

POWER N:

KEEPING BUSINESS CONNECTED

The Facility Manager's Guide
to Maintaining and Upgrading

**ELECTRICAL EQUIPMENT,
TECHNOLOGY SOLUTIONS,
LIFE SAFETY SYSTEMS**



KEVIN GRAY

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Power On
Kevin Gray —1st ed. ISBN 978-1-955242-05-9

Testimonials

“We have found Gray Connective to be highly professional and very responsive. They always attend to our requests promptly, and follow up after the work is completed.”

– Howard Conley, Sr. Manager Plant Engineering,
Ardent Mills

“We have depended on the experience, expertise and reliability of Gray Connective for several years. Our projects are scheduled and executed promptly, and the follow up service is exceptional.”

– Todd Wismer, Zone Operation Manager,
PepsiCo, Inc. Frito Lay-NE Region

“Gray Connective shows up on time for our estimates and responds with quotes quickly. If we ever have an issue they are quick to respond.”

– Charles Adams, CEO,
Industrial Communications Company

“With Gray Connective managing our electrical, telecommunications and security systems needs we are able to manage our projects smoothly. Their extensive knowledge has always ensured that we will install systems that meet our specific needs.”

– William Hildenbrand, CEO, Pallet Express Inc.

“Gray Connective does high quality work and completes our projects on time. They have always been helpful in educating us on available products and options. I look forward to working with Gray Connective on future projects and would recommend them to other businesses.”

– Jennifer Felegy, General Manager, Lehigh Country Club

“Gray Connective has been our contractor since 2007 and has always been responsive for our electrical and security system needs. They provide us with dedication we look for in our vendors and suppliers. I would highly recommend their services.”

– Janet Mease, Executive Vice President,
Two Rivers Health & Wellness Foundation

“We have worked with Gray Connective for many years and receive outstanding service for our customers’ structured cabling needs. Gray Connective has dedication to projects and partners that matches our own, which is paramount in our vendor relationships. I would not hesitate to recommend them.”

– Jared Steckel, CISO, Computing Technologies, LLC

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Introduction

I KNOW WHAT YOU'RE thinking... "Why do I want to read a book about electrical systems? I manage the place. That stuff should just work."

Well, I have some good news!

I didn't write this book thinking you would read it cover to cover. Instead, I wrote it as a quick and ready reference for you as a facility or property manager, so that you will know enough about these systems covered in this book to make decisions when you need to. And you will be armed with the key questions you should ask before you hire a contractor to fix, upgrade, or install a new electrical, renewable energy, life safety, or any other systems covered in the book.

So, thumb through the book now. Maybe you're already planning a renewable/alternative energy upgrade, or you're looking to add smart building features, or change to LED lighting. I cover it all and more.

Or maybe you don't have anything planned right now, but you may in the future. In that case, browse through, so you'll know what's inside, and then find a convenient spot on your bookshelf for this book, so it will be close at hand when you need it next.

And, if you ever run into an electrical, life safety, renewable energy, data network issue and don't want to read the book, just keep it handy, so you'll have my name and number. Call me, and I'll help you. Think of me as your secret "shortcut."

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CHAPTER 1

Electrical Maintenance

Why Electrical Maintenance Is Important

LET'S FACE IT—THE idea of electrical maintenance isn't exciting, and it's something you probably don't think about until you have an electrical problem. That's the way most people think of electricity. We tend to take it for granted... until we don't have it.

In this first chapter, I'm going to show you the few essential things that you need to focus on when it comes to electrical maintenance. Most of your electrical systems will run for a long time, without intervention, but there are a few critical components that are ignored by most property and facility managers.

These few “misses” are the things that end up costing building and facility owners as much as 10 to 100 times the cost of simple routine maintenance.

Electricity Is Your #1 Money-Making Resource

For anyone operating a commercial facility, it's easy to understand that you have to maintain the grounds, the building interior, the roof, the parking lot, and the other *visible* parts of the facility. Those are all important, but the purpose of every commercial facility is to make money.

Have you ever tried to operate a cash register without electricity?

What about trying to carry on operations inside your buildings when the lights are out and the machines won't run?

Every minute your facility is without power you are burning money. Want to have to explain to your boss or building owner why the lack of annual maintenance on a \$2 bolt caused the main breakers to melt and shut down the building for 36 hours and comes with a \$10,000 repair bill?

That's the risk of not performing the simple, inexpensive maintenance outlined in this chapter.

Benefits of Regular, Inexpensive Electrical Maintenance

There are five big benefits of keeping your electrical systems tuned-up and working at peak performance:

- 1. Limit Downtime.** Regular maintenance will catch problems when they are small and easy to fix, without shutting down the facility.
- 2. Limit Equipment Breakdown.** Poorly regulated power and power surges can cause equipment failure inside your facility.
- 3. Extend Equipment Lifespan.** When machinery, motors, and pumps receive stable, consistent power, they last longer with fewer problems.

- 4. Improve Equipment Efficiency.** Properly maintained electrical systems improve the energy efficiency of the motors and machinery in your facility.

- 5. Safety of Employees and Patrons.** Electrical issues can cause a range of threats to people in your facility from electric shock to fire. Regular maintenance fixes these problems early.

What to Maintain

My goal is to give you a simple list of the few most critical things to maintain in your facility. Obviously, every facility is different, and there may be specific systems and unique issues at your facility that would require more than what I outline here. Contact my team to get a complete facility review with customized maintenance recommendations for your site.

Switchgear

Switchgear is the set of switches and breakers that control the distribution of power coming from the power source into your facility. In your home, you're probably very familiar with your breaker panel. That panel is the switchgear for your home.

In a commercial building you have a similar but much more robust and more complex switchgear, capable of handling much larger amounts of electricity.

