



SURGE PROTECTION

MORE THAN AN ACCESSORY

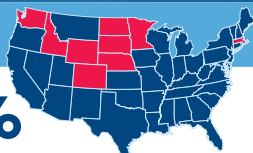
In a **2017 survey** of electrical designers, electrical planners, and electrical engineers who worked in **designing / renovating electrical systems** in industrial facilities, healthcare facilities, and IT centers, the **Electrical Safety Foundation International** found:

42.4%



of all respondents use the 2017 National Electrical Code when designing or installing

17.2%



of respondents were in states where the 2017 NEC has been adopted

94%



of those surveyed find surge protection to be very or extremely important to building owners and tenants

Most frequently mentioned surge protection devices designed or installed into buildings:

TYPE 2 Surge Protection Devices

35%

TYPE 1 Surge Protection Devices

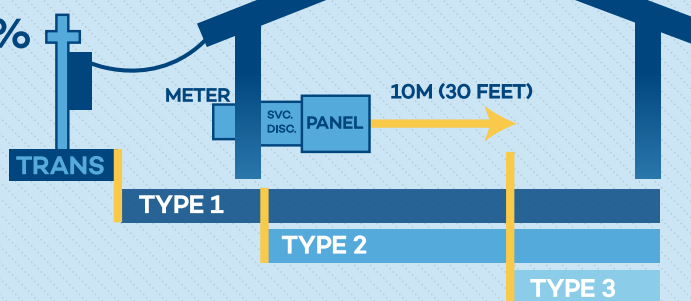
29%

TYPE 3 Surge Protection Devices

21%

Point -of- Use Surge Protection Devices

15%



FREQUENCY OF SURGES



Voltage surges significant enough to cause **EQUIPMENT DAMAGE** occur with monthly or greater frequency in:



69% of Healthcare facilities



76% of Industrial facilities



80% of IT center facilities



Surges significant enough to cause **INJURY OR DEATH** occur annually, or less than once a year in:



56% of Healthcare facilities



54% of IT center facilities



51% of Industrial facilities

REASONS SURGE PROTECTION WAS INSTALLED:

26%
CUSTOMER REQUEST

16%
OTHER

29%
NEED TO PROTECT
EXPENSIVE EQUIPMENT

29%
CODE
REQUIREMENTS

REASONS SURGE PROTECTION WAS NOT INSTALLED:

37% COST OF SURGE PROTECTION DEVICES

30%
INADEQUATE
SURGE PROTECTION
TECHNOLOGY

33%
LACK OF
CONCERN
ABOUT SURGES

CAUSES OF SURGE:

15% STATIC ELECTRICITY DISCHARGE

25%
OTHER

15%
ELECTRICAL EQUIPMENT
TURNING OFF/ON

24%
FAULTY OR
DAMAGED
WIRING

21%
LIGHTNING
STRIKE

! Circuit Interrupters and Over Current Devices are NOT Surge Protection Devices. Learn more at ESFI.org



www.facebook.com/ESFI.org

www.twitter.com/ESFI.org

www.youtube.com/ESFI.org

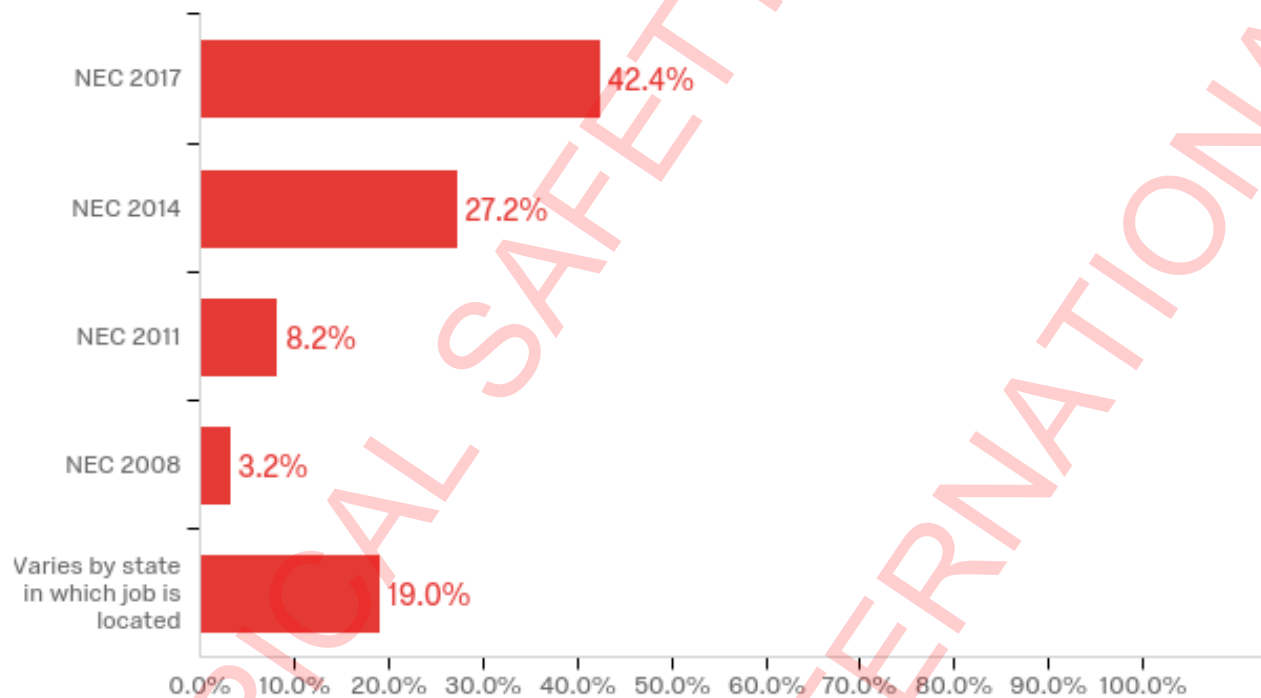
Surge Damage Survey Results Summary

We conducted a survey of electrical designers, electrical planners, and electrical engineers who work in designing/renovating electrical systems in industrial facilities, healthcare facilities, and IT centers. A third-party vendor of survey sample that recruits and maintains panel databases contacted these qualified respondents, who were then invited to participate in our online survey project. Through this process we obtained 110 completed questionnaires. Key findings and summary data follow below.

Key Findings

- At the time this survey was open for participation, only 9 states had adopted NEC 2017. In 17.2% of the responses, survey participants mentioned providing services in NEC 2017 states. However, when asked to indicate what version(s) of the National Electrical Code they use when designing and/or installing building electrical systems, NEC 2017 is mentioned in 42.4% of all responses. This seeming discrepancy may require further study, but answers to the open-end follow-up question, “What is the primary reason why you use more than one version of the NEC when designing and/or installing building electrical systems,” offer some guidance. Client request, unique requirements for particular buildings, and consulting several versions of the NEC as standard operating procedure, are some of the comments that help provide insight on the apparent disconnect.
- More than 98 percent of respondents consider surge protection to be a “very” or “extremely” important factor, themselves, when designing and/or installing building electrical systems. Similarly, 93.6 percent of respondents think surge protection is “very” or “extremely” important to building owners or tenants. However, when actually discussing their design or installation plans with owners or tenants, the share of respondents reporting that it is “very” or “extremely” common for building stakeholders to mention surge protection slides to 72.8 percent, and 8.2 percent note that such mentions are “slightly” or “not at all” common.
- Every single respondent claims to be at least “moderately” familiar with surge protection technologies, with 97.3 percent indicating that they are “very” or “extremely” familiar.
- The most frequently mentioned surge protection technology designed or installed in buildings by respondents is Type 2 SPD (34.7%), followed by Type 1 SPD at 29.5 percent, and Type 3 SPD a 20.7 percent. Point of use protection is mentioned only 15.1 percent of the time.
- Respondents were asked to report on the frequency of voltage surges in key facility types. The majority of voltage surges significant enough to cause equipment damage occur with monthly or greater frequency in all three facility types, based on respondents’ observations: healthcare (69.1%), industrial (76.3%), and IT centers (80.0%). Surges significant enough to cause injury or death are reported to occur at a much less frequent pace. A majority of respondents note that such significant surges happen “annually” or “less than once a year” in healthcare facilities (56.4%, IT centers (54.6%), and industrial facilities (51.8%).
- Code requirements and the need to protect expensive equipment from damage both received 28.9 percent of mentions as factors causing electrical architects/designers/engineers to design or install surge protection in a given building. Specific customer request for surge protection (25.7%) is also a strong contributor.
- On those occasions when surge protection is not designed or installed in a particular building project, respondents point to the expense involved most often (36.7%), followed by lack of concern about surges (32.9%), and inadequate surge protection technology (30.4%). With more than 63 percent of respondents either not being concerned about voltage surges or believing the technology to address them is inadequate, this demographic might benefit from industry education or outreach efforts.
- A relatively modest majority of respondents (55.5%) indicates having observed significant incidents of voltage surges. The most commonly attributed causes of voltage surges are faulty or damaged wiring (24.4%), lightning strikes (21.5%), and electrical equipment turning on/off (16.2%). Most respondents are equally concerned (59.1%) about trying to prevent both internal and external surges.

What version of the National Electrical Code do you use when designing and/or installing building electrical systems? [Select all that apply]



Answer	%	Count
NEC 2017	42.4%	67
NEC 2014	27.2%	43
NEC 2011	8.2%	13
NEC 2008	3.2%	5
Varies by state in which job is located	19.0%	30
Other (please describe)	0.0%	0
<i>Total</i>	100%	158

In which state(s) are the properties located for which you provide electrical design, engineering, or planning services? [Select all that apply]



Answer	%	Count
Alabama	1.0%	2
Alaska	0.0%	0
Arizona	4.6%	9

Answer	%	Count
Arkansas	1.0%	2
California	7.2%	14
Colorado	2.1%	4
Connecticut	1.5%	3
Delaware	0.5%	1
District of Columbia	0.0%	0
Florida	5.6%	11
Georgia	6.2%	12
Hawaii	0.0%	0
Idaho	1.0%	2
Illinois	3.6%	7
Indiana	1.5%	3
Iowa	1.5%	3
Kansas	1.0%	2
Kentucky	0.5%	1
Louisiana	1.5%	3
Maine	1.0%	2
Maryland	1.5%	3
Massachusetts	2.6%	5
Michigan	2.6%	5
Minnesota	1.0%	2
Mississippi	1.5%	3
Missouri	2.6%	5
Montana	0.5%	1
Nebraska	0.5%	1
Nevada	1.5%	3
New Hampshire	0.5%	1
New Jersey	3.1%	6

