required by AHJ
1. Preparation

It should be noted that two-thirds of the process of conducting a periodic safety test is “preparation and calibration,” and the final third is “testing.” It is not a process that can be done quickly. It is a process that requires a mechanic and the inspector witnessing the tests to work safely and to follow an established set of rules and guidelines that may have to be varied based upon the manufacturer model of each type of elevator device. Let’s get started on testing.

Time to Get Out the Books!

Elevators are complex devices. Each manufacturer has a unique method of building an elevator safety device that varies from model to model. There are a number of books that need to be made available to a mechanic in order to conduct a proper safety test. These books include the ASME A17.1 Elevator Safety Standard; The ASME A17.2 Inspector Guide; The Elevator Industry Field Employees Safety Handbook (EIFESH); any other equipment specific technical manuals and employer policy and procedures. In addition, the local AHJ may have deviations of the ASME A17.1 standard that the mechanic will need knowledge of in order to be in compliance.

The MCP

Prior to entering the hoistway or pit areas, a mechanic should confirm the testing procedures in the maintenance control program (MCP). The MCP is a document that is provided by the manufacturer and it is required to be available to “elevator personnel.” The definition of “elevator personnel” includes both elevator mechanics and inspectors. The MCP requirements come from ASME A17.1 section 8.6. The MCP document applies to both new and existing equipment. Procedures for periodic testing are required to be part of this document. The MCP also documents the procedures for unique or product-specific equipment.

These “unique” approaches can be a critical issue for testing new machine room-less (MRL) elevators. The mechanic may need to know how to gain access to a governor located in the hoistway or accessed from the top of an adjoining elevator car. The mechanic will need to know how to position the elevator and secure the platform to be able to work both safely and effectively. I cannot stress enough of how this document will impact your ability to safely conduct testing and inspecting of modern elevator equipment. You cannot make assumptions or rely upon your “wits” to be safe. Follow the written procedures.

The EIFESH

The EIFESH is a supplement to the safety practices outlined in the MCP and is familiar to all who work in the elevator industry, including QEI certified inspectors. When used properly, the EIFESH is a proven document that can help you return home safe every day. It outlines using the proper procedures for safely accessing car-tops and pits, following the lock-out/tag-out procedures when necessary and ensuring that you have and wear all of the proper personal protective equipment. Confirm any other safety practices established by the company and the building.
ASME Books
All QEI certified elevator inspectors are required to have a “working knowledge” of a series of ASME standards related to elevator equipment. These standards include the ASME A17.1 document that established the details of what should be tested on a full-load periodic safety test. Elevator mechanics should have the same level of knowledge of these standards. The ASME A17.1 standard provides safety slide tables, governor calibration charts and other critical testing data that is required for traction elevators to be in compliance. Do you have the ASME A17.1 standard available to you when you are conducting tests?

Do you have the companion ASME A17.2 Inspector Guide? This guide provides the testing methodologies for traction elevators as well as other types of equipment. This guide also provides a historical reference for older pieces of elevator equipment to ensure that the proper standard is being applied. Which safety slide table do you apply to an elevator from the 1940s? It is not found in the table included in the ASME A17.1 standard, but it is found in the ASME A17.2 Inspector Guide. The Guide also provides a description of conducting governor pull-through tests as well as discussion on how to conduct tests on modern MRLs.

Reviewing the MCP, the EIFESH and the testing guidelines in ASME A17.1 and A17.2 is the critical starting point of the safety test process. There is no reason to move onto step two and three of the safety testing process if a mechanic does not know the requirements of the local AHJ. A mechanic cannot conduct a proper safety test without this knowledge. To do so would be “faking it.” The industry does not have room for individuals who do not follow the proper procedures and those who short-cut safety or short-cut critical testing methods. This includes both inspectors and mechanics.

Look!
You have taken the time to know what to test, and to understand what is required. Now it is time to take a look at the elevator equipment. An elevator mechanic should look before testing. There should not be any assumptions made as to the current condition of the equipment. Items do get damaged. Electrical Protective Devices (EPDs) are sometimes missing. Safety components are sometimes deteriorated or missing. A mechanic should review the structural components in the machine room and hoistway. Is this elevator able to be tested or are some repairs necessary prior to testing?