Switchgear is one of the largest sources of electrical repair calls, and often the calls come after something has gone wrong in the middle of the night or on a weekend. As you know, any emergency repair is costly.

In the case of your switchgear, a quick, simple and inexpensive annual inspection and maintenance routine will allow your electrician to find and proactively fix minor issues that cause major damage when left unattended.

Recommendation: Call my team to schedule a regular annual switchgear inspection and tune-up.

Physical Damage to Systems

The second largest source of electrical problems is caused by other equipment, such as forklifts and motorized dollies, people, and vandals.

In many cases, the damage may be unseen below the surface or behind walls, yet it is still there and poses a risk to people in the facility.

Recommendation: Do an electrical system assessment after any accidental damage to your facility.

Electrical Hazards

The third big source of electrical problems is electrical hazards.

Ever had an outlet that shocked you every time you plugged something in or a light that never quite worked consistently, leaving a dark area outside the facility?

Over time, your electrical systems can become worn and show signs of impending failure. Don't ignore these issues. They bring big liability risk with them if someone gets hurt by the system.

Recommendation: Repair electrical hazards immediately. Do not let them exist, unaddressed. You are asking for a lawsuit.

How to Budget and Plan for Electrical Maintenance (Without Breaking the Bank)

We recommend setting up an annual maintenance routine. If you don't have one, call our team, and we'll help you set up a maintenance plan.

The key to keeping maintenance costs down, while avoiding costly emergency service, is to focus on the few things that cause most of the problems.

Start with the Switchgear

Your maintenance program should begin by inspecting and doing routine annual maintenance on the switchgear in your facility. This is the most important piece of electrical equipment in your facility. If it fails, you are out of power and out of business until it is repaired.

A switchgear inspection is fast, easy, and inexpensive. There really is no excuse not to have it inspected every year.

Repair Obvious Damage When It Occurs

The biggest mistake we see made is putting off the repair of damage to electrical systems in your facility. A forklift hits a breaker panel for a machine. The panel is damaged but looks okay on the outside, so you think you can ignore it... until it overheats and damages the equipment. Get any damage repaired right away. It always costs less to be proactive.

Questions to Ask Your Contractor

- What electrical components should be maintained annually?
- Do we have any systems that, because of age, present a short-term danger?
- What is your current, annual maintenance practice for your electrical systems?

Key Actions

- Create a detailed inventory of your electrical systems and devices.
- Create your annual maintenance schedule.
- Call an electrical contractor anytime there is an accident on the property that may have impacted electrical lines or equipment.

CHAPTER 2

Energy Efficiency

THERE'S A LOT of buzz around the idea of energy efficiency, and often people combine energy efficiency with the idea of alternative or renewable energy. While the topics are related, in this chapter, we'll focus on energy efficiency or *how to do more while using less electricity*.

We'll cover alternative and renewable energy in Chapter 7.

In this chapter, we'll discuss the major energy efficiency approaches in commercial facilities and how to think about the Return on Investment (ROI) of any initiative you're considering.

Energy Efficient Buildings Are Worth More

Before we get into the “how” of energy efficiency, it's important to understand why you would want to improve the energy efficiency of your facilities. The first and most obvious reason is to reduce your energy costs. I'll talk more about how to calculate ROI in a moment.

A key but often overlooked reason to improve your building's energy efficiency is that it can increase the value of the property. In a recent McGraw Hill Construction survey, a third of those surveyed say they'd pay a premium for a green retrofitted facility.

Another study of the Los Angeles market by CoStar found that buildings with ENERGY STAR or LEED certification were able to command higher per-square-foot lease rates and sold for higher than asking price when compared to average prices in the market.

So, there is a big bottom-line incentive to upgrade your building to increase the energy efficiency.

The Two Biggest Bang for Your Buck Upgrades

If you're going to do energy efficiency upgrades, some options are better than others. Here are the two best upgrade projects to consider.

- 1. LED Lighting Conversion.** Converting from incandescent, fluorescent, metal halide, or high-pressure sodium lights to low-energy LED lights is one of the first (and best) upgrades you can make. Switching to LED isn't always as simple as changing light bulbs, but it can have big payoffs, including:
 - Significantly reduced electricity costs
 - Reduced maintenance costs (bulbs are changed much less frequently)
 - Increased employee productivity that comes from increased lighting and better quality, cleaner light
- 2. High-Efficiency Motors and Variable Frequency Drives.** Every commercial building has motors and drives running its critical systems. In manufacturing facilities, the use of motors and drives is often obvious: Machinery, conveyor systems, and lifts are all operated by motors. In office buildings, you may not see them, but

the HVAC, chillers, and pump systems all have motors and drives.

Older motors tend to operate at a single speed—high—and as a result, sometimes they are running faster than necessary and using more electricity than is needed to perform the work they are doing.

The answer is to replace older motors and drives with new variable speed, high-efficiency models that adjust their speed to the requirements of the work. Variable speed drives and motors can deliver significant cost savings.

The Impact of Lighting on Productivity

Researchers at The University of Greenwich found that bulbs in the 17,000 Kelvin band (extreme blue light) increased worker productivity by supporting mental alertness and acuity. Many of the new LED lighting options, combined with building automation systems, allow you to adjust the color of light in your office and production areas throughout the day to optimize productivity.



The Biggest Mistakes Facilities Make with Energy Efficiency Projects

- 1. Not doing enough to see meaningful savings.** This is probably the biggest mistake. Energy efficiency efforts, when done correctly, can have a compounding effect on cost savings. Often, management will do a partial LED lighting upgrade, only changing out the bulbs and leaving the old fixtures. Then, six months later when they are able to see the

savings, it's a major disappointment. If you want to save real money, don't do half an upgrade. You'll be disappointed.