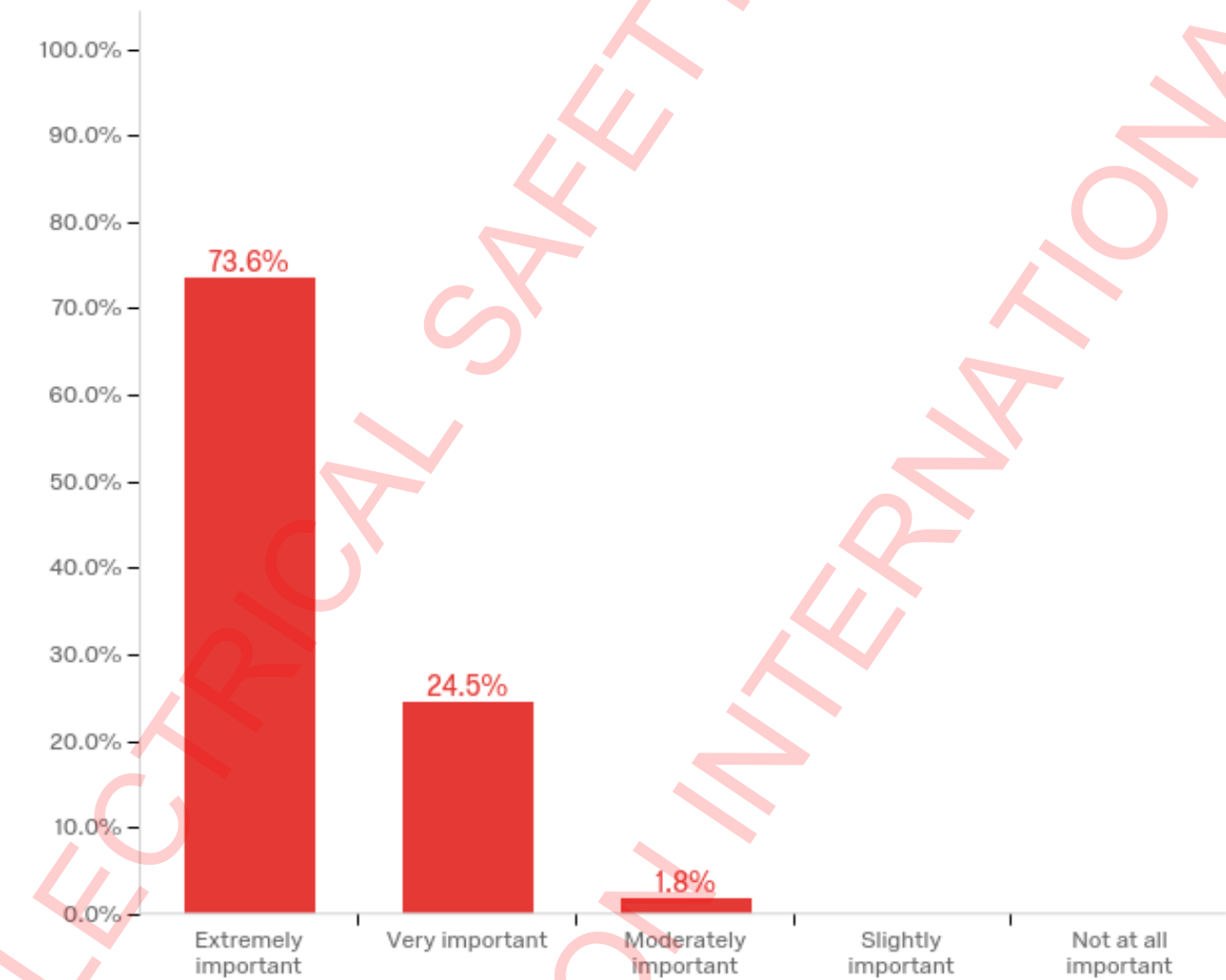
Answer	%	Count
New Mexico	1.5%	3
New York	7.7%	15
North Carolina	4.1%	8
North Dakota	0.0%	0
Ohio	2.6%	5
Oklahoma	2.1%	4
Oregon	1.5%	3
Pennsylvania	5.1%	10
Rhode Island	1.0%	2
South Carolina	1.0%	2
South Dakota	0.5%	1
Tennessee	2.6%	5
Texas	2.6%	5
Utah	0.0%	0
Vermont	1.5%	3
Virginia	2.6%	5
Washington	2.1%	4
West Virginia	0.0%	0
Wisconsin	2.1%	4
Wyoming	0.0%	0
<i>Total</i>	100%	195

What is the primary reason why you use more than one version of the National Electrical Code when designing and/or installing building electrical systems?

Key Responses

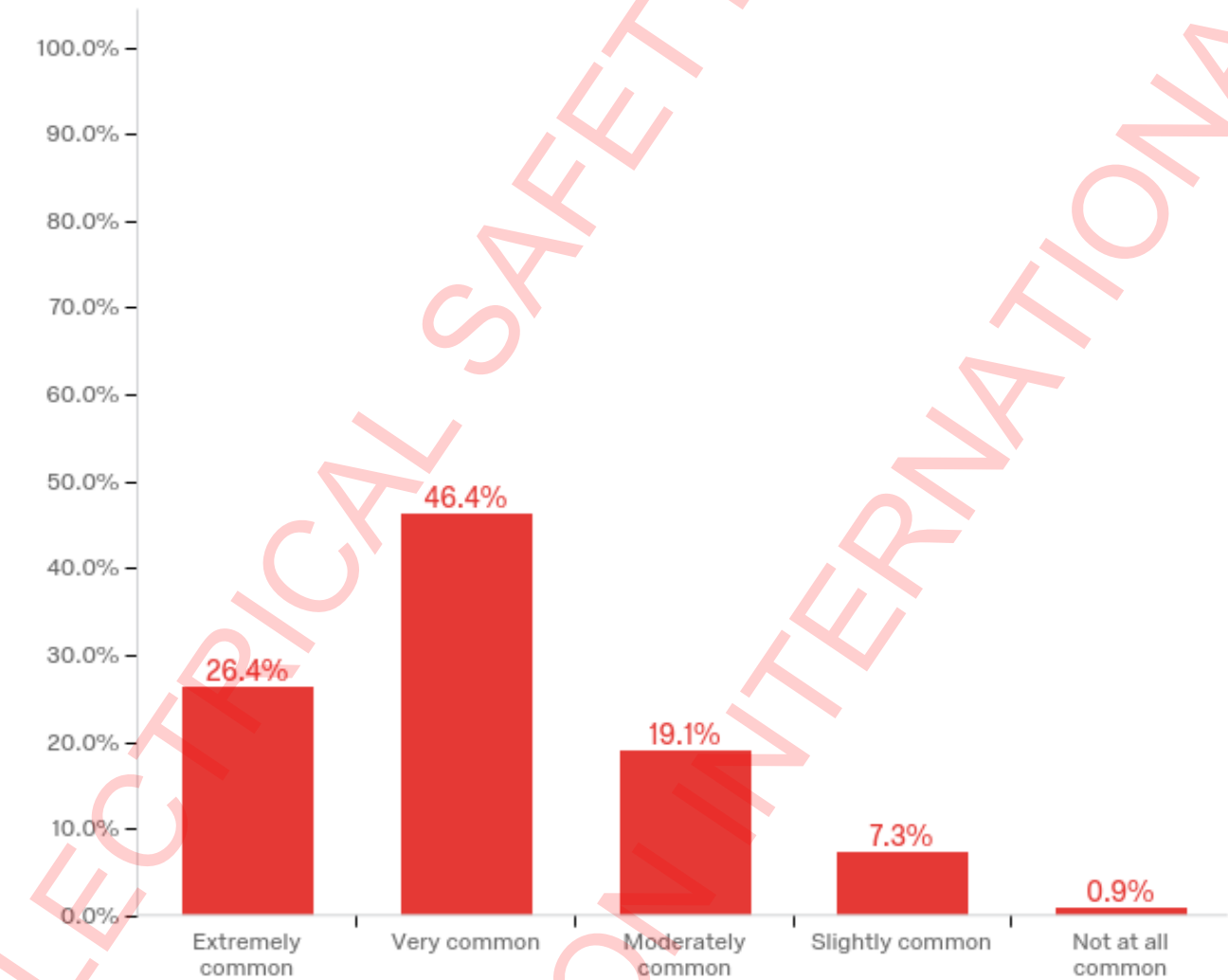
- Depending on the state in which the property is located
- Diff jobs/states require diff specs
- For different projects, I have learned that it make cause problems to use the latest code for all of them. I have tried this way, but it has only caused problems, most of our projects we use the latest, but some of them, we simply cannot.
- For variance. Also a backup. If the most recent version is having problems the other version can be used while the 2017 version is getting fixed.
- If we are installing in a building that does not fit the requirements, then we use a different version. We also use different ones upon the client's request.
- Our organization is extremely thorough, detailed, and code oriented when implementing code in our designs; therefore, we consult several versions of the NEC when designing and/or installing building electrical systems.
- Because there are systems that can support 2017 and there are systems that cannot support them and 2014 must be implemented

How important is surge protection as a factor in your plans when designing and/or installing building electrical systems?



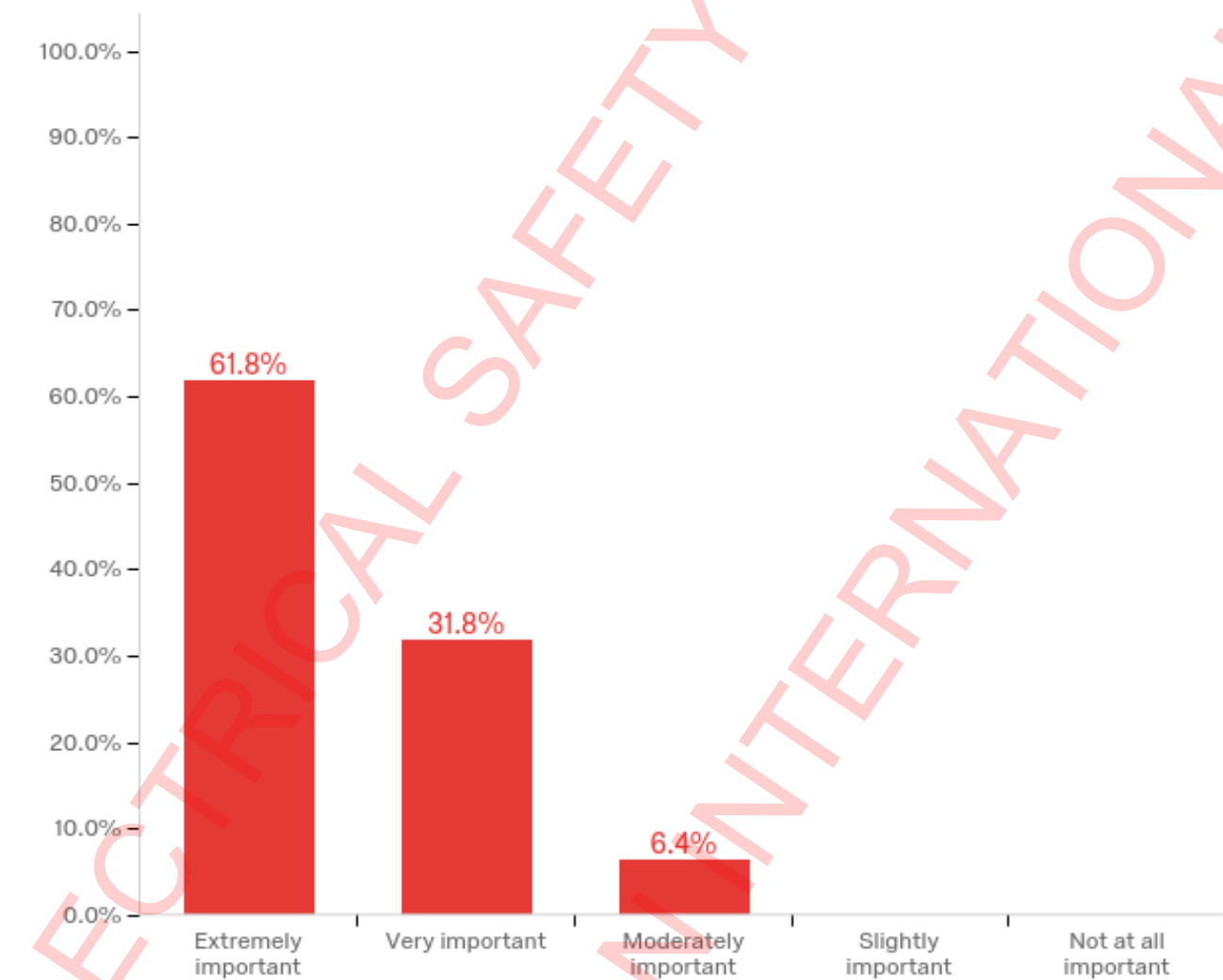
Answer	%	Count
Extremely important	73.6%	81
Very important	24.5%	27
Moderately important	1.8%	2
Slightly important	0.0%	0
Not at all important	0.0%	0
Total	100%	110

How common is it for building owners or tenants to mention surge protection when discussing your design or installation plans for building electrical systems?



