Elevator Safety And How Code Change Means
A Big Challenge For The Big Apple.

Elevators: Safety in Numbers

Even if you're not a person who cares much for numbers, the statistics pertaining to elevators can be a bit eye opening. For instance, according to Consumer Watch.com, U.S. elevators make 18 billion trips a year [1]. As for safety, the U.S. Bureau of Labor Statistics and the Consumer Product Safety Commission report that on average 27 people die, and 10,200 are injured, every year nationwide in elevator mishaps [2]. A little over 50% of those fatalities, according to the U.S. Labor Department Census of Fatal Occupational Injuries, occur during the repair, service or maintenance of elevator equipment, or affect people who use elevators as part of their daily employment (such as office workers) [3].

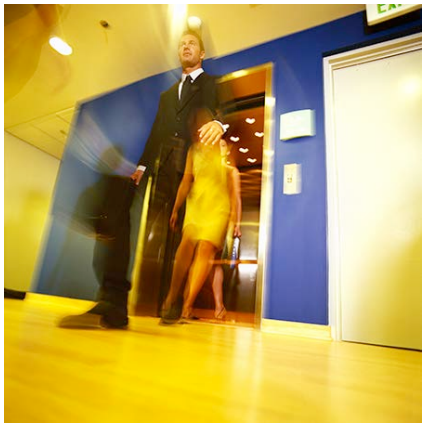
For those with a penchant for percentages, in an article by the LA Times, they estimated the elevator fatality rate to be 0.00000015% per trip [4]. This is an especially small percentage when you consider that car accidents claim 27 victims every six to seven hours in the U.S [5].

So it's easy to understand how one could be lulled into a sense of complacency, into thinking that the modern elevator is hardly in need of any modification or

Statistically a person is 60 times more likely to die from a fall down the stairs than from an elevator.

improvement. After all, there is a measure of risk, which some call acceptable risk, that one takes getting out of bed or crossing the road.

Fortunately however, to professionals in the elevator industry, even a small percentage of failure, for any reason, is seen as unacceptable. Because they understand that even the smallest error can create tragic results. Especially in today's voracious 24/7 news cycle, social media driven world; a place where legions of personal injury lawyers constantly scan the headlines on the lookout for any elevator accident.



The NYC Building Code could impact up to 40,000 installations citywide.

All it takes is a quick bit of online research and you can find websites offering footage of elevator accidents compiled in morbid "Best Of" compilations that attract both the paranoid and simply curious. Mostly they offer slightly edited security cam videos, with a voice describing the accident, all the while telling viewers with weak stomachs to not look. It's unsettling, and highly unfair.

They never bother to mention that a person is 60 times more likely to die from falling down the stairs. Nor do they acknowledge that you're nearly as likely to be struck by lightning (25 persons each year according to LiveScience 2.9.16, "The Odds of Dying", Laura Geggel) as you are to be killed in an elevator mishap.[6] The truth is that elevator fatalities, outside of popular movies or dramatic television programs, are very rare. But facts like that aren't useful to online sites trying to attract viewers and sell ad space.

Over time, regulatory bodies and foresighted industry professionals have sought to add various features to the elevator to provide for greater passenger safety. Unfortunately, as is often the case with technological devices, system improvement is also driven by tragic accident. It was one such fatal mishap that led to a recent change in the NYC Building Code by the Department of Buildings, which must be addressed by January 1, 2020 for elevators to be in compliance. This Code change has enormous implications; in fact, the provision impacts up to 40,000 elevators out of a total of 65,000 elevators throughout the city. What does this regulation provide? Basically, it addresses an issue of safety that most of the public believes is implicit: that an elevator car will never move with its doors open. Sadly for some, that doesn't always prove true.

A tragedy spurs a change

Many NYC industry professionals still cringe when they recall an incident from December of 2011. That was when a young midtown Manhattan woman was dragged to her death when the elevator car in her office building left the landing with the doors open. What followed was a scene that left passengers, bystanders, and rescue personnel shaken.

A fatal elevator accident in December of 2011 led to NYC Code changes with far-reaching implications.

Unfortunately, this was not the first instance where either a faulty car door mechanism, poor wiring technique, or a maintenance worker using a wire jumper—a practice frequently used by service mechanics which allows them to bypass elevator safety mechanisms— has created a serious accident. However, the severe nature of this accident, and its occurrence in such a prominent venue, grabbed headlines and made immediate action imperative.

So while experts reviewed the circumstances behind the fatal 2011 Manhattan office elevator accident, the NYC Elevator Code Committee moved quickly to respond. Regardless of whether the cause was found to be negligence, carelessness, mechanical failure, or accident, the code committee lobbied the city council to adopt an addition to the NYC Building Code.