- 2. Too much focus on rebates instead of the best, most efficient products.** Rebates are great when you can get them, but often they are offered to subsidize the sale of under-performing, older technology. Be careful and consult with an expert. My team is always available to help. Don't make the mistake of taking the short-term rebate savings and missing out on the much bigger, long-term savings that come from buying the most efficient products.

- 3. Not installing SMART Controls.** Much of energy waste is caused from simply "leaving the lights on when nobody's home." Lights, equipment, HVAC, and other systems are often left on, consuming energy and burning money when they are not needed. Make sure you invest in SMART Controls that allow you to tailor exactly when lights and other electrical equipment operate. The latest control systems allow you to automate not just the On/Off times, but also the intensity of operation, leading to significant savings.

- 4. Do nothing.** Many facility managers take the "if it ain't broke, don't fix it" mindset. This works until it doesn't. Systems break, and as energy and environmental regulations continue to evolve and become more restrictive, the cost to maintain and repair older fixtures and equipment is being pushed higher and higher. If you choose to "do nothing," you're effectively locking in your losses.

5. Waiting until you're forced by code requirements.

Code requirements in many jurisdictions are increasingly pushing energy efficiency upgrades and retrofits. Waiting until you're forced by code requirements puts your back against the wall. You are much better off making your plans to upgrade without the time pressure that will be imposed if and when the code requirements in your jurisdiction change to favor greater energy efficiency.

Questions to Ask

- How important are green initiatives to our company?
- What bulbs and fixtures can we convert?
- Are there opportunities to use automation control to save money?
- Do we have older motors that should be replaced with high-efficiency, variable speed motors?

Key Actions

- Calculate cost savings of LED.
- Identify where you are using motors—HVAC, chillers, machines.
- Conduct an energy audit.

CHAPTER 3

Parking Lot and Exterior Lighting

PARKING LOT AND exterior lighting is complex enough to warrant its own topic. As you'll discover in this chapter, the exterior and parking lot lighting on your site can be a big source of expense and liability.

In this chapter, we'll look at the risks of poor exterior lighting and the opportunities to improve your exterior lighting.

Three Ways Poor Exterior Lighting Costs You Money

Exterior and parking lot lighting has a direct, yet seldom recognized, connection to your facility's profitability. In fact, there are three ways that exterior lighting eats away your profitability.

The Liability Problem

Poorly lit parking lots and outdoor areas are just asking for something bad to happen. It's usually not a matter of "if" but "when" you'll experience a LICE event (Liability Induced Cash Extraction). Slips and falls are the most common liability issue in dark parking lots and outdoor areas.

You know there is an army of personal injury attorneys waiting for the opportunity to profit from your poorly lit site. Just Google "liability from poorly lit parking lot," and you'll see that the first

page is filled with law firm websites educating your patrons on the fact that you're liable if they are injured in your low-light parking lot or exterior area.

But that's not the only liability risk. A 2017 Office for Victims of Crime report states that 35% of all aggravated assaults happen in a commercial place, parking lot, or parking garage.

Dark or heavily shadowed parking lots and garages attract crime. Roughly 10% of all crime occurs in a parking lot or garage.

The Energy Cost Problem

Older exterior lighting often uses metal halide or high-pressure sodium bulbs because of their brightness and relatively longer life compared to the technologies that preceded them. However, metal halide or high-pressure sodium bulbs use a lot of energy, especially compared to today's LED lighting technology. **An LED conversion (changing out bulbs and ballasts) can give you a 75-percent to as much as a 90-percent reduction in energy consumption.**

In many facilities, the exterior and parking lot lighting is one of the biggest energy costs. One of the easiest ways to cut your energy costs and create a brighter outdoor environment to reduce your liability exposure is to convert your older exterior and parking lot lighting to LED.

LED lights are less expensive to operate, last 20 to 50 times longer than incandescent bulbs and 2 to 3 times longer than metal halide or high-pressure sodium bulbs.

LED lights also offer vastly more control over the brightness and color of the light used. With new SMART control systems, you can easily program the lights to change both brightness and light color (from warm to cool light) based on the weather or the ambience you are trying to create, which is very popular for retail locations.

The Sales Problem

Dimly lit parking lots and outdoor spaces deter shopper traffic. People want a well-lit, inviting, safe-at-night environment. They're attracted to businesses that provide well-lit outdoor areas, and they'll drive by and avoid businesses that are dimly lit.

Is this any surprise given the crime statistics I shared earlier?

If you own a retail site, the value of your site is closely tied to the traffic coming into your parking lot. If customers are driving by your site, to a competitor, because the parking lot looks dark, uninviting, or even scary, you're sucking money right out of your own bank account.

The Biggest Mistake Managers and Owners Make When Considering an LED Conversion

The #1 mistake I see made by owners and managers is thinking that if they just change out the bulbs from incandescent, fluorescent, metal halide or high-pressure sodium to LED that it will be "good enough."

The problem with this thinking is that you only capture a fraction of the potential energy savings. The lighting fixture ballasts that are required for the older bulbs consume energy

on their own. Most people don't know this—they think all the energy is consumed by the bulb. You can buy LED bulbs that are installed into existing ballasts. This is a lower cost option initially, but in the medium to long-term, we find that every site that simply swaps out bulbs, comes back to change out the fixtures later.

This means the owner is paying to convert to LED twice. The initial investment in bulbs is wasted. They often still have years of life remaining, but by themselves just didn't provide the kind of energy savings the owner or manager had hoped for.

If you're considering a LED conversion, we recommend you invest in a full conversion by replacing fixtures. You'll find that you need fewer fixtures in most areas, compared to your old system because the LED light is much brighter and covers a bigger area. That means you have fewer fixtures to maintain over time.

You'll also gain new capabilities to control your lights—dimming them to use less power and provide more pleasant light on cloudy days or at dusk and dawn.