Answer	%	Count
Extremely common	26.4%	29
Very common	46.4%	51
Moderately common	19.1%	21
Slightly common	7.3%	8
Not at all common	0.9%	1
Total	100%	110

In general, how important do you think surge protection is to building owners or tenants?



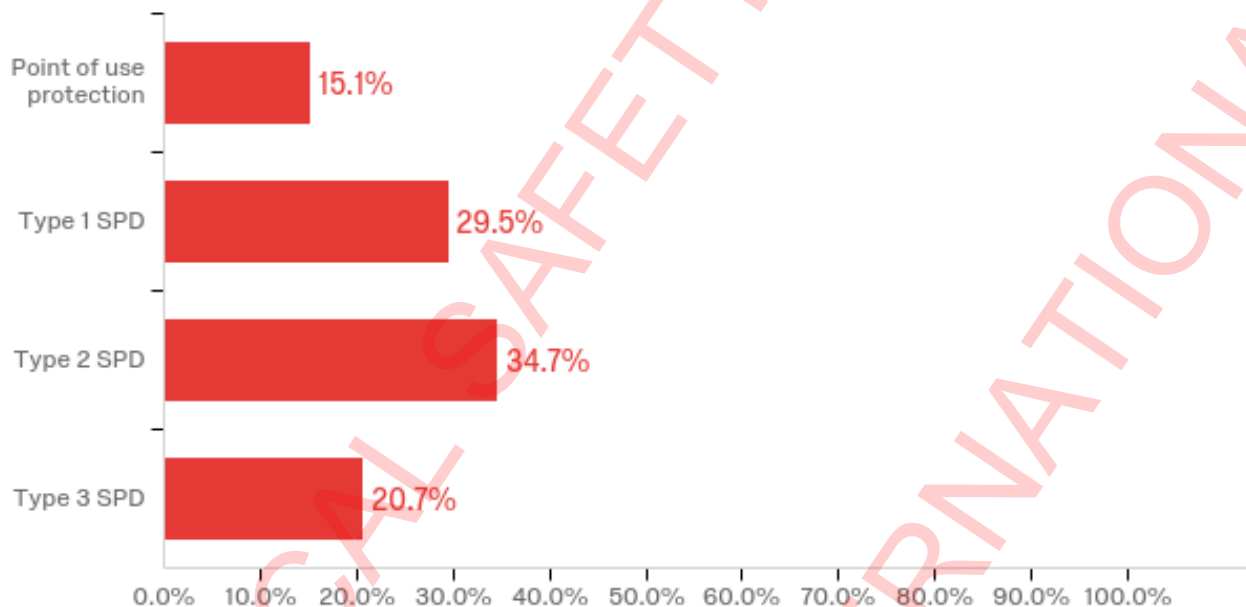
Answer	%	Count
Extremely important	61.8%	68
Very important	31.8%	35
Moderately important	6.4%	7
Slightly important	0.0%	0
Not at all important	0.0%	0
Total	100%	110

How familiar are you with surge protection technologies?



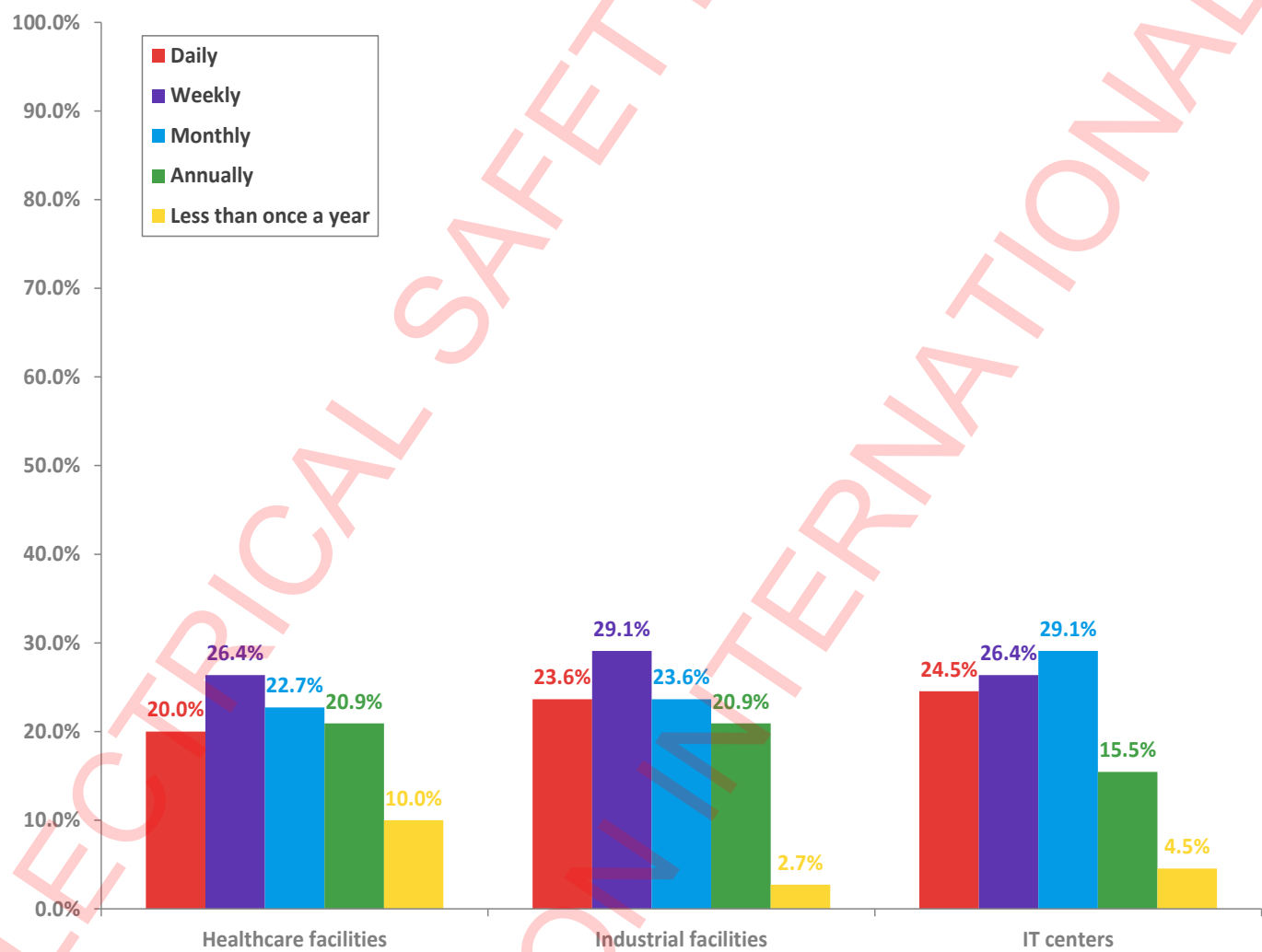
Answer	%	Count
Extremely familiar	55.5%	61
Very familiar	41.8%	46
Moderately familiar	2.7%	3
Slightly familiar	0.0%	0
Not familiar at all	0.0%	0
Total	100%	110

What types of surge protection technologies have you designed or installed in buildings?
[Select all that apply]



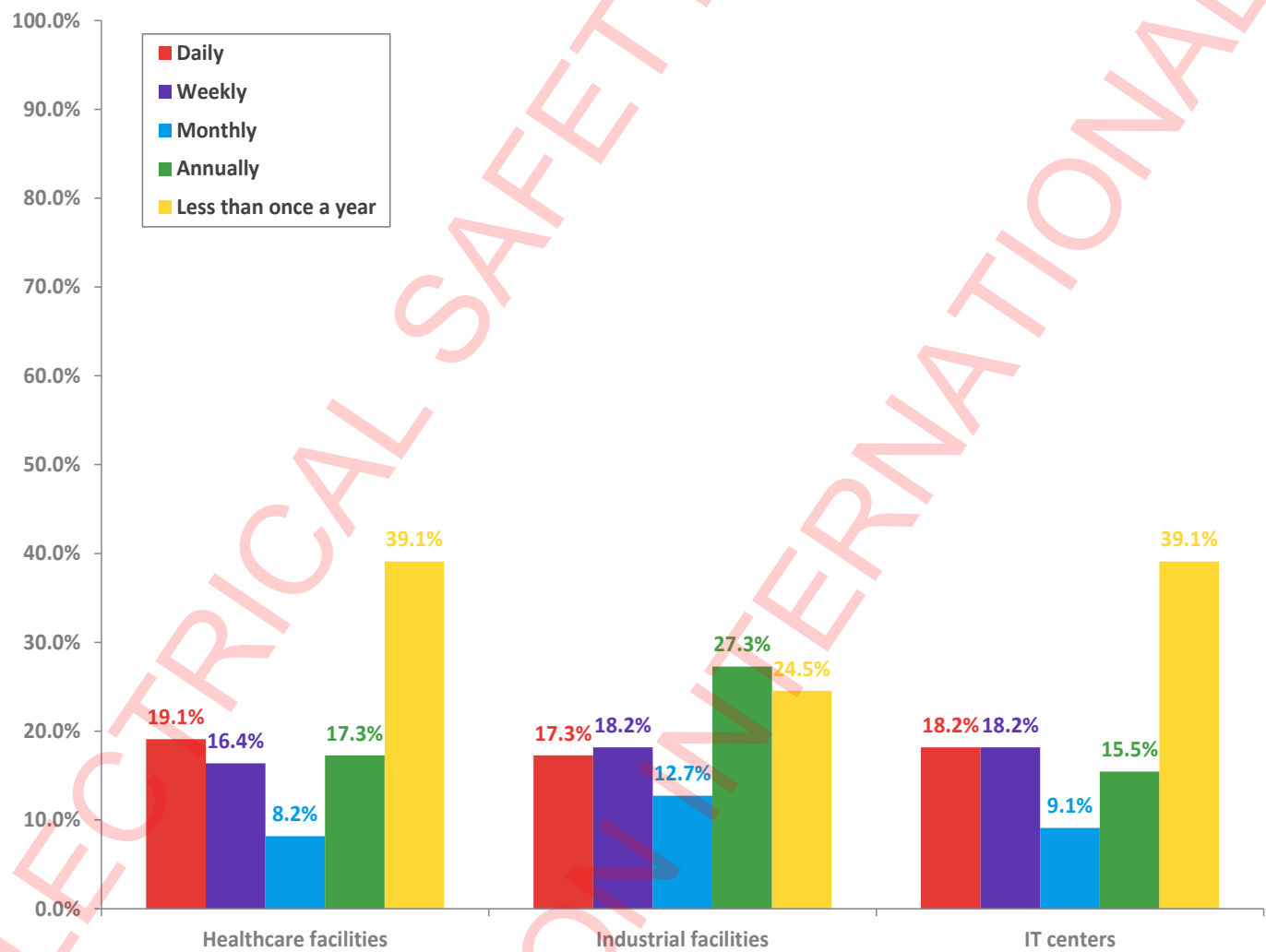
Answer	%	Count
Point of use protection	15.1%	38
Type 1 SPD (Type 1 SPD protects electrical installations against direct lightning strokes. It can discharge the back-current from lightning spreading from the earth conductor to the network conductors. Type 1 SPD is characterized by a 10/350 μ s current wave.)	29.5%	74
Type 2 SPD (The Type 2 SPD is the main protection system for all low voltage electrical installations. Installed in each electrical switchboard, it prevents the spread of overvoltages in the electrical installations and protects the loads. Type 2 SPD is characterized by an 8/20 μ s current wave.)	34.7%	87
Type 3 SPD (These SPDs have a low discharge capacity. They must therefore mandatorily be installed as a supplement to Type 2 SPD and in the vicinity of sensitive loads. Type 3 SPD is characterized by a combination of voltage waves (1.2/50 μ s) and current waves (8/20 μ s)	20.7%	52
Total	100%	251