As an elevator mechanic or inspector, have you determined how you will secure any adjoining car from operation while you are conducting the tests? Do you have safe and convenient access to the machine room and hoistway? Are there any issues as to the adequacy of the suspension members or governor ropes? Are there sufficient overhead clearances to prevent damage to the elevator equipment? There are many examples of elevators undergoing alteration updates and it is discovered that the elevator could not have had a fully compressed buffer without breaking the car guides.

Looking and asking questions should be part of every mechanic’s approach when surveying the job site for hazards. Use your knowledge, skills and ability to protect your personal safety as well as the safety of others and the equipment. Combining “looking” with “reading” will allow for your preparation to be complete and allow you to move onto the second part of the inspection process: calibration.
2. Calibration
The second portion of the three-part safety test process includes items related to “calibration.” The elevator device needs to be prepared for testing. This includes cleaning, actual calibration, and conducting limited testing prior to moving onto testing the major components of the mechanical safeties.

Prepare!
Nearly every testing item related to governor calibration, mechanical safety application as well as buffer engagement relies upon one basic definition: rated speed. Rated speed is defined by the ASME A17.1 standard as the speed of the elevator in the up direction with a capacity load. This speed is to be established prior to calibrating the speed governor or conducting the setting of the safeties. In order to know the capacity of the car, the platform should be measured and the capacity confirmed against the requirements outlined in the standard.

Note: obtain the rated speed of the car using a tachometer and by following the procedure listed in the ASME A17.1 document or the MCP. It is a preferred practice by many companies to obtain the speed of the car from outside the hoistway rather than placing a tachometer against the guiderail as has been past practice. The usage of accelerometers and other velocity feedback devices should be confirmed as acceptable by the AHJ prior to proceeding.

Clean!
An elevator operates in a relatively dirty environment, even in an office building. A mechanical device must be cleaned and lubricated in order to function reliably. This includes the speed governors as well as the mechanical safeties.

Speed governors are known to have had broken or missing springs, worn bearings, and incorrect calibrations. Many times a speed governor may need to be replaced prior to completing a test. Always clean and calibrate the overspeed governor.

Mechanical safeties are just as prone to wear and lubrication issues. Each side of the safety device should be inspected for damaged jaws and broken components. In addition, ASME standards require that the distance between the safety shoe and the guide rail be maintained correctly on type B safeties. Note: This article is not meant to discuss all of the details of all of components supplied by elevator manufacturers, such as the various types of safeties used. That information can be obtained from the NEIEP education materials and in the ASME A17.2 Inspector Guide.

Conduct!
The speed governor for type B safeties requires that the device be calibrated. This means that the device is tested to be sure that both the mechanical device functions at the speed permitted by the standard as well as the electrical switch. This switch is a critical EPD that removes power from the driving machine. It is to function on modern equipment in both directions of travel.
The second critical test of a speed governor includes the testing of the forces generated by the jaws on a traditional governor rope. The conducting of a “pull-through” test and the “pull-out” test ensures that the governor rope will not be damaged as the jaws are applied to the rope. The force that is permitted shall not exceed 20% of the breaking strength of the governor rope. That can be a very high value as opposed to what is normally found on most manufacturer’s speed governors. Please review the data tag on the speed governor that lists the maximum pull through force. This force is rarely above 1000 ft-lbs of force. The “pull-out” force is not to exceed 60% of the pull-through value.

The MRL type of elevator devices can utilize either traditional speed governors, remote resetting governors or even jawless style governors. Each type of governor has specific procedures for testing. Each will have personal safety issues to be followed. This is the time to get the MCP and follow those specific and unique processes.

Inspect!
Prior to impacting the speed buffers or conducting the mechanical safety tests, the oil buffers are to be inspected. This inspection is meant to ensure that the buffer is physically in place and secure, and not subject to exterior corrosion. In addition, the buffer oil level is checked and confirmed that water has not been introduced into the buffer from any flooding that may have occurred since the last test was conducted. It would be prudent to ensure that the buffer is free to move and will likely function during the full-speed test. Spring buffers are to be inspected for being properly secured and ensure that they have not been damaged or deformed.