How to Make the Switch to LED

The first thing you'll want to do is have an electrical contractor evaluate your current lighting fixtures.

Then the contractor should do a foot candle analysis to determine where you have dark, shadow-filled areas. With the analysis in hand, you and the contractor can sit down together to discuss what lighting improvements you want to make.

The contractor will create a lighting plan (how many, what type, and where lights will be placed) and a lighting control plan (how you will control and adjust the lights, automatically, to achieve the aesthetic you want).

Once the plan is approved, the contractor will secure the necessary permits and install the lights. It's a simple process, but you'll want to work with someone who specializes in LED conversions for commercial buildings and parking facilities.

Key Questions

- What's the condition of your current lighting?
- What is your lighting energy consumption?
- Does your lighting meet current standards for safety and illumination?

Key Actions

- Conduct a lighting audit.
- Explore LED lighting options.
- Identify nighttime safety risks or dark areas.

CHAPTER 4

Electric Vehicle Charging

WITH THE RAPID growth of interest in electric vehicles, more commercial facilities are looking to install electric charging stations. If you're considering adding a charging station, here are the key things you need to consider:

What Level Charging Station Will You Use?

The biggest decision you have to make is determining what level of charging station you want to install. The main driver behind the decision is how your charging station will be used. The three levels of charging stations vary in many ways, but the most significant is the time it takes to charge a vehicle.

Level 1 Charging Stations use a 120-volt AC circuit. They are the least expensive but they take the longest amount of time to charge a vehicle. These types of chargers don't require any special equipment or installation and are often used at home. Typically, a Level 1 charger requires 11 to 20 hours to charge a vehicle. These work best when the vehicle can be plugged in and stationary overnight. Level 1 chargers will typically get 4 miles of driving range per hour of charge.

Level 2 Charging Stations are suitable for both commercial and residential use. Commercial stations typically use a 208-240

volt AC circuit and must be installed by a licensed electrician. They can be powered by either traditional utility provided power, or by a solar panel system. Typically, a Level 2 charger requires 3-8 hours to charge a vehicle. Level 2 chargers will typically get 32 miles of driving range per hour of charge.

Level 3 Charging Stations are commonly known as DC Fast Chargers and provide 100 or more miles of range to a typical vehicle in 30 to 40 minutes of charging. Level 3 chargers require specialized equipment and professional installation.

Benefits of Installing EV Charging Stations at Your Facility

There are a number of benefits and incentives for installing charging stations at your facility.

- Attracts high-end consumer/EV owners
- LEED Credits available in certain situations
- Federal and State financial incentives and tax credits
- Compliance with local development regulations

EV Charging Incentives

As of 2022, 45 states and many utility providers offer incentives for the purchase, installation, maintenance, and operation of EV charging stations. The amount of the grant money can be up to 75% of the total project cost.

Program funding is typically to support installation of Level 2 and Level 3 charging equipment.

Some requirements for the grants might include:

- A community charging hub such as a dedicated publicly accessible lot
- A destination location such as a large commercial development
- A transportation corridor such as a major highway

Additional grant information is available through your state's website.

CHAPTER 5

Life Safety Systems

What Are Your Life Safety Systems

THE TWO PRIMARY electrical life safety systems are the emergency lighting system and the fire alarm system.

Emergency lighting systems are designed to operate when the building loses its outside power supply or during an emergency triggered by the fire alarm system. The emergency lighting system has two functions:

1. To provide light, so that people can see well enough to safely exit the building.
2. To illuminate the exits.

The fire alarm system exists to detect the smoke and heat from a fire, alert people inside the building, and summon the fire department.

All pretty obvious stuff, but it's important to start with the basic definitions.

Some would consider security systems part of the life safety system, but security systems are complex enough to warrant their own chapter, and they are generally not regulated in the

building code in the same way that emergency lighting and fire systems are regulated.

Risks Related to Life Safety Systems

There are three risks to avoid related to your life safety systems:

- 1. The Obvious Risk.** Life safety systems protect human life inside your buildings and facilities. For this reason they are among the most important systems in your building and should be tested on a regular schedule to ensure they are working properly and protect the people inside the facility.
- 2. Liability.** When an emergency situation happens at your facility that results in an injury or death, you will almost certainly face a liability claim by the injured person. If one of your building's life safety systems fails during the emergency, the next question that will be asked is the date and results of the last system test. You don't want to find yourself in the position of having to defend a claim where the last system test was more than a year before the incident.
- 3. Regulatory Fines.** In many jurisdictions, the fire marshal will conduct annual inspections of your life safety systems to ensure they are functioning. A failed inspection will generally trigger a citation and fine. These fines are easily avoided with a simple, inexpensive, regular inspection program.

Fire Drills

Fire drills are the best way to test both the human and the electrical components of your life safety systems. Both must work together—people need to know what to do and how to do it during an emergency, and the alarm systems must detect and warn of a fire—to protect the lives of the people in your facility.

Four Reasons to Conduct Fire Drills:

1. Provide employees with an opportunity to rehearse emergency procedures and learn evacuation procedures and routes.
2. Evaluate employees' understanding of and ability to execute emergency plans to identify areas for training.
3. Assess the effectiveness of your current emergency procedures and evacuation plans.
4. Maintain compliance with local fire code and insurance requirements.

OSHA Recommendations

While OSHA doesn't have a specific requirement (as of this writing) to conduct fire drills, the OSHA Evacuation Plans and Procedures eTool has the following to say about fire drills:

“It is a good idea to hold practice drills as often as necessary to keep employees prepared. Include outside resources such as fire and police departments when possible. After each drill, gather management and employees to evaluate the effectiveness of the drill. Identify the strengths and weaknesses of your plan and work to improve it.”