How frequently would you say healthcare facilities, industrial facilities, and IT centers experience voltage surges significant enough to cause equipment damage?



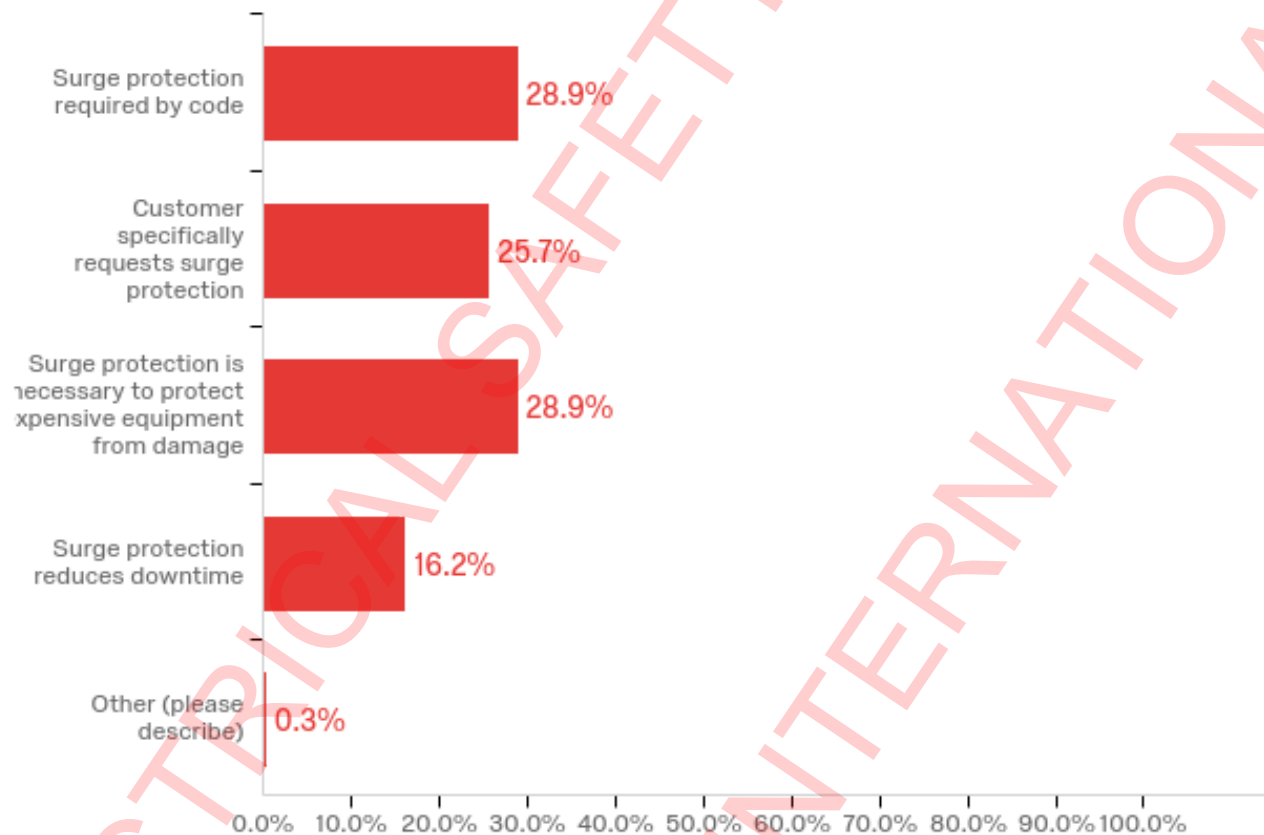
	Daily	Weekly	Monthly	Annually	Less than once a year	Total
Healthcare facilities	22	29	25	23	11	110
Industrial facilities	26	32	26	23	3	110
IT centers	27	29	32	17	5	110

How frequently would you say healthcare facilities, industrial facilities, and IT centers experience voltage surges significant enough to cause injury or death?



	Daily	Weekly	Monthly	Annually	Less than once a year	Total
Healthcare facilities	21	18	9	19	43	110
Industrial facilities	19	20	14	30	27	110
IT centers	20	20	10	17	43	110

What causes you to design or install surge protection in a particular building? [Select all that apply]

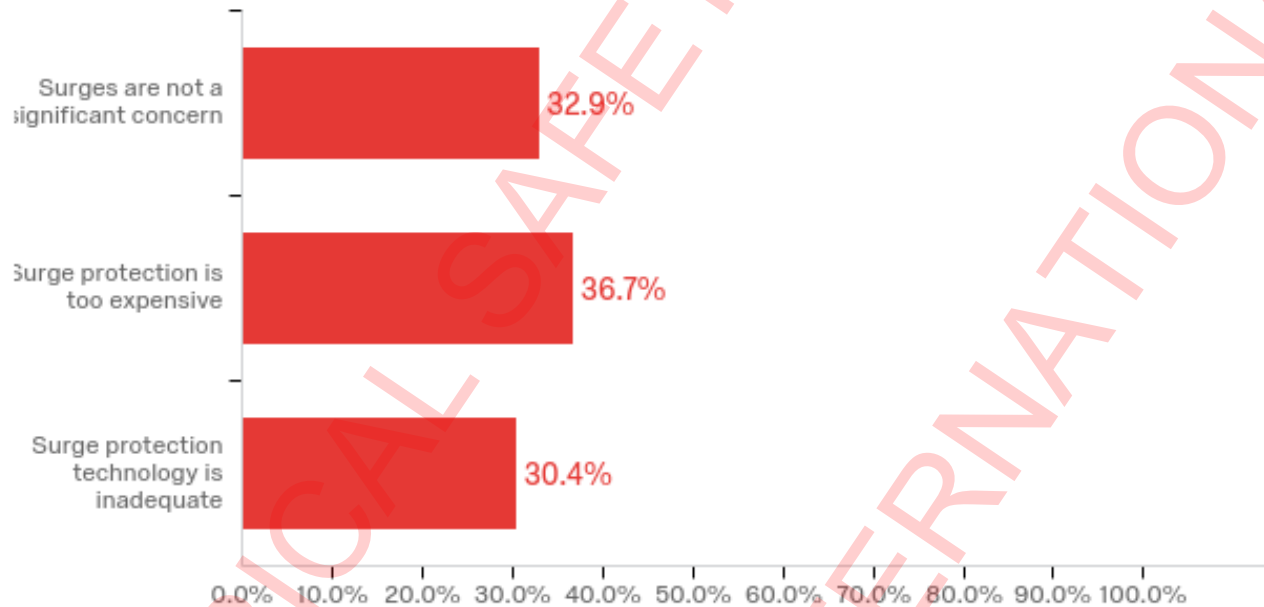


Answer	%	Count
Surge protection required by code	28.9%	91
Customer specifically requests surge protection	25.7%	81
Surge protection is necessary to protect expensive equipment from damage	28.9%	91
Surge protection reduces downtime	16.2%	51
Other (please describe)	0.3%	1
<i>Total</i>	100%	315

“Other” response:

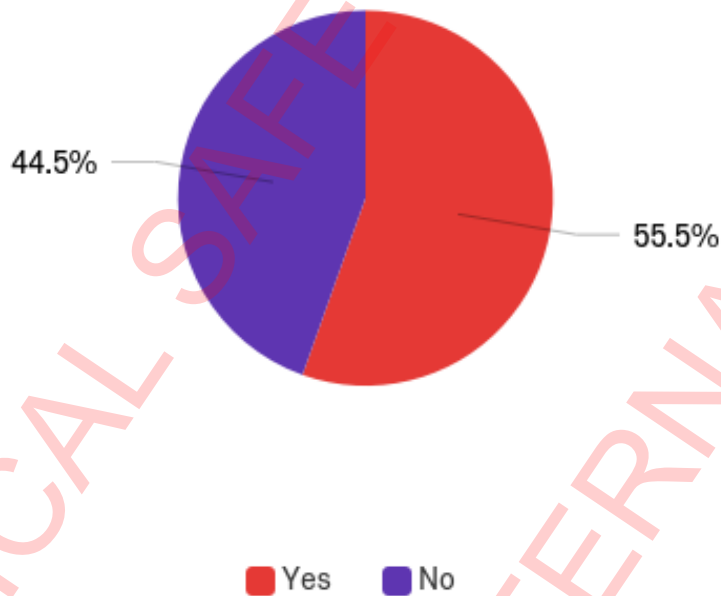
- Safety of my clients and their clients

What causes you not to design or install surge protection in a particular building? [Select all that apply]



Answer	%	Count
Surges are not a significant concern	32.9%	26
Surge protection is too expensive	36.7%	29
Surge protection technology is inadequate	30.4%	24
Other (please describe)	0.0%	0
<i>Total</i>	100%	79

Have you personally observed any significant incidents of voltage surges?