Building Code, Appendix K3, Rule 3.10.12, states that means shall be provided to monitor the hall doors and car gate for faulty circuits, and, if a faulty circuit is detected, the elevator shall be prevented from operating and removed from service. This rule applies to all passenger and freight elevators under the jurisdiction of the NYC Department of Buildings, and sets the deadline for compliance at January 1, 2020.

The deadline for Code compliance is January 1, 2020.

While the new rule is based on ASME 17.1, 2.26.5, "System to Monitor and Prevent Automatic Operation of the Elevator With Faulty Door Contact Circuits", its firm deadline for compliance gave the measure real teeth. Also, the fact that this provision would apply retroactively to all NYC elevators made this case unique throughout the entire industry. Certainly, many of NYC's newer elevator systems already feature Controllers with the capability to monitor elevator door faults and prevent potential accidents, and have been installed for years. But this Code change could impact up to 40,000 elevators, and affect tens of millions of passenger trips a day [7]. So the question for many then, was not whether

the rule change was a good idea, but if it could be fully implemented in the time allowed, and at what cost?

The solutions at hand

Today many companies offer door and gate fault monitoring mechanisms as add-on features. However, whether that option actually comes installed on a particular Controller often depends on where it is finally installed. As is often the case, should a certain state, region or municipality elevator code not specify such a feature to be used it is often left inactive. Making the situation even more difficult, even if a professional were looking to employ a door and gate fault monitoring system it can sometimes be difficult to determine whether or not a particular Controller provides the feature. Though some manufacturers do call attention to it in their sales literature, others mention it only in passing or not at all.

Door lock monitoring, which is sometimes referred to as "redundancy" has been required by ASME 17.1 code since 2000, and controls built to meet 2000 or subsequent Codes have this feature built in. This means that most microprocessor-based Controllers built since then (and a few relay-based systems built earlier) either come with monitor circuitry already installed, or can be connected to devices to offer door fault monitoring capability. At least these can be adjusted, modified, upgraded or quickly replaced in order to achieve compliance. The real problem NYC professionals face comes from the vast number of elevators in NYC using legacy equipment, which will not easily permit fault monitoring to be installed. Typically elevators are only required to meet the code requirements that were in effect in the year they were installed. The fact that the Code change would be enforced retroactively, as this one would, was almost without precedent in the industry.

Some outside of the industry may wonder if ASME 17.1 code has long specified that door fault monitor capabilities should be provided, then why isn't it a standard feature in controllers already? Actually, it's not that simple. One has to remember that the The American Society of Mechanical Engineers, which is dedicated to establishing a code to make sure an elevator is safe, is strictly an advisory committee and has no regulatory enforcement capability at all. A dizzying array of state, local and municipal enforcement bodies handle that part of the equation. Certainly it makes sense for something as complicated and important as an elevator to be built, installed, and maintained by rules that are equally applicable, everywhere. But that's not the current reality. That said, ASME guidelines are quite often adopted and then enforced by legislative action, in effect turning ASME standards in many places into the law of the land.

Fortunately, the ability to detect jumped or faulty door circuits has been available to the industry since 1978. Called FM1, the monitoring circuit has been tested, proven, and has sold over 10,000 units worldwide. Over time it has become a mainstay in

GAL relay, PLC logic, and microprocessor controls, and is highly compatible with most other makes of relay and solid-state controllers.

Available today in microprocessor form, FM1 was designed, patented and manufactured by Walter Glaser of GAL Manufacturing long before the industry ever considered the consequences of faulty door contact circuits. Originally created for an entirely different purpose, FM1's true potential wouldn't be recognized until many years later. When GAL came to realize that FM1 could remove a potential source for serious passenger injury, the company moved to become an advocate for industry change. In the end, the FM1's story is one of ingenuity, stubbornness, patience, and a tale of how sometimes even the best innovations take years to be accepted by an industry

FM1: How it was developed and why

Faulty door contact monitoring and Rope Gripper® capabilities have been a critical part of all Galaxy Controllers since 2000.

Walter Glaser has always believed that a company's main goal should be to design products to surpass the code, instead of striving to just meet the required standard. As brother to co-owner Herb Glaser, Jr., and son of co-founder Herbert Glaser Sr., the idea of product innovation, and a desire to promote passenger safety has been on his company's radar from its start in 1927.

In the mid 1970s the NYC elevator industry saw a huge rise in elevator vandalism. This problem was especially prevalent in the city's housing projects, schools and collegiate dorms. In addition to the high cost of fixing demolished door buttons and tampered doors, mischief-makers would frequently thrill ride on the top of cars (called "elevator surfing" and detailed today in ill-advised YouTube posts), or run the elevator with open doors. More than an expensive nuisance, such vandalism led to severe accidents.