The testing of the EPDs is critical to the safety of those conducting the tests and for the safe operation of the elevator. The ASME A17.1 standard requires the testing of all of the EPDs. This means top and bottom terminal devices, governor tension devices, compensating sheave EPDs and other devices outlined in ASME A17.1 section 2.25 and 2.26 as well as 8.6. As was indicated earlier, the test is more than just taking the weights off the truck.

### 3. Testing and Reporting
Part three of this three part testing process is the exciting part. This is when the mechanic tests the safeties at rated speed in the down direction with a load on the car. The same load and speed conditions are used when engaging the oil buffer. Note: the testing of the counterweight buffer is done without a load on the car, but at rated speed.

The conducting of a full load periodic safety test is really answering a series of questions. These questions include:

- Does the slide distance meet code requirements? The slide distances the average of the four marks that will likely be left on the rail surface after the completion of the test. If rails are dirty or corroded or if tests are conducted on top of other marks, the recent slide marks may be difficult to read. The average of the four marks should be used to determine compliance with the standard. The length of the safety shoe is not counted in the slide distance.

<table>
<thead>
<tr>
<th>Rated Speed (FPM)</th>
<th>Minimum Stopping Distance (inches)</th>
<th>Maximum Stopping Distance (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>350</td>
<td>7</td>
<td>28</td>
</tr>
<tr>
<td>500</td>
<td>13</td>
<td>47</td>
</tr>
<tr>
<td>1000</td>
<td>52</td>
<td>158</td>
</tr>
</tbody>
</table>
3. Testing and Reporting (continued...)

- Was the governor tripped by hand to set the safeties at rated speed for the five-year test (or at governor tripping speed for acceptance testing)? The standard requires the plank switch to be adjusted or moved to ensure full application of the safety at full speed. The device is not to be “jumped.” Is this being done in your organization?

- After the safeties were applied, did the platform remain level after testing? Think of what could occur if the platform was racked to one side, the platform was out of level and the load shifted…the safeties may not be able to perform as intended.

- If the unit does not have a governor, did obtaining the necessary slack rope activate the safety and slack rope devices? This approach is used in the roped-hydraulic type of elevator as well.

- Have the car and counterweight oil buffers been tested by fully compressing the buffer at full rated speed, and did the oil buffer return within 90 seconds? The standard requires the limits to be adjusted or moved to ensure full compression can occur without slowing the car prior to buffer engagement. Is this being done in your organization?

- For traction machines, did the unit lose traction during the testing of the safeties and the compression of the buffers, or did the control drive stall? The loss of traction when an elevator is at extreme travel or when sitting on an applied safety is just as important as the maintaining of traction during normal operation.

- Was the brake test performed with weights totaling 125% of the capacity placed on the car? This test is critical. The car is not required to lift the 125% load. The elevator is required to properly lower, stop, and hold the load. This test should be conducted near the bottom terminal floor.

- Has the ascending car-protection device been tested? This device is new to the United States in the past 20 years. It is required on new elevators installed under the 2000 edition of the ASME A17.1 standard and later. In my experience, there are more elevator installations found sitting in the overhead than there are elevators found sitting on their safeties. The device may be a rope brake or similar acting appliance. The typical new driving machine incorporates the ascending car protection in the multiple brake design. Each of those brakes is to be tested separately.

- Has the unintended car movement device been tested? This critical test ensures that uncontrolled movement away from the floor is prevented. This device is usually installed on devices under the 2000 code and later.

- Were the normal and terminal electrical stopping devices tested? All EPDs are to be tested and verified.

- Where provided, was the firefighter’s service Phase I/II key switch inspected and tested? This is not a test of the fire alarm smoke devices. Those devices are tested annually by another NFPA standard and usually by the building department or by the local fire authority. The test is simply calling the elevator down by the Phase I key switch, then operating Phase II (if provided) by moving the car to an upper floor and opening and closing the doors and returning to the main floor. This allows for the exercise of the electrical relays associated with the device.