When and How to Conduct Fire Drills

The frequency of how often you conduct fire drills will largely be driven by the requirements of your local fire code and the significance of the fire hazards in your facility. The presence of significant fire hazards, such as gasoline, flammable solvents and materials, use of open flame or high heat, manufacturing processes, or difficult to egress areas would lead you to more frequent fire drills. In these situations, you will want to consider a quarterly fire drill schedule.

In facilities with relatively low fire risk, you may look at conducting fire drills every six months.

In every case, ensure you are meeting the requirements of your local fire code and the requirements of your insurance policies, and leases, at a minimum.

10 Questions to Ask After a Fire Drill

After every fire drill, ask these 10 questions to evaluate the effectiveness of your systems.

1. Did the fire alarm activate properly?
2. Did all employees hear the alarm?
3. Did any auto-locking doors automatically unlock and release locked doors to allow people to egress the building?
4. Did your in-building communications systems function as expected, and were employees able to hear and understand instructions?
5. Did all employees respond to the emergency signals?

6. Did managers and employees carry out assigned emergency duties, such as systematically safely turn off any running machinery or equipment?
7. Did specific employees need assistance exiting the building? If so, incorporate an aid plan in your evacuation plan update.
8. Did employees know their assigned evacuation routes, and did they follow them?
9. Were hallways and stairwells clear and unobstructed?
10. Did employees go directly to assembly areas after evacuating the building and was a headcount conducted?

Who Initiates a Fire Drill?

Coordinate your fire drills with an alarm contractor—my team and I are happy to help you. You will want the contractor to initiate the drill and check the operation of all of the electrical components of the life safety systems. They are also able to coordinate with the local fire marshal if and when necessary.

If you are overdue for a fire drill at your facility, call my team to discuss scheduling your next drill.

Key Questions

- When was the last time you conducted a fire drill?
- Is your system current on its annual inspection?
- Are your people familiar with your evacuation/emergency plan?

Key Actions

- Explore insurance discounts, rebates, and incentives for installing or upgrading your life safety systems.
- Review your safety procedures and evacuation plan.

- Schedule your next annual system inspection—emergency lighting, fire extinguishers, and suppression system.

CHAPTER 6

Security Systems

Why Security Systems Are Important

FACILITY OWNERS USUALLY install security systems for two reasons—liability protection and crime prevention.

If people are going to be inside your facility (and of course they are), then you have a liability risk should someone be injured at the facility. This is especially true for facilities where the public is invited in, such as retail and office settings. Having a security camera system in place to record the actions of people at your facility can provide critical evidence in the case of slip and fall claims, parking lot accidents, and even worker's comp claims from workplace accidents.

Without camera evidence, these claims are often a case of he-said-she-said. With camera footage, you can often quickly dispense with cases of clear fraud or negligence on the part of the injured person.

Similarly, security camera footage can be instrumental in documenting evidence of criminal activity at your facility either by employees or by outsiders.

5 Common Uses of Security Cameras and Systems

- 1. Liability Protection.** As mentioned above, a primary motivation for installing security systems and cameras specifically is to provide evidence to refute liability claims.
- 2. Crime Prevention.** Orange County, New Jersey found that crime dropped by 50% after installing monitored security cameras in high-crime areas. A study of convicted burglars by the University of North Carolina at Charlotte found that 83 percent tried to determine if a house or business had an alarm system (only 13% would continue with the burglary if a security system was present), and 60 percent said security cameras are a major consideration before committing a burglary.
- 3. Vehicle Detection.** Systems can be configured to detect vehicles entering your facility outside of normal operating hours and trigger alarms and alerts to a monitoring company, building managers, and the police. License plate detection is also possible but requires very high-resolution cameras. Often the cost of license plate detection cameras and image analysis software exceeds the benefit of having the information in the first place.
- 4. Production Line Monitoring.** In addition to providing security footage, cameras are often installed to monitor production lines for speed of production and for quality control.
- 5. Staff Safety.** Because of the high degree of deterrent provided by security systems and cameras, they give you

a solid layer of protection for your staff and the people who visit your facility.

Biggest Mistakes Facility Owners and Managers Make with Security Systems

Buying a Home System for Commercial Use. In recent years, we have seen many facilities and small businesses turn to the security systems available at big-box home improvement stores. There's a real danger of using these systems. They are simply not designed for use in commercial settings, where your liability is much greater and you have a duty to maintain a safe environment for your employees and customers. Avoid these systems.

Fake Cameras. When the crime deterrence benefits of security cameras became widely known, companies began selling fake security cameras to businesses that wanted to avoid the expense of installing functioning cameras. While they're attractive from a cost perspective, fake cameras create a significant liability for your facility. The presence of the "cameras" gives employees and customers a false expectation of security, which may expose you to unnecessary liability. When we see fake cameras in a facility, we immediately recommend the building owner remove them to limit their liability.

No Field of View Analysis. We will often be called-in to "fix" a system that doesn't provide full camera coverage. This is a common but easily avoidable issue. Before you install a new system or upgrade or expand your current system, have your electrical and security contractor conduct a field of view analysis and create a camera coverage plan. This will ensure

that when your cameras are installed, they will cover all of the areas that are important to you.

Insufficient Storage. Storage methods for security cameras have changed dramatically over the years. Older systems record to VHS style tapes, and then systems moved to storing 30 to 60 days of digital footage. Now, storage is cheap and easily expandable. With the proliferation of personal injury claims on commercial property, we recommend you invest in enough video storage capacity to maintain video records beyond the normal statute of limitations for these cases in your state (often two years or longer). This is one of the first upgrades to consider if you have an older system.

Unrealistic Expectations (it's not like the movies). We've all watched those movies where the detective is able to zoom into security camera footage and read the inscription of the criminal's watch. Unfortunately, this isn't a reality yet. Don't expect that level of resolution and detail from your security cameras.