Pondering a solution, Glaser created rough schematic sketches and used them as the starting point for a series of product prototypes. Refining each variation over time through tests on GAL and non-GAL equipment, GAL soon debuted a simple solution to the problem under the highly descriptive, but unwieldy name of the: "Elevator Door Tampering Protection System". Its primary purpose was to make it impossible for vandals to tamper with the door interlock and gate switch. Any attempt to do so would prevent the elevator from running, keep the doors open, and activate an alarm, indicating unauthorized personnel had interfered with the equipment. The unique design behind this door fault monitoring circuitry was awarded a patent in 1978. Offered as an additional feature in all nonproprietary GAL Controllers, the door fault monitor would soon earn a much easier to remember name— FM1.

Initial sales of the patented and CSA certified FM1 monitor were sluggish. Instead of being disappointed however, Glaser and the company took the time to reevaluate the device and see it instead as a readymade safeguard against car door accidents caused by human error. Soon afterward they began to fully publicize the device's wider merits in industry gatherings, educational forums, and onsite visits. Now used globally, and incorporated as a feature in all GAL microprocessor-based Controllers since 2000, other companies have come forward to create their own variations of FM1. Still it's highly doubtful if they would have made the attempt at all, without GAL's efforts to point out that not only did FM1 provide a comparatively easy and economical fix to address a potentially lethal problem, but also it was simply the right thing to do.

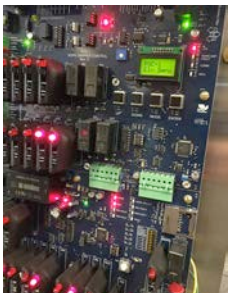
Says Peter Novak, Senior Electrical Engineer at GAL, "FM1 is like any one of a number of simple ideas that starts out to address one problem—such as vandalism— and then turns out to be novel solution for something else entirely. It's a win-win for everyone; especially when it comes to safeguarding passenger safety. Which is what we're all about here at GAL."

How FM1 works

Putting aside all the various mechanical parts of a door operator and car door that must work in tandem, basically an elevator "knows" when to close and depart because an electrical signal is created and sent from the Controller. That signal is created when monitoring sensors within the car door gate switch and in the interlock contact on the landing door, complete an electrical circuit. When all contacts are made, then the Controller knows it's safe to move the elevator. The system is highly reliable and has proven to be an effective way to do the job. However, it does offer a way where a maintenance mechanic could create an artificial bridge, or jumper. This would permit the door to stay open so service could be performed, by making it appear to the control that the door was actually closed.

FM1 utilizes this closed circuit approach but takes it a step further. FM1 demands that that the electrical signals move forward in a predetermined order. And if that specific sequence isn't followed, then the door will appear to the control as open, it will then keep the car from moving and sound an alarm.

This means that FM1 meets the new Code provision by constantly monitoring the car and preventing operation with the doors open, regardless of whether an incorrect signal is relayed from the car door contact or landing door contact. This capability to detect faults from bypassed car door contacts makes it virtually impossible to physically jump the electrical circuit and bypass elevator safety features, either intentionally or accidentally. In essence, it's a watchdog always on guard for door faults of any kind.



FMG1 Monitor for UCM and ACO conditions utilizes the Hollister-Whitney Rope Gripper®

The impact from the oncoming deadline

So, how is the industry coping with the approaching NYC January 1, 2020 compliance deadline? That really depends upon whom you ask. Some elevator professionals are only now starting to consider how the code change will affect them, while the overall pace to actually address the situation could be best be described as sluggish. Considering that up to 40,000 elevators could be impacted it has become a true cause for concern for many, including GAL VP Business & Development, Doug Witham. ‘‘This is a requirement that NYC has to live with. There is a lot of work to be done to comply. I worry that it’s not being taken seriously enough. A lot of time has passed since this requirement was adopted, and it doesn’t seem like much of the work has been completed. I don’t think we should count on an extension.”

Despite this there is still reason to hope. Remember that the code only stipulates what the change is and when it must be implemented. It doesn’t require that existing equipment must be changed; instead equipment could be simply upgraded to comply. Often modernizing an installation can be done at a fraction of the cost of a new system. And while there will undoubtedly be some who will see any expense to address Code compliance as a burden they’d just prefer to ignore, the liability associated with non-compliance is huge. In addition to loss of service it can include fines, canceled insurance coverage, legal liabilities, and massive inconvenience to tenant traffic.