- Where provided, was the standby emergency power inspected and tested? (Must have occurred within 12 months of safety test.) Elevator personnel in most cases do not conduct the test. This is a test that is to be conducted by the building owner as determined by the local building department or fire authority.

- Where provided, were the broken rope, tape, or chain switches tested? These are EPDs.
Where provided, were the closing force of power operated hoistway door systems operated and tested? This information can usually be found in the MCP.

Where provided, were the emergency terminal stopping speed limiting devices tested? Refer to the MCP or the ASME A17.1 Inspector Guide.

Where provided, were the leveling zone, leveling speed and inner-landing zone tested as required? Refer to the MCP or the ASME A17.1 Inspector Guide.

**Reporting**

Upon the completion of the tests, the documentation required by AHJ is to be submitted to their office. Be aware that most AHJs are subject to laws that make documents, such as test forms, public records that can be viewed and obtained by others. Accuracy of reporting is critical.

**Other Types of Equipment**

The typical traction elevator was the basis for the content of this article, but as we know, there are many types of devices that have safety tests required to be performed by AHJs, including direct hydraulic elevators, roped hydraulic elevators, rack and pinion elevators, and others. The simple 1-2-3 inspection process applies to those pieces of equipment as well. Preparation is similar in most cases. The inspection and calibration is similar but done specifically for hydraulic valve bodies. The testing of the EPDs is the same and the most critical element.

**Note:** Specifically related to hydraulic elevators, all tests of the bypass (or relief) pressure are conducted while the elevator is at extreme travel and in contact with the stop ring. The usage of shutting off the gate valve on the oil supply line is a prohibited practice and does not result in a complete pressure test. For additional information related to testing other types of equipment, please refer to the ASME A17.2 Inspectors Guide.

**What's on the Horizon?**

The tests described in this article are the traditional methods outlined by the ASME standards and the general safety practices used in the United States today. There are other testing methods being used in Canada and in Europe. Those practices do not utilize weights during a “full-load” periodic test. The process relies upon the testing being conducted without weights, but the results are recorded by an accelerometer. The performance is then compared to what would be expected to be achieved with an actual full-load test.

This method of testing is promoted as resulting in less potential damage to equipment and persons conducting the tests. The “weightless” testing procedure is currently being considered by the ASME standards committee for inclusion in the next edition of the ASME A17.1 standard. That process will be reviewed in future articles.

**Summary**

This article discussed the expectations of AHJs when witnessing periodic full-load safety tests. There are differences when conducting acceptance tests on new or altered equipment as well as when conducting annual tests without loads. Those issues may be explored in future articles.

The testing was outlined as a simple 1-2-3 process. As we have learned, testing is two-thirds preparation and calibration, and only one-third testing. It is time consuming when done properly, but it is critical for the safety of the public and to the safety of elevator workers to ensure that all safety practices are followed. When tested properly, the critical EPDs and mechanical safety devices will likely function as intended to protect the public from a catastrophic failure. The result is an elevator that the public can depend upon and ride with confidence without having to understand the “magic” hidden behind the curtain.
The Role of Awareness in Electrical Safety

Dave Keaney
In all industries where technicians are required to install, service, and maintain electrically operated equipment, there is an abundance of literature available that details proper safety procedures and requirements. A comprehensive approach to electrical safety must also include a general awareness of the potential hazards that exist whenever electricity is involved.

The electrical hazards present to the elevator mechanic are numerous. They range from voltages in main line disconnects to stored charges on the capacitors in a solid state motor drive. The one common thread with all these hazards is that they can cause a serious problem in a very short period of time, usually within seconds. There are many important points to be aware of regarding electrical hazards. One of the most important points is that they can be created by normal equipment operation. There does not always need to be a “problem” with a piece of equipment for a hazard to be present. Acquiring as much knowledge as possible about the equipment we service is critical to understanding overall operation and knowing how to avoid potential hazards.