No Regular Inspections and Tests. This is a biggie. Most companies put up cameras and then neglect them. Cameras should be inspected and tested annually to ensure they are working properly.

Not Budgeting for Upgrades Annually. Technology changes quickly, and systems need to be upgraded to keep compatibility. A big mistake we see is facilities that neglect regular upgrades and then are hit with a large capital outlay to upgrade the entire system at once. The easiest and most

affordable way to keep your system current is to budget for small, annual upgrades and improvements.

For a comprehensive review of your security system from the alarm panel, access control, cameras, storage and monitoring, call my team at 610-253-3081.

Key Questions

- Have your needs changed over time?
- Does your current system meet all of your security needs, given new workplace threats?
- Is your system compliant with current communications protocols?
- Is your system providing the level of employee safety and liability protection you want and need?

Key Actions

- Remove any fake cameras that may be installed.
- Check your video storage system regularly to ensure it's capturing video accurately and storing the date and data properly.
- Review and update your alarm codes each time you experience employee turnover.

CHAPTER 7

Building Automation

What Is Building Automation?

BUILDING AUTOMATION INVOLVES a series of automated controls for heating, ventilation and air conditioning (HVAC) systems, lighting, building access control, energy management, fire alarms, life safety systems, and security systems.

The goal is to optimize the performance of these systems and align their operation with the use of the building. One of the primary drivers of building automation is the cost savings that can result from reducing the use of building systems when they are not needed.

What Systems Are Good Targets for Building Automation?

Most building automation projects start by targeting the biggest systems in the building: HVAC, boilers, and chillers. A 2019 Department of Energy study found that the HVAC systems account for an average of 40 percent of commercial building energy costs.

Lighting is close behind at 20 percent of energy costs. Controlling and optimizing these systems can produce significant energy savings and extend the lifespan of your equipment.

Once you've automated the operation of these bigger systems, you'll want to identify the electrical systems, pumps, and any equipment with a motor. These smaller systems don't have the concentrated savings impact of the bigger systems, but combined, they can create significant savings in both energy use and reduced maintenance costs.

A study by The American Council for an Energy Efficient Economy (ACEEE) found that implementing building automation controls in Class B office buildings saved an average of 18 percent in HVAC costs per building. The author Christopher Perry said, "We estimate that smart building technologies can save the average office 18 percent in HVAC, 28 percent in plug load, and 33 percent in lighting energy."

Reduced Building Management Labor

The second big driver of cost savings from building automation systems is the reduction in labor needed to manage, monitor, and adjust the automated systems in a building. This is especially valuable if you have a campus or portfolio of buildings.

All of the system management can be consolidated, automated, and monitored remotely. One person is now able to control the systems in many buildings from a remote location, without the need to be onsite as frequently.

Occupancy Sensors Allow Pinpoint Control

In the past, building automation might have applied one set of rules to the entire building. Today, occupancy sensors are able to detect when someone is in a specific office, conference room, or part of the warehouse floor.

As occupancy is detected, the lights are turned on, the air conditioning or heat is turned on to set an appropriate temperature, and other systems can be tied in to turn on as needed. When that specific space is unoccupied, the lights can be turned off automatically, the temperature can be adjusted to a setting that requires less energy to maintain, and other equipment can be turned off.

Calculating Potential ROI from Building Automation

Before you start a building automation project, consult with an electrical contractor who specializes in building automation. They will be able to measure the amount of energy consumed by your major building systems and help you develop a building automation plan to balance cost savings against the cost to install the system, so that you maximize your ROI.

To find out what your return on investment could be from a building automation upgrade, call my office 610-253-3081 and schedule a Building Automation Evaluation.

Key Questions

- What systems should you automate first for maximum ROI?
- What engineering will be necessary to upgrade and automate your systems?
- What budget should you set for building automation?

Key Actions

- Do a system audit/engineering study to determine what to automate.
- Research manufacturers and system hardware.
- Calculate potential cost savings.

CHAPTER 8

Generators and Backup Power

When Do You Need Backup Power?

RECENT EVENTS ACROSS the country have shown the vital importance of having backup power. From serious weather events that take out power for days or weeks to power grid failures and power capacity shortages, the frequency of significant power outages is on the rise.

That combined with our increased reliance on electronic and digital systems means that most businesses will want some level of backup power in place to allow for continuity of operations.

Catastrophic events are not the only times you will want to have backup power ready. Data centers and companies with intensive database access needs have long invested in backup power systems—both generators and batteries—as have hospitals and outpatient surgery centers.

The uses in those facilities are obvious, but retail outlets may have the best opportunity to see a return on investment in a backup power system. In retail, a backup power system can keep the store open, keep shoppers shopping, and can power the registers, so that you can continue to conduct business and make money.

What Do You Want to Power with Your System?

The first question to ask when considering a backup power system is “What do you want to power?” Except in rare and highly mission critical situations, the cost to power your entire facility from backup power is likely prohibitive.

The best way to balance cost with return on your investment is to carefully identify the systems you need to continue operations. Separate them into essential systems and “nice to have” systems. Here’s an example:

System		Importance
Emergency/Life Safety Systems	▶	Essential
Lighting	▶	Some essential and some “nice to have”
Data/ computer systems	▶	Essential
Refrigeration	▶	Essential
HVAC	▶	“Nice to have”

Methods of Calculating Generator Size

Full Load Capacity by Measurement

An electrician can measure the load being used by your facility during peak hours and use that measurement to determine the size of the generator you’ll need.

Once you have your measurement, divide the total amps by three for three-phase current, by two for single-phase current, and then use the following formulas to calculate KW.

Three phase loads: $KW = (V \times I \times PF \times 1.732) \div 1,000$.

Single phase loads $KW = (V \times I \times PF) \div 1,000$.