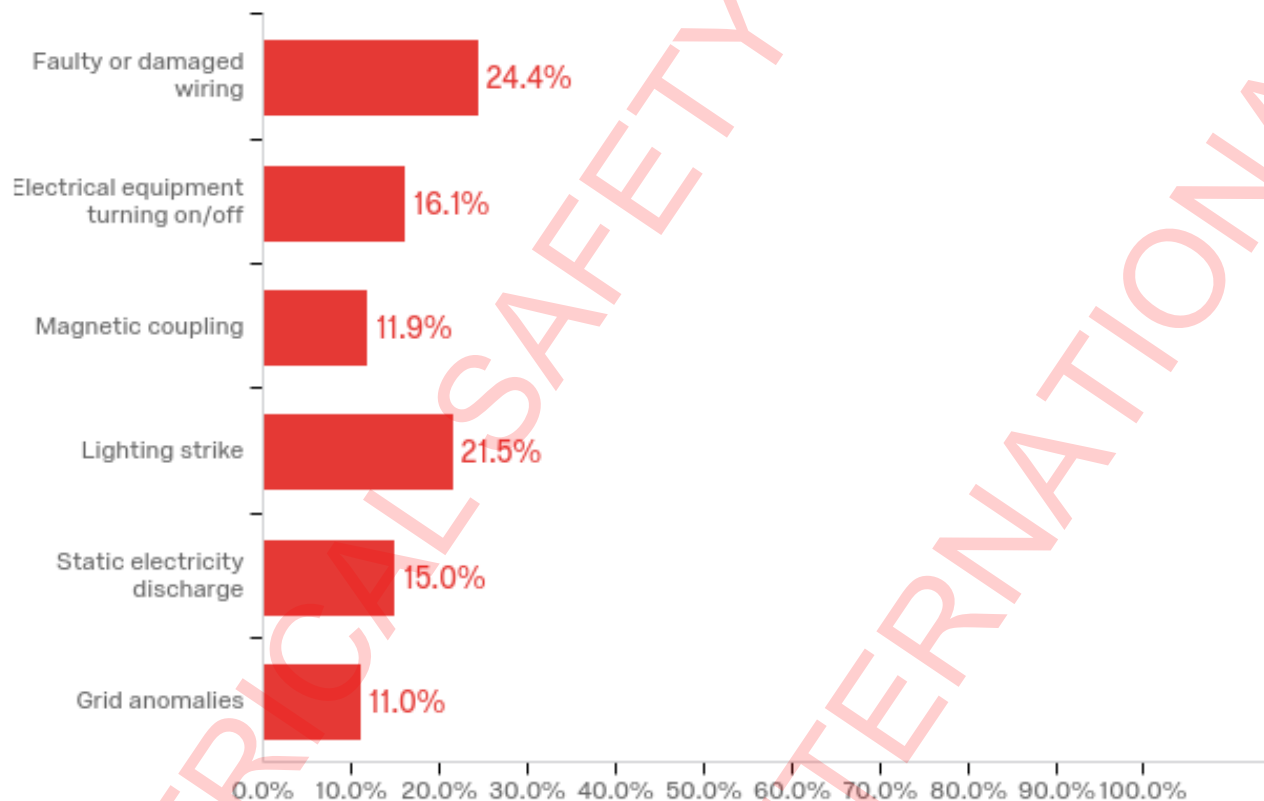
Answer	%	Count
Yes	55.5%	61
No	44.5%	49
Total	100%	110

Please describe the incidents of voltage surges you have personally observed.

Key Responses

- Variances in voltage due to brown outs and surges are very common
- It's a factory. When the injection molding machine is in use the lights will dim
- Most of the incidents I have seen involve direct lighting strikes
- In the southern spring and summer afternoon thunder storms are common and a given part of life in the region. Voltage surges are therefore common in homes, tech centers, hospitals, industry, etc. I have seen many incidents of voltage surges and resulting damage in all of these areas.
- Overvoltage
- Caused costly damage to industrial facilities
- I've observed surges that affected servers in data centers and caused significant downtime.
- Overload in the capacities of the breakers in small industries, lack of maintenance in the electrical systems of hospitals and industries
- Hospital lost all power

Which of the following conditions lead to voltage surges? [Select all that apply]



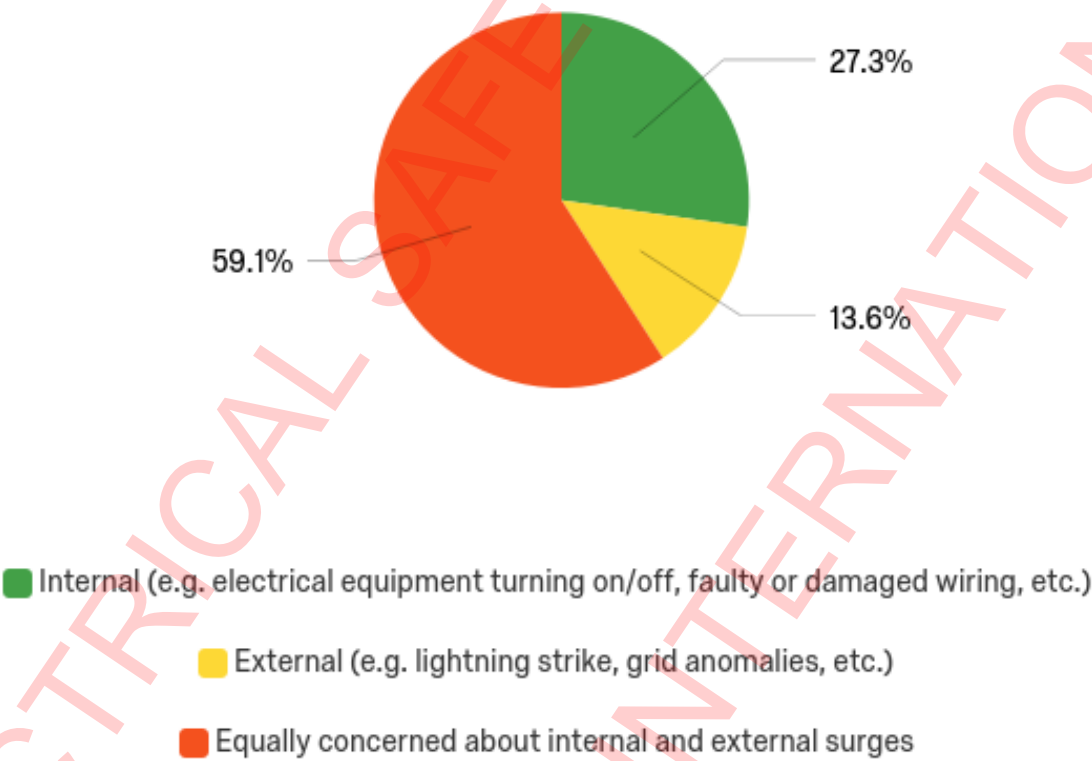
Answer	%	Count
Faulty or damaged wiring	24.4%	86
Electrical equipment turning on/off	16.1%	57
Magnetic coupling	11.9%	42
Lighting strike	21.5%	76
Static electricity discharge	15.0%	53
Grid anomalies	11.0%	39
Other (please describe)	0.0%	0
<i>Total</i>	100%	353

Place the following causes of voltage surges in order of most to least common, in your experience.

NOTE: *Smaller mean score equals more common cause of voltage surges*

	Mean	Std Deviation	Count
Faulty or damaged wiring	1.7	0.8	74
Electrical equipment turning on/off	2.2	1.1	47
Lighting strike	2.4	1.5	66
Static electricity discharge	2.9	1.1	47
Magnetic coupling	3.2	1.2	39
Grid anomalies	3.3	1.5	35

What types of surge are you most concerned about trying to prevent?



Answer	%	Count
Internal (e.g. electrical equipment turning on/off, faulty or damaged wiring, etc.)	27.3%	30
External (e.g. lightning strike, grid anomalies, etc.)	13.6%	15
Equally concerned about internal and external surges	59.1%	65
Total	100%	110

What do you consider to be the most effective surge technology?

Key Responses

- [Many specific manufacturers and brands were mentioned. See below for examples]
 - Belkin PivotPlug
 - Vortex
 - Tripp Lite TLP1008Tel
 - Accell Powramid D080B-015K
 - Tripp Lite's SpikeCube
 - Belkin BV112050
 - I.T. Protector
 - APC Surgearrest
 - T&B Power Solutions
 - APC Surgearrest 3020J
 - Tripp Lite
 - G and G
 - LYSB016
 - Belkin BP108000
 - Bestek 8-Outlet
 - Gome
 - Belkin
- UPS
- Check all ground protection. Install top of the line surge protectors. Educate people about battery backups and surge protectors
- GFI technology, which is always improving
- Surge suppression technology has the highest industry standards today for quality, performance and customer satisfaction.. A layered defense approach, with devices strategically placed based on customer power, and telecom needs.
- I think that is those that offer surge protection device (SPD) and transient voltage surge suppressor (TVSS) on the same unit.
- Depends on the setting and whether it is commercial, industrial, or private home.
- All current options are useful.
- I consider there is no an "effective" surge technology.
- SPD at main service entrance
- Properly installed wiring
- Transient volt suppression
- Surge suppressors
- Surge protectors
- Surge protected outlets are important
- I prefer surge suppression over protection, honestly.

Describe your typical approach to designing and/or installing surge protection for a property (e.g. protect whole building, room-by-room protection, target certain equipment types, etc.)

Key Responses

- Protecting certain sections of building where certain types of equipment can cause a chain reaction down the line in remote parts of the building.
- Main computer rooms are first concern. Shop facility comes second.
- GFI in-line protection should be provided anywhere moisture is present or can be present, including all exterior receptacles and appliances.
- Sufficient up to date wiring, surge protectors for all electrical equipment, circuit breakers
- A layered defense approach using patented, proprietary surge protection devices which are strategically placed based on a careful analysis of customer power, data and telecom systems unique needs
- Mapping out all the surge protection needed for the structure before doing so.
- I will always work based off of mine and other's previous work. Our basic concern is making sure that people have a good education and understanding of protection equipment, and that electrical barriers are number one priority
- Again, it depends on the venue & setting, taking into account the size of building & what it's intended uses are, but generally, we always design & install surge protection for a property to code, generally using combined panel protection & signal protection.
- Many of the surge suppression strips we're used to, whole-house surge protectors use metal oxide varistors (MOVs), to shunt power surges. MOVs get a bad rap because in surge strips one surge can effectively end the usefulness of an MOV.
- Usually we go about protecting each room individually, with the rooms containing important equipment at the top of the priority list. Machines that store data in multiple servers are of our prime concern for surge protection.
- Surge Protection has been considered keeping in mind the load a particular equipment consumes. For ex a high power refrigerator and AC may require stabilizer.
- Usually whole building, room-by-room as needed
- My typical approach is to target certain very essential equipment first and then will discuss room-by-room approach.
- We usually start by doing basic protection for the entire building and if there are any high priority rooms we'll add additional technology. This is especially true in healthcare situations where the equipment requires more reliability and protection.
- Grounding Is Fundamental, Zones Of Protection, SPDs coordinating, SPD rating, installation
- The whole building is ideal for IT centers. For good service one doesn't really need all that, so room by room is more cost effective.

Please describe any surge protection successes that occurred after completion of your building projects.