Certainly, if your current elevator is performing well it may be possible to just add a new board to an existing controller to bring it into compliance. However, a simple software upgrade doesn’t always address the issue. New test procedures recently adopted by the NYC Department of Buildings provide evidence that technological functionality cannot simply be taken as a given. In other words, simply because a Controller provides door fault monitor capability, it doesn’t automatically follow that you’ll be compliant. The only way to be sure of Code compliance is to evaluate your system by using newly mandated test procedures.

In addition to the current code situation, professionals also have to consider the upcoming impact of NYC Building Code, Appendix K3, and Rule 3.8.4.1, which must be fulfilled by January 1, 2027. This new requirement provides protection against unintentional car movement as specified in ASME A 17.1 Section 2.19.2.

Hollister-Whitney Rope Gripper®

And it requires one to either convert to a dual-plunger brake assembly, or to incorporate an emergency braking system to prevent Unintentional Car Movement (UCM) and Ascending Car Overspeed (ACO) motion. Fortunately, GAL provides a solution for this as well with their FMG1 device. FMG1 can monitor for UCM and ACO and activate the Hollister-Whitney Rope Gripper® if either condition is indicated.

Regardless of whether you are targeting the upcoming 2020 compliance deadline, or are being proactive and are also thinking ahead to 2027, we urge you to move quickly and consult with either GAL or others on how best to address the situation. The technical solutions are out there – and the costs for them are not prohibitive, indeed the biggest challenge is time. This issue impacts up to 40,000 NYC elevators now, and they must all be in compliance by Jan 2020. A tall order indeed!

For the NYC elevator industry the countdown to Code compliance is well underway, and it can take up to 6 weeks just to obtain the necessary city permits to proceed. Waiting much longer could risk failure to meet the compliance deadline. Nevertheless there are solutions available and GAL stands ready to provide assistance. Says Steve Ort, VP of Sales & Marketing for GAL, "We fully recognize the importance in supporting our industry partners and feel we are uniquely qualified to help. Our company is already working to provide them with the products, expertise, and support they need to meet this rapidly approaching deadline."

If it's a NYC elevator problem, then why should I care?

12% of all U.S. elevators are found in NYC [8]. So it is perhaps no surprise that what starts in New York reverberates everywhere. And when you consider how quickly an elevator accident can become a hot topic worldwide, it's easy to see why other U.S. metro areas could come to view NYC Elevator Code 3.10.12, Appendix K as a wake-up call.

What impacts the NYC industry reverberates around the world.

The impact of a retroactive code change applying to up to 40,000 elevators throughout NYC should also make every professional in the industry pause. Ask yourself, how you would be able to cope, if you found yourself in similar straights? Obviously, in countries possessing rows of newly built skyscrapers and with plans to build even more, the idea of acting proactively while the fix is relatively easy to accomplish is a logical one. No doubt they will encounter problems too. Which means that many around the world will be closely following how the Big Apple handles its compliance situation and using those lessons to guide their efforts.

However, the biggest question we in the industry face is a simple one: do we put off fixing a potential problem because the actual possibility of it being a cause for passenger death is low, or do we have a responsibility to try to remedy the situation because it is the right thing to do? Defining acceptable risk is always difficult to do, because everyone has his or her own view of acceptable risk. However, even a remote 0.00000015% possibility for a fatality in an elevator is too much, especially for anyone who's unfortunate enough to be the victim.

Works cited

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(8) ibid.

Consumerwatch.com is dedicated to keeping the public informed about defective products, recalls and safety concerns associated with numerous products ranging from tools, cars and food to medical devices and children's toys. It receives its information from the Consumer Product and Safety Commission, or CPSC, which is an independent government agency.

Authors:

Peter Novak, P.E: Senior Electronic Engineer for GAL Manufacturing Corp., Bronx, NY

Steven Ort: VP Sales and Marketing of GAL Manufacturing Corp., Bronx, NY

Biography:

Mr. Novak has worked within the elevator industry for over 25 years. First as an Electrical Engineer for Computerized Elevator Control Group, then joining GAL Manufacturing in 2004 as Senior Electrical Engineer. He has both Bachelor and Master's Degree of Electrical and Electronics Engineering from the New York University Polytechnic School of Engineering. In addition he is an Adjunct Assistant Professor at Queensboro Community College. He lives in the Greater New York City

area. He is also a licensed Professional Engineer in the State of New York and in the Province of Ontario, Canada.

Steven Ort joined GAL as VP Sales and Marketing in 2016. Prior to this he served as VP of Sales with Oerlikon Surface Solutions, a Swiss-based manufacturer providing global surface solutions, manmade fibers and advanced drive technologies to business. Steven has over 25 years of industrial Marketing/Sales experience and holds a Bachelor of Science in Business from Central Michigan University, as well as an MBA from the University of Michigan Ross School of Business. He and his wife reside in Long Island, NY.