Calculations

Take your total KW from your formula calculation x 0.25 for reserved capacity = Generator Size in KW

Full Load Capacity by History

If your business runs equipment that operates 24 hours a day, you can calculate your electricity needs based on the amount of power you use in a month.

Most utility companies show your maximum (peak) power usage on your bill. By analyzing your usage over the previous 12 months, you can find your highest peak usage. Then add 25 percent to your peak usage to account for reserve capacity.

Square-Footage Method

For retail and other commercial locations, you can use the square-footage method. This is often the simplest method. You can make these calculations by utilizing article 220 of the national electrical code.

Types of Backup Systems

The most common types of backup power systems include:

- **Solar Power Systems.** Solar-powered backup systems are becoming increasingly popular. These systems charge batteries attached to the system. When the power goes out, the batteries can be used to power certain building systems until power is restored.
- **Batteries.** Batteries can be charged from solar, wind, or conventional electric grids. They store electricity and then power your equipment when the power grid fails. A simple example is the Uninterrupted Power Supply (UPS) system attached to your computer.
- **Generators.** Generators can provide extended power and do not require a clear sunny day to do so. Large commercial generators are usually powered by one of the following fuel types, depending on what is available in your local area and at your facility:
 - Propane
 - Diesel
 - Natural gas
- **Wind Generation Systems.** A less common backup power solution is wind generation systems. These systems use wind turbines, often mounted on top of your building, to charge batteries attached to the system. The drawback of wind systems is the need for the wind to blow. They are only useful in locations with strong and consistent wind.

Battery Systems

There are three main categories of commercial-grade power storage systems (battery systems):

1. Emergency Backup
2. Peak Demand Shaving
3. Full Off-Grid

Emergency backup systems and peak demand systems are generally smaller, require significantly less capacity, and are less expensive than full off-grid systems.

Battery Backup Systems

A battery backup system is designed to store electricity that comes from the power grid or from on-site solar panels until there's an interruption in the grid power—in other words, until the power goes out. Then, similar to a generator, your power control system will automatically switch from drawing power from the grid to drawing from the battery backup.

Backup systems can be designed to take electricity from solar panels and store it for use at night or during cloudy days when the solar panels are not generating electricity.

Peak Demand Shaving Systems

Demand shaving systems are designed to reduce the amount of electricity you're pulling from the grid (and paying for) during peak hours. Most utility companies charge more for electricity during daily peak demand times.

A battery system can be configured to allow you to buy electricity during low-demand hours (in the middle of the night), store it,

and use it to reduce your grid energy usage during the expensive peak demand hours.

Full Off-Grid Systems

As you might imagine, storing enough electricity to reliably power an office building, retail location, factory, or even a small office, while being disconnected from the grid, requires massive battery banks.

For most businesses and organizations, the investment required to be completely off-grid, while maintaining reliable power, isn't worth it. However, if energy security, self-sufficiency, and uninterrupted power are important to you, I'd be happy to help you understand the options available.

Key Mistakes to Avoid

Installing Too Small. The #1 cause of frustrated facility owners and managers after a power outage is the result of installing a system that is too small for the number of things that need to have power. Every backup power system has a limited capacity to produce energy. When you exceed that capacity, things stop working and you can burn up the system. This is why it's so important to be clear about what you want to power and have an electrical contractor calculate how much capacity you will need.

Adding Equipment. Another problem with designing too small is adding too many pieces of equipment to the backup power source that were not contemplated during the system design. This can happen over time as you add equipment to your facility. Some of this new equipment may be critical to your operations. That's why it's important to periodically review the

anticipated load on your backup system and have a contractor update the load calculations to ensure you have sufficient power when you need it.

Trying to Manage the Generator Load Yourself. Just don't do it. An overloaded generator can be dangerous. Have your electrician involved to manage the generator load.

Choosing the Wrong Fuel Type. Make sure that the flow rate of natural gas or propane from your utility will support the amount of fuel your generator will require. This is not an issue with diesel generators. Be sure to choose a fuel type that is likely to be available locally, even if your area is without power for days to weeks.

Key Questions

- What systems do you want or need to keep online during a power interruption?
- What type of fuel source is available for your generator?
- What is the best location to install your generator?

Key Actions

- Calculate your full load requirement.
- Determine what size generator or battery system will power your full load.
- Determine how long you want to be able to operate when the grid power goes down.

CHAPTER 9

Renewable and Alternative Energy Systems

Types of Renewable and Alternative Energy Systems

THE THREE TYPES of renewable or alternative energy that are used in commercial settings are solar, wind, and geothermal energy. Each has advantages and disadvantages, and not all types of renewable energy are available at every site.

If you're in an area without consistent wind, installing wind turbines wouldn't provide the impact you'd want. Similarly, geothermal energy isn't suitable in every location.

Solar is available everywhere as long as you have an open view of the southern sky. In the remainder of this chapter, we'll focus on solar energy and key considerations when evaluating solar for your building.

Why Install Solar?

Most often, businesses choose to invest in solar energy to offset energy costs. There are also good public relations reasons for adding solar and being seen as a responsible, sustainable company.

When you are expanding your facility or replacing/upgrading the roof, you should evaluate whether you would benefit from adding a solar system to your building. Coupling infrastructure replacement or expansion with solar often reduces the overall cost of the solar installation.

What Are Your Goals for Solar? Understanding the goals that drive your interest in solar will help you find the right solution for your facility and the results you want. Most businesses that install solar power are looking for one or more of the following benefits:

- Cost savings
- Carbon offsets
- PR/Community goodwill
- Power generation
- Power backup
- Peak use augmentation

Knowing what you want to get out of your solar project will ensure that you don't over or under-build your system.