Key Responses

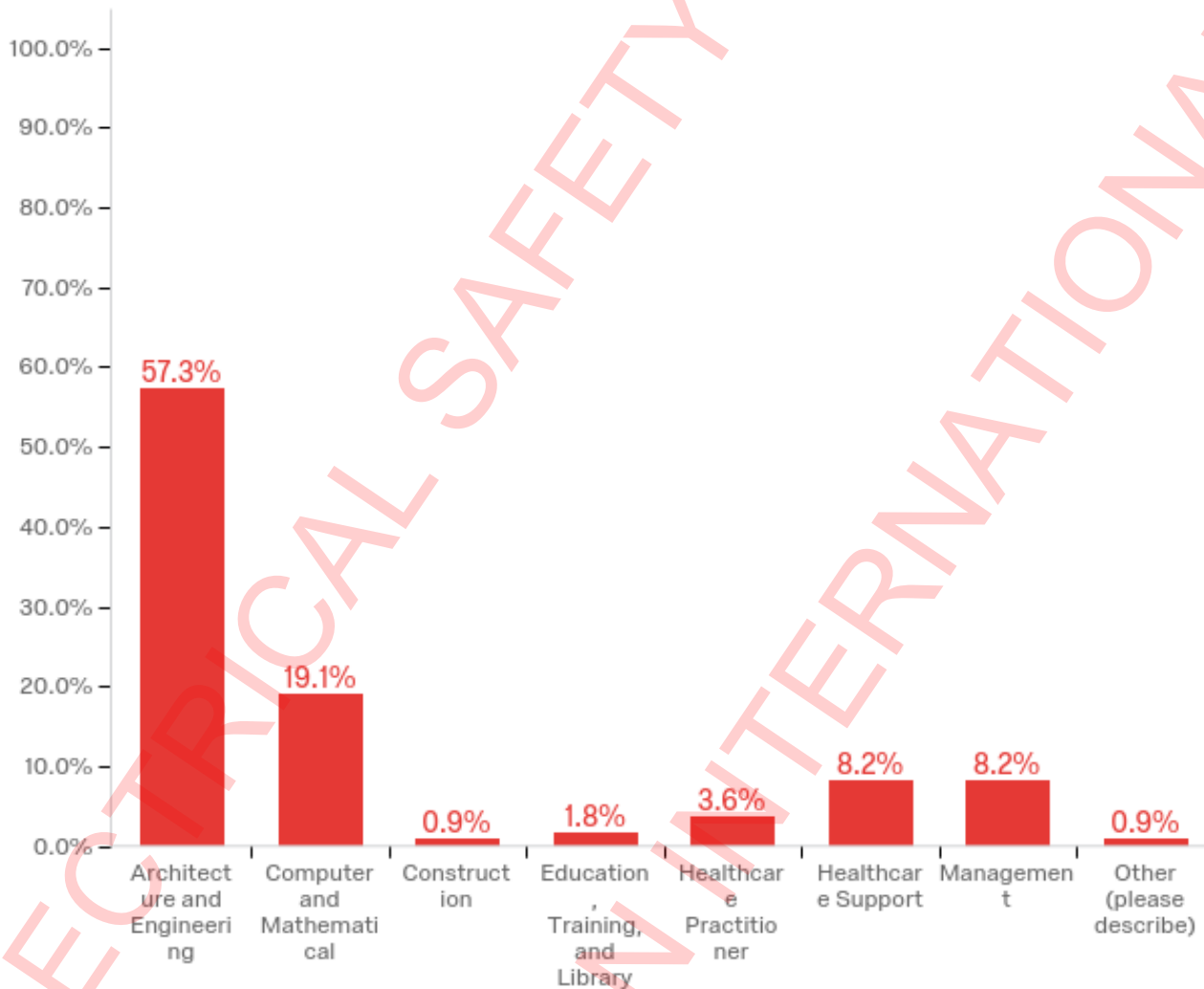
- The facilities were completely safe, in places where peaks were recorded, it does not happen anymore and in this way it stopped losing equipment due to electrical faults
- Kept building operational
- Prevented damage from lightning
- Every time we install a surge protector device it is a success
- Make sure every design goes over the total usage by at least 15%
- Frankly, I consider a success any time I don't get negative comments
- Every year there are a lot of electrical surges that destroy hundreds of electrical equipment, surge protection has helped to protect maximum possible
- We have had owners tell us that had we not done the electrical surge protection as we did, there would have been many issues as some still got risk taken by the outlets of electrical discharge, but our designs had prevented it further of any real injury.
- There are many industrial successes just taking into account the number of lightning strikes which manufacturing & industrial facilities take every month as well as the nature of industrial/manufacturing facilities and the amount of voltage which is used. There are daily successes in the manufacturing/industrial facilities in which my organization has designed & installed surge protection.
- Equipment suffered less damage and downtime was significantly lessened.
- Unfortunately surges do happen however we have a 99% success in protecting our clients from damage
- Approximately 4 months ago a huge storm came through my area of Georgia and had knocked out power in the surrounding buildings and neighborhoods. But our buildings were spared.
- Well if there aren't any damages to the building and the property inside, then that is a success. There has been no damage in our recent designs and hopefully there won't be. So I consider all those to be successes.
- We have not had a surge death or equipment failure since we began this tactic of dual protection
- Most of the time if it's working, I don't hear about it.
- In the middle of hurricane Ike the surge protector in a hospital in Houston took 3 hits from lightning and didn't set anything off.
- Engineer found incoming power is dirty. Then after installing a TTLP surge suppression unit with transient filter, the monitoring equipment showed much cleaner power.
- A restaurant that I worked on suffered from a grid malfunction that fried the two buildings adjacent to it... My restaurant's systems were unaffected.

How would you describe your current employment status?



Answer	%	Count
Employed full time	90.9%	100
Employed part time	7.3%	8
Self-employed/Business owner	1.8%	2
Unemployed/Looking for work	0.0%	0
Student	0.0%	0
Homemaker	0.0%	0
Retired	0.0%	0
Other	0.0%	0
Total	100%	110

Please indicate your occupation.

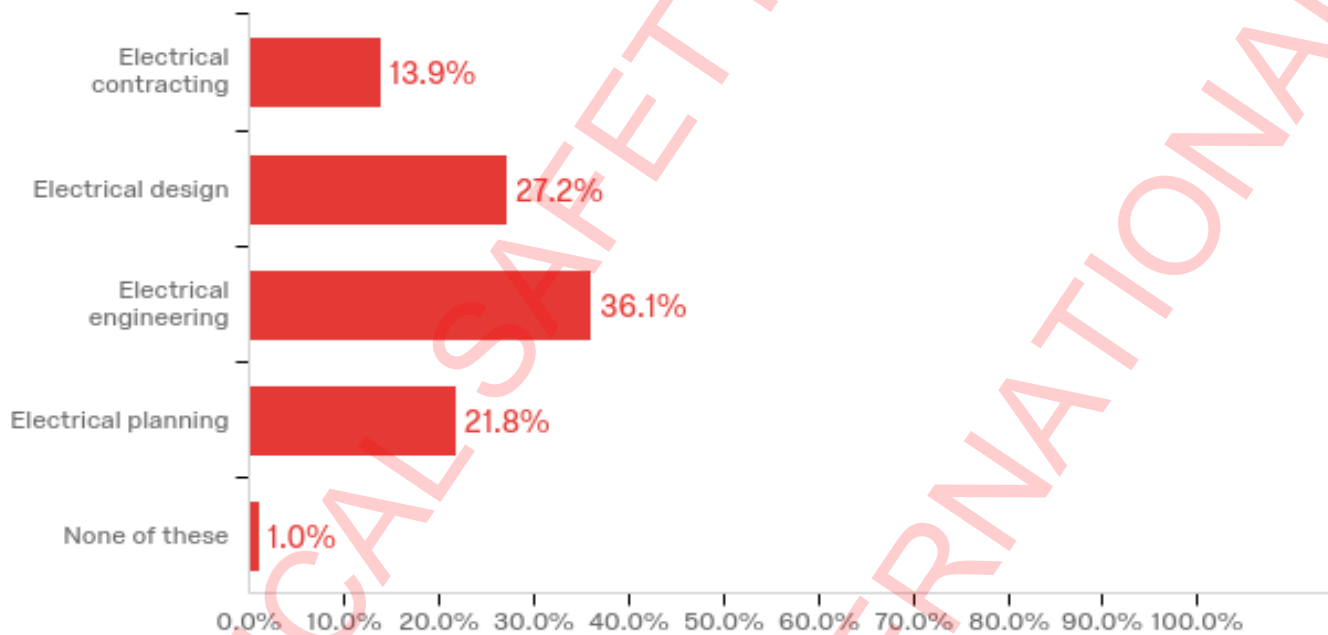


Answer	%	Count
Architecture and Engineering	57.3%	63
Computer and Mathematical	19.1%	21
Construction	0.9%	1
Education, Training, and Library	1.8%	2
Healthcare Practitioner	3.6%	4
Healthcare Support	8.2%	9
Management	8.2%	9
Other (please describe)	0.9%	1
<i>Total</i>	100%	110

“Other” response:

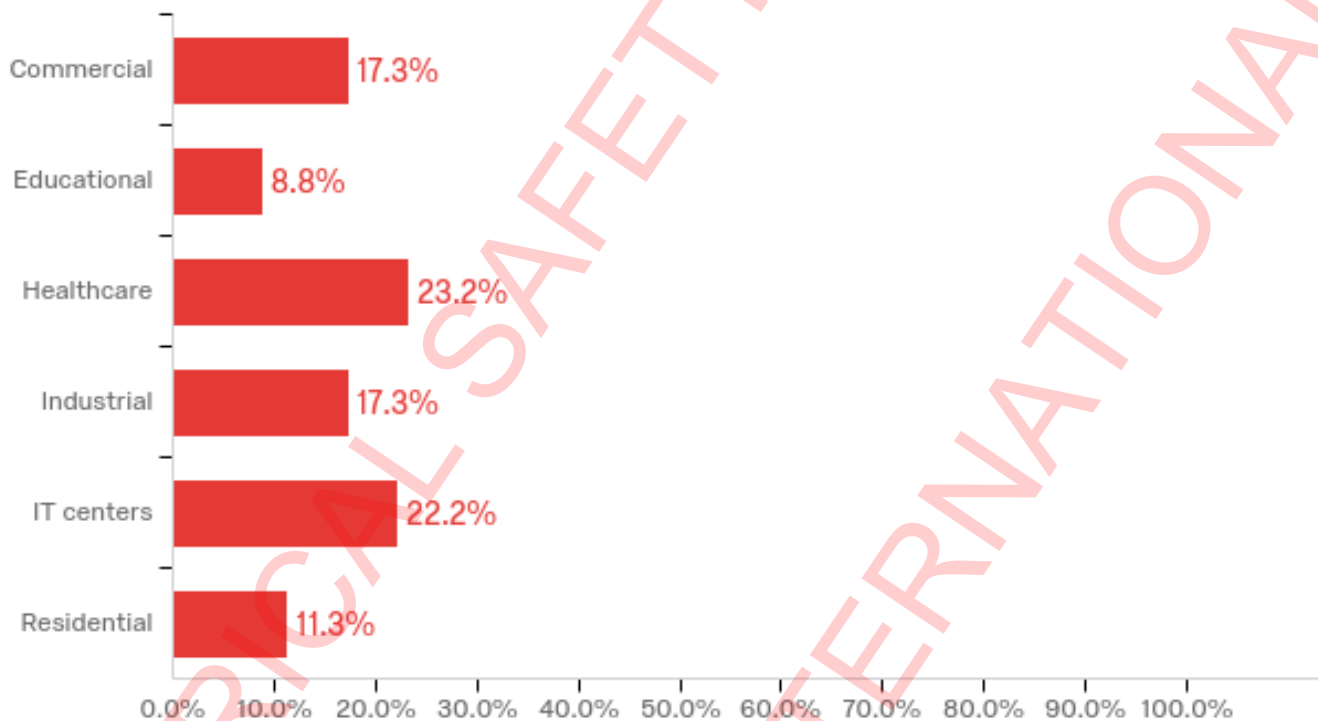
- it technology

In carrying out the responsibilities of your occupation, does your role involve any of the following? [Select all that apply]



Answer	%	Count
Electrical contracting	13.9%	28
Electrical design	27.2%	55
Electrical engineering	36.1%	73
Electrical planning	21.8%	44
None of these	1.0%	2
<i>Total</i>	100%	202

In which of the following building types have you worked to design or renovate the electrical systems? [Select all that apply]



Answer	%	Count
Commercial (includes entertainment, lodging, office, restaurant, retail, and similar facilities)	17.3%	49
Educational (includes day care, K-12, vocational/technical, college/university, and similar facilities)	8.8%	25
Healthcare (includes hospitals, imaging clinics, medical centers, and similar facilities)	23.2%	66
Industrial (includes distribution centers, factories/manufacturing, warehouses, and similar facilities)	17.3%	49
IT centers (includes backup facilities, data centers, server farms, and similar facilities)	22.2%	63
Residential (includes manufactured housing, multi-family, single-family, and similar facilities)	11.3%	32
None of these	0.0%	0
<i>Total</i>	100%	284



Surge Damage Survey Results Summary

Appendix: All Verbatim Responses

ELECTRICAL SAFETY
FOUNDATION INTERNATIONAL

What is the primary reason why you use more than one version of the National Electrical Code when designing and/or installing building electrical systems?