Decisions made long before an accident happens can be crucial. If a service team was going to replace hoist ropes, they wouldn’t start the job until they had obtained all of the equipment necessary to perform every step of the replacement and had discussed how they were going to proceed. The same logic needs to be applied to electrical work. Decision making is simply a selection made after considering all possible options. To be able to weigh all options properly, we need to have a sound knowledge of the equipment on which we are working, an understanding of the environment around us, and an awareness of potential hazards.

**Safety Awareness Tip #1: Understand the equipment you are servicing.**

Take, for example, a mechanic planning on replacing contacts on a motor start relay in a hydraulic controller equipped with a battery lowering device. Locking out the main line disconnect, while a necessity, does not always create a truly “safe” environment. The lowering device has the capability of supplying a power source by itself. In some cases the lowering device is inside the controller and can output 120VAC, and in others it can be external to the controller and capable of three-phase 480VAC. It is essential that technicians know what their equipment is and understand how it works, including how to disable it if necessary, prior to working on the controller.

**Safety Awareness Tip #2: Be aware of and alert in your environment.**

Picture this: a mechanic is replacing a roller guide on the top of an elevator. By itself, this appears to be a task with no electrical dangers. But what if there were a cover missing on an electrical box, or a wire had come loose from a terminal and was exposed? This could be very dangerous. Even a small shock could cause a reflex reaction that would cause someone to lose their balance and possibly fall.

**Safety Awareness Tip #3: Be on the lookout for potential hazards.**

How many times has a new apprentice on an overtime emergency power test been told to “…go with the electrician and call me on the radio when we’re running on the generator”? The apprentice dutifully follows the electrician down to a main electrical room and stands by his side while he throws a main power breaker to initiate emergency power. The apprentice is just following directions, and they often assume they are safe since they are with an electrician or building engineer. But often times, these electrical rooms have very high voltages and if not properly maintained can be a dangerous environment. If a short circuit were to occur in this type of equipment, it could create an “Arc Flash” or “Arc Blast” situation.
In this scenario, the temperatures created can reach as high as 35,000 degrees Fahrenheit, much hotter than the surface of the sun. When copper vaporizes, it expands to 67,000 times its size in solid form – so this rapid expansion, coupled with temperature, will cause a blast that will throw shrapnel, create a pressure wave, and can kill a person more than ten feet away.

The combination of proper safety procedures and the concepts described above can help minimize a person’s likelihood of having an accident. But just as safety procedures need to be explained, studied, and constantly reevaluated, these other concepts need the same attention.

Almost everyone in the elevator industry would agree that our new equipment is sophisticated and representative of advances in technology. How many of us make it a priority to learn about these advances before or during their implementation? Due to their capacitors, which provide high DC bus voltage, the Variable Frequency Drives that we install today are not safe to work around until power has been removed for at least five minutes. These drives are adorned with warning messages, and their manuals specifically point out that there needs to be a time delay between powering them down and trying to service them. This is only one example of a newer safety procedure that came about because of new technology in our industry.

As advanced as the elevator business is, in many ways we are still a niche industry. In most cases, by the time we see “new” technology in our systems, it has been around for a few years, and there is a wealth of information available for those who seek it out. A quick search on the internet shows that serial bus communication is more than 25 years old, though its deployment in elevator systems is more recent. Solid state motor drives were being used long before they became standard in the elevator trade, and some of the more seasoned mechanics in the IUEC know that the first infrared door detectors came a number of years after similar systems were being used on entrance doors to buildings. The point to realize here is that when we see a new technology being introduced in our trade, we need to take the opportunity to not only study the documentation provided with the equipment, but also need to take it upon ourselves to try and find additional information so we can expand our own knowledge.

In summary, the best opportunity we have to create the “safe” environment we desire in the workplace is to keep a few key points in mind:

1. Learn as much as possible about the equipment you are working on.
2. Make sure you have an awareness of the environment you are working in.
3. Consider all of the potential hazards present to anyone performing the work.
4. To ensure your own safety, as well as the safety of your coworkers and members of the public, consider all of these factors when making decisions about how to perform your work.

Keeping all of these points in mind will help us incorporate learned safety procedures and other preventive measures to minimize potential accidents. We all know that ours can be a dangerous business, but with an emphasis on overall awareness, we can decrease our exposure to hazards.
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