- because it is inexpensive and they both also work really well
- because it is the industry standard and we like to follow the standard
- Better results and quicker service
- Depending on the state in which the property is located
- Depending on where the work done...
- Diff jobs/states require diff specs
- different states have different regulations
- different states, whichever is easier
- each municipality has different rules so you follow
- For different projects, I have learned that it make cause problems to use the latest code for all of them. I have tried this way, but it has only caused problems, most of our projects we use the latest, but some of them, we simply cannot.
- For variance. Also a backup. If the most recent version is having problems the other version can be used while the 2017 version is getting fixed.
- I use more than one, because it depends on what we are building or designing.
- If we are installing in a building that does not fit the requirements, then we use a different version. We also use different ones upon the client's request.
- It depends on the job we are doing
- it is very important to improve my work
- My Contracting Firm is located in several different states.
- new information
- Our organization is extremely thorough, detailed, and code oriented when implementing code in our designs; therefore, we consult several versions of the NEC when designing and/or installing building electrical systems.
- porque hay sistemas que puede soportar la 2017 y hay sistemas en los q no los puede soportar y se debe implementar la 2014 [because there are systems that can support 2017 and there are systems that cannot support them and 2014 must be implemented]
- require to effectively, and security reason
- So we have more choices
- SOME SMALLER BUILD DOES NOT NEED THE LATEST CODE
- Sometimes it is requirement of clients
- Sometimes it just takes two different types to make a system come together
- State regulations and requirements vary from one location to another
- There is something that the new one does not have but the old one does.
- this is necessary, we used more than one type to adaptation of character building....
- to adaptation of type building and about effectively
- To increase design flexibility
- We are switching to 2017 version
- Work strategies

Please describe the incidents of voltage surges you have personally observed.

- cause of water
- was not properly installed
- A UPS failed causing mass outage and leaks
- Surge in cooling systems forcing a "melting" process.
- Voltage Surge Protectors
- there was a big storm and we had a surge
- I have seen others get injured because they were not careful enough
- Lightning strike
- thunderstorms constantly here in FL
- Security
- the electricity went bad
- variances in voltage due to brown outs and surges are very common
- IT A FACTORY WHEN THE INJECTION MOLDING MACHINE IS IN USE THE LIGHTS WILL DIM
- Most of the incidents I have seen involve direct lighting strikes
- In the southern spring and summer afternoon thunder storms are common and a given part of life in the region. Voltage surges are therefore common in homes, tech centers, hospitals, industry, etc. I have seen many incidents of voltage surges and resulting damage in all of these areas.
- Was at a hospital during an electrical storm.
- There has been a few times where there has been inadequate surge protection and some employees had to get burn damage at the hospital.
- 234 htu
- Voltage surge
- Less incidents
- Once I observed a building get struck by lightning.
- Interception observed
- I have personally observed voltage surges primarily in industrial settings and a few in IT settings.
- A surge caused ten fuses to completely blow. Then all the lights went off. And it needed to be repaired.
- At a hospital during a storm.
- different surges ended up blowing out one of my computer's power supply
- sobretension [overvoltage]
- Half burned building and two people injured
- most time about low security and damage by environment
- commonly about not stable voltage,
- Anything that apply
- Caused costly damage to industrial facilities
- They become too hot and make some in there out of control.
- Southern parts have a significant time table where surges occur
- I've personally seen important equipment spontaneously shut down because there was an electrical overload and when someone went to try and fix it, they were injured.
- rare but serious
- Power outage

- When the levels of the surges go dangerously high.
- a voltage surge of 220 volts at a hospital facility
- I've observed surges that affected servers in data centers and caused significant downtime.
- Fire
- Electrical fires
- no problem
- we are in tornado alley severe weather is the norm here
- lightning strike causing damage to valuable equipment.
- After a lightning storm hit a hospital we were working on, we watched the power jump from the topmost part down the metal. Without protection every piece of equipment in that hospital would have been fried.
- Witnessed new computer receive a sudden surge from unknown source causing major damage
- Just drastic damage from lightning strikes
- contact with high voltage but nothing serious, thank god
- Burn out of entire electronic equipment
- A worker accidentally brushed a high voltage bar on an industrial board
- the power voltage was too high and the lines exploded
- while working on damaged surge unit in a thunder storm it took a hit and exploded causing the whole building to surge with it.
- Overload in the capacities of the breakers in small industries, lack of maintenance in the electrical systems of hospitals and industries
- watched plugged in cords come blasting out of outlets, small fire to follow
- Electrical download
- a wide gash of fire on a work adventure in Florida 4 weeks ago
- I saw a person affect his field or high voltage
- I've observed monthly surges attack going on
- hospital lost all power
- It shocked someone, but it wasn't anything serious.

What do you consider to be the most effective surge technology?

- Belkin PivotPlug
- not really sure
- vortex technology is high end
- Depending on the exposure of the installation to surges, protectors of different discharge capacities will be required.
- UPS
- Automatic checkout timers for the system grids.
- 6 USB Power Port Protector.
- power strips
- because it is best to try to handle it in house
- surge protection
- it works when you do the job as intended to be done
- Surge protection combined with other options

- CHECK ALL GROUND PROTECTION. INSTALL TOP OF THE LINE SURGE PROTECTORS. EDUCATE PEOPLE ABOUT BATTERY BACK UPS AND SURGE PROTECTORS
- double tiered copper with porcelain
- Security
- the tripp lite TLP1008Tel is the best [best]
- GFI technology, which is always improving
- SURGE BREAKER BOX EVERY 200 FEET
- TLP1008TEL
- surge protectors, basic but effective
- Surge suppression technology has the highest industry standards today for quality, performance and customer satisfaction.. A layered defense approach, with devices strategically placed based on customer power, and telecom needs.
- The ones with the best technologies in place.
- I think that is those that offer surge protection device (SPD) and transient voltage surge suppressor (TVSS) on the same unit.
- To me it all goes on how well you wanna be protected. but the best is the ones that will shut off all power before letting anything else happen
- Accell Powramid D080B-015K
- Tripp Lite's SpikeCube
- Belkin BV112050
- Tripp Lite TLP1008TEL
- When people use basic protection from the point of contact to the electric discharge
- Belkin BV112050
- internal
- Damaged wiring
- Surge internal
- Underground wiring
- An external
- Depends on the setting and whether it is commercial, industrial, or private home.
- The latest version with all the abilities and features to prevent the surge as possible.
- All current options are useful.
- the battery backups from best buy
- supresor de tension [surge suppressor]
- Use the best and most effective cabling and use the best engineers in the field
- I am a person who is always in command of these precautions
- high security
- high security, stabilized
- I consider there is no an "effective" surge technology.
- security and high safe product
- The fuse in technology
- Security concern
- the protection

- Type 1 protection level: Powerful lightning current arrester Level of protection type 2: Surge protection, which should not be missing from any power source Type 3 protection level: Surge protection for sensitive devices
- Meter of high energy loads
- new technology
- Damage wiring is my the most that I consider.
- The multi surge strip
- SPD at main service entrance
- Properly installed wiring.
- Transient volt suppression
- initial implementation
- Wiring
- transient voltage suppression
- the new power breaker systems
- IT Protector-Innovative Technology
- Surge protectors
- Surge protectors insulated conductors
- APC Surgearrest
- T&B Power Solutions products
- One concealed and hidden
- safe to use
- Not sure of which is the MOST effective technology
- it is very important and fast
- I guess I would say MOVs are a very effective surge technology being used. They have a great price and performance ratio making it a smart choice for many situations.
- Surge protection
- APC Surgearrest 3020J
- financial protection
- depends on your need
- save time, save money
- installing surge protection that routs the increase safely away
- surge suppressors
- Surge protectors.
- It varies based on what equipment is being used
- Surge protectors.
- The most effective has to be one that doesn't charge itself or take too much work to use. This is the only way that we can be sure that it will not cause problems.
- REDUCING DAMAGE
- Surge protected outlets are important
- Use all safety equipment to be safer
- The Tripp lite products tecks.
- More security and high quality

- not to use power that we don't need
- G and G
- LYSB016, the Belkin BP108000, Bestek 8-Outlet
- Not sure, there are many
- I don't know
- Gome
- the latest is most efficient
- prevent injury and downtime
- I prefer surge suppression over protection, honestly.
- whole house protection
- surge protectors
- it is very important to organization work
- lg protection
- high prices to pay
- The Best Power
- the Tripp Lite TLP1008TEL
- I like the belkin one, because it is simple, but really effective.
- UFCAP
- Currently none.
- not sure
- Capacitors
- Various types
- Belkin

Describe your typical approach to designing and/or installing surge protection for a property (e.g. protect whole building, room-by-room protection, target certain equipment types, etc.)

- Plug-in Protection
- Apply the best available products for the job
- make sure everything is up to code
- In some installations a single surge protector may be sufficient. However, in many others, more than one protection step
- By appliance
- Protecting certain sections of building where certain types of equipment can cause a chain reaction down the line in remote parts of the building.
- Electrocutation Hazard
- be careful
- we would track down the problem and fix it immediately
- protect entire structure
- I like it all the ways I do it
- Target areas high in expensive computer devices

- MAIN COMPUTER ROOMS ARE FIRST CONCERN. SHOP FACILITY COMES SECOND.
- make it efficient and strong
- Checking security
- I usually speak with the customer
- GFI in-line protection should be provided anywhere moisture is present or can be present, including all exterior receptacles and appliances.
- MAKING SURE THE MAX USAGE IS NEVER MET.
- It is a very simple procedure, where you get the surge protector and mount in a proper place and make the connection of the device – however it is best left to professionals for best results
- sufficient up to date wiring, surge protectors for all electrical equipment, circuit breakers
- a layered defense approach using patented, proprietary surge protection devices which are strategically placed based on a careful analysis of customer power, data and telecom systems unique needs
- Mapping out all the surge protection needed for the structure before doing so.
- Good ground structure, enough power supply and great quality materials for all the infrastructure.
- By design I always try to make it something simple and small that can be put out of sight but yet that is very reliable
- The best way is to have a licensed electrician connect the surge protector, steps are to open the main panel and connect the surge protector or attach the surge protector with each individual product
- First, turn off the main electric supply, remove the main knockout plug and install the surge protector – connect wires carefully and plug the electrical items to the electric outlets.
- it is very simple you need to select the place where to mount it and then install and check if it is working perfectly
- Turn of the main electrical panel, unscrew the front of the panel and then install the surge protector.
- I will always work based off of mine and other's previous work. Our basic concern is making sure that people have a good education and understanding of protection equipment, and that electrical barriers are number one priority
- connect it to an existing two-pole breaker secure the offset and connect the wires and tighten then connect telephone wires etc to the SPD
- it's harder when internal
- Internal records
- Equipment
- It varies by project
- Must be protected
- Again, it depends on the venue & setting, taking into account the size of building & what it's intended uses are, but generally, we always design & install surge protection for a property to code, generally using combined panel protection & signal protection.
- I research and then pick the most effective at preventing surge equipment. Then I install it.
- I inspect and identify the specific need for protection .Then I install.
- different room to room setups are usually battery backed up
- puesta a tierra, líneas de suministro [grounding, supply lines]
- My approach is based on the design to work and how to protect it without you seeing something strange for the client protection for example I try to make it as hidden and secure as possible
- target certain equipment types,

- as commonly after step building ,to avoid damage and satisfied
- for all, from building step to equipment type
- I always turn off the electricity to the house at the main panel. Then, I remove the front of the electrical panel and exposing the breakers. After that, I remove the knockout plug and install a whole house surge protector. Then, connect the surge protector to the circuits and use a power strip that has a built in surge protector. After, I plug electronics and appliances into the surge protected power strip, and then I plug the power strip into an electric outlet. Finally, replacing standard electrical outlets with surge protection outlets.
- including, room by room protection, high protection, and security
- Good treatment
- many of the surge suppression strips we're used to, whole-house surge protectors use metal oxide varistors (MOVs), to shunt power surges. MOVs get a bad rap because in surge strips one surge can effectively end the usefulness of an MOV.
- I do it by room to room protection, I think it is more practical
- Type 1 protection level: Powerful lightning current arrester Level of protection type 2: Surge protection, which should not be missing from any power source Type 3 protection level: Surge protection for sensitive devices Protection for American network forms: Surge protection for American installation requirements to UL 1449 3rd Edition and NEMA
- Always have a design that is easy to detect a power failure
- protect whole building
- Install the circuit breaker so when something happened they will turn off all the electric immediately.
- In healthcare you have to target the equipment to protect human life.
- Study equipment to be used in property, and plan from there
- Usually we go about protecting each room individually, with the rooms containing important equipment at the top of the priority list. Machines that store data in multiple servers are of our prime concern for surge protection.
- Depends on type of property and square footage
- old school, my original education
- It differs
- We assess the facility and all the wiring.
- First what wattage and amperage are they using. We then assimilate this into the surge protection that they require and by state standards
- It depends on the type of installation but in IT centers, we often install different surge protection depending on the type of equipment.
- Surge Protection has been considered keeping in mind the load a particular equipment consumes. For ex a high power refrigerator and AC may require stabilizer.
- Target and pin point individual equipment as well as whole room and entire projects
- you have to know where all things are located like the cable connection, air terminals, water pipe connection, ground termination
- Usually whole building, room-by-room as needed
- Checking the current charge, size and location
- protect the whole building
- My typical approach is to target certain very essential equipment first and then will discuss room-by-room approach.

- protect whole building
- We usually start by doing basic protection for the entire building and if there are any high priority rooms we'll add additional technology. This is especially true in healthcare situations where the equipment requires more reliability and protection.
- Protect whole building
- we always look first at the equipment that eats the most electricity, but still install surge protection for the entire property
- Financial protection to all.
- each outlet should be protected as you never know what it may have plugged in to it
- protect electrical devices from voltage spikes
- we design the protection on the building by the height and the location of building high rises get more attention the buildings with low tops the size of the building plays a big role
- Determining the amount of voltage is used at any given time.
- We design surge protection room by room.
- We do a whole building protection couples with room by room protections as a back up
- Protecting the equipment throughout the building.
- I will begin by examining the product and the way that we pursue. I would work to utilize what we do best.
- checking all equipment work correctly before installing
- I try to specify it to the types of facility and the types of equipment
- Loose or exposed to short circuits
- Really simple, take into account of electric items time of use
- I installed and surge detection system
- I make sure wiring isn't tangled
- I set up the surge protector far from the expensive equipment so that if it goes off it won't be harmed
- Make a scheme of all the wiring, measurement of the voltages and capacity of the cables, close circuits with breaker in each room, place independent plugs in each room of the building...
- Target retain equipment
- this is a really good question but it would take too long for me to type out
- Protect cables equipment
- keeping persistent and well focus on it
- Grounding Is Fundamental, Zones Of Protection, SPDs coordinating, SPD rating, installation
- The whole building is ideal for IT centers. For good service one doesn't really need all that, so room by room is more cost effective.
- I go and put one in the breaker box, with the power coming from outside, connected to the protector, then connect that to the panel.
- trying to keep surges to ground and bypass your equipment
- target certain equipment types
- not for security
- observe first then decide on prices etc
- Be focused and attentive
- Section 5.2.3 Guidelines For Providing Surge Protection at Commercial, Institutional, and Industrial Facilities
By Matthew T. Glennon, P.E. AVP, Hartford Steam Boiler Electrical Loss Control ...
- My approach is to use the newest and best technology.

- The focus is the implementation of the electric plane to avoid discrepancy
- Detect areas most prone to accidents.
- room by room
- Make sure all power is off
- Whole building
- Make sure it works

Please describe any surge protection successes that occurred after completion of your building projects.

- Plug-in Protection
- can really recall any
- there are many test tries to see if the tech is up to par
- The facilities were completely safe, in places where peaks were recorded, it does not happen anymore and in this way it stopped losing equipment due to electrical faults
- Successfully handled grid anomalies
- California Ground Movement (earthquakes) that caused permanent structure to relocate off foundations causing surges in emergency equipment in health facilities.
- Protecting Commercial Facilities
- all projects were successfully
- we put in surge protectors in all of our new construction
- kept building operational
- it works when we do it all correctly as needed
- Prevented damage from lightning
- BAD STORM BUT COMPUTERS HELD POWER
- many spikes averted
- Working together
- they worked well after I finished
- every time we install a surge protector device it is a success
- MAKE SURE EVERY DESIGN GOES OVER THE TOTAL USAGE BY AT LEAST 15%
- After the installation done by professionals, they were more reliable and protected.
- frankly, I consider a success any time I don't get negative comments
- our customers have been very happy with the protection they have received, especially high tech need places, especially university and hospital settings
- A lightning strike went completely unnoticed.
- I do not recall of any right now, no incidents to mention
- One I have designed saved a whole building from catching fire
- A lot of clients who had burnt motors, refrigerator, ac motors caused by electrical fluctuations are very happy as now they are protected
- every year there are lot of electrical surges that destroy hundreds of electrical equipment, surge protection has helped to protect maximum possible
- there are lot of successes, many people have saved their devices from getting damaged due to random surges

- After the surge protection, there were a lot less frequent damages to equipment and electronics
- We have had owners tell us that had we not done the electrical surge protection as we did, there would have been many issues as some still got risk taken by the outlets of electrical discharge, but our designs had prevented it further of any real injury.
- surge protection has helped a lot of sensitive items and for a very long time
- wires got damaged
- Building projects
- Surge
- Protection from direct lightning strikes.
- The success
- There are many industrial successes just taking into account the number of lightning strikes which manufacturing & industrial facilities take every month as well as the nature of industrial/manufacturing facilities and the amount of voltage which is used. There are daily successes in the manufacturing/industrial facilities in which my organization has designed & installed surge protection.
- Once a surge was moments away from happening, but the surge protection completely prevented it from happening.
- Been many over the years that mostly are minor.
- our battery backups worked past a certain point even after a major surge
- puesta a tierra [grounding]
- I always focus on everything is perfect in the protection that is why I look for the best workers
- The buildings do not present problems
- overall successes, we concern too about costumer satisfied
- no damage, and we concern to high protection
- I can't think of any particular success.
- most project, surge protection successes
- Building protection
- It protects your devices from any trouble that can occur from surges inside the house.
- The system out
- Our latest success was in a technology building. We managed to repair all the installations in record time
- none
- GREAT SERVICE AWARD
- It works perfectly as people expected.
- no damages to building or person
- Next building damaged IT equipment
- After the completion of the building project, there was a reduction in surge-related injuries and less incidents of important machines and equipment shutting down.
- All, using pretty much transient voltage suppression, and series mode surge protection
- I have had no such adverse instances with my work
- Better protection
- Lowered the chance of injuries/death More business
- At a medical center in the state that had significant power surges. We found the problem and installed a larger amperage surge system
- Equipment suffered less damage and downtime was significantly lessened.

- Not very sure.
- Unfortunately surges do happen however we have a 99% success in protecting our clients from damage
- Don't have to worry as much about lighting and etc
- Damage from surges reduced/eliminated
- Having the right gear and equipment
- safe to use
- Approximately 4 months ago a huge storm came through my area of Georgia and had knocked out power in the surrounding buildings and neighborhoods. But our buildings were spared.
- it was very safe
- All of our installations have been successful at protecting electrical equipment for each client.
- In a health care facility
- we never had a complain about faulty surge protectors
- everything was simple
- none come to mind
- protect your gear against random power spike damage
- we've protected entire it centers from massive outages
- Despite lightning strikes and high energy usage we rarely have surge issues.
- Well if there aren't any damages to the building and the property inside, then that is a success. There has been no damage in our recent designs and hopefully there won't be. So I consider all those to be successes.
- We have not had a surge death or equipment failure since we began this tactic of dual protection
- Successfully protected hospital equipment from a grid anomaly.
- The successes are what we strive for the most and it is what we work to achieve. It is best handled to the best of our ability
- when every equipment work very well
- Most of the time if it's working, I don't hear about it.
- Uniform, safety boots and standards for working with high voltage
- Never made aware of success just failure
- A common surge detection system with a actuator actuated by coils
- purchased different wiring
- in the middle of hurricane ike the surge protector in the a hospital in Houston took 3 hits from lightning and didn't set anything off.
- No power outage, all new and optimum electrical systems for the electric charge and maintenance of the same in the times that correspond
- Don't recall any
- none
- Gome protection
- many successes my own is earning profit
- Engineer found incoming power is dirty. Then after installing a TTLP surge suppression unit with transient filter, the monitoring equipment showed much cleaner power.
- A restaurant that I worked on suffered from a grid malfunction that fried the two buildings adjacent to it... My restaurant's systems were unaffected.
- Haven't gotten any called from customer about power going down.
- there were no issues after a hurricane

- it was very nice
- protections all equip
- many successes like profits
- An excellent job
- no more issues
- There hasn't been as many incidents reported afterward.
- The success was protection against transient surges success from the power supply to the plug
- Repairs were completed and power restored.
- nothing
- Too many to recall
- Na
- Didn't surge