A Primer on Solar Technology

There are two common types of solar panels in use in the United States—glass panels and thin film panels. These are photovoltaic panels, meaning they take the light energy from the sun's rays and convert it into electric current.

Glass panels come in two types: monocrystalline and polycrystalline. Both are made of silicon wafers that are assembled into rows and columns then covered with a glass sheet.

Monocrystalline solar cells are cut from a single, pure crystal of silicon. Polycrystalline cells are made from fragments of silicon crystals that are melted, molded together, and cut into wafers.

Solar Panel Type	Pros	Cons
Monocrystalline	Highest efficiency Most aesthetically pleasing	Most expensive
Polycrystalline	Low cost	Lower efficiency compared to monocrystalline
Thin-film	Lightweight and flexible	Lowest efficiency

Solar panels cannot store the energy they produce, so most solar systems include batteries that are connected to the panels. Any excess power generated by the panels is either stored in the batteries or transmitted onto the local power grid using a grid-tie inverter. The unstored excess power is sold to the local utility and can provide a source of revenue to offset the installation costs of the system.

Glass panels are the most reliable, produce electricity most efficiently, and last longest. In a commercial setting, you will most often want to install glass panels. Thin film panels are made from thin sheets of photovoltaic film. While you may save money on the initial installation, you can expect higher maintenance costs and a shorter operating life from thin film panels.

Key Considerations for Solar Energy Installation

Before you decide to make the leap into solar power, you should consider the following factors that will impact your system.

Your Location. Does your site, and specifically the proposed location of the panels, receive significant sunlight?

Panel Direction. You need the ability to face the panels to the south, and you need an open southern sky. North facing panels don't get enough direct sunlight to produce significant electricity.

Panel Position. Will you use a fixed or dynamic panel? Fixed panels are, as the name implies, fixed at the time of installation and do not adjust to the sun. Fixed panels are typically installed at an angle of 22.5 degrees from horizontal. Dynamic panels adjust their angle and orientation to track the sun, always maintaining a position that optimizes power generation.

Installation Location. Will you install the panels on the roof of the building, as a parking cover, in an open ground location on your site?

Power Storage. Will you store power in batteries onsite to provide peak power capacity and backup power, or will you use a grid-tie inverter to sell excess power to the utility company?

Billing Tenants. If there are tenants in your building, how will you charge for the solar power you provide? There are apps and software tools that help facilitate tracking and billing of power provided to tenants.

Ease of Maintenance. If you have a high-pitch roof, installing panels on the roof may increase overall maintenance difficulty and maintenance costs by requiring specialized equipment to reach the panels for routine maintenance.

How to Get Started with Solar

The fastest, easiest way to find out if solar is a viable option for your commercial building is to schedule a Solar Viability Analysis. To schedule your analysis, call 610-253-3081.

Key Questions

- What renewable system is most suitable for your facility based on your location?
- How much renewable power do you need to generate?
- Will you store the power on-site, or will you sell it back to the grid?

Key Actions

- Investigate available government and utility company incentives for installing renewable energy systems.
- If using solar, determine the orientation of the panels.
- Calculate the payback period for the renewable system.

CHAPTER 10

High-Speed Data Transmission

HIGH-SPEED DATA IS transferred around facilities and from your facility to the Internet using three transmission methods.

Understanding the Three Transmission Methods

The three main transmissions methods used to transmit information within and around buildings are:

1. Twisted-Pair Cables
2. WiFi
3. Fiber-optic Cables

Each technology has strengths and weaknesses. Most facilities will want to use a combination of technologies to move data securely and efficiently around the facility and to and from the Internet.

Twisted Pair Cabling (CAT 5e/CAT 6/CAT 6a/CAT 8)

Twisted pair cabling is a type of wiring where two copper wires of a single circuit are twisted together to improve electromagnetic compatibility. Compared to older single conductor cable technology, twisted pair cables reduce crosstalk and interference, resulting in a cleaner transmission signal.

The technology has been around for a long time. It is the basis for the analog phone system and most modern computer network wiring.

If you're familiar with CAT 5e/CAT 6 (and now CAT 6a and CAT 8) Ethernet cables (you might have one plugged into your computer), these cables use twisted pairs of wires inside the cable to transmit data.

Twisted pair cables are most often used to connect computers inside a building. Your building may have one of these types of cables inside the walls to handle high-speed data transfer across the organization's network.

Such cabling systems tend to provide higher data transfer speeds and better reliability, compared to wireless networks (WiFi). They also have the ability to deliver power to devices such as security cameras, routers, and even LED lighting using Power Over Ethernet (POE) technology.

WiFi (Wireless Networks)

WiFi has become ubiquitous. Most facilities have some form of WiFi coverage, at least in parts of the facility. The big advantage of WiFi is the elimination of cables. Now you can connect your computer and most new equipment to the internal network and the Internet without running a cable to the device.

The result is drastically reduced costs because you're not investing in wires and you don't have the complication of having to run wire through walls and ceilings to distribute data throughout a building.

The downside of WiFi is that it can be susceptible to radio interference. In certain facilities where the data connection is critical and losing it could cause a safety issue, or in facilities where there is significant radio interference, WiFi may not be the best solution.

New WiFi technologies, including new mesh networks, are helping to improve coverage, increase speeds, and reduce problems of interference.

Fiber-Optic Cabling

Fiber-optic cabling differs from twisted pair cabling in an important way: Twisted pair cabling transmits electricity across a copper wire, where fiber-optic cables transmit infrared light across fiber strands within the cable.

Light is transmitted through the cable at the “speed of light in glass”—not quite the full speed of light, but still quite fast. In fact, the transmission time to send a signal over 1000 kilometers (about 621 miles) is just 11 milliseconds.

Fiber-optic cabling is most often used in situations where a large amount of data needs to be transmitted in near real-time or transmitted over a long distance.

There are two types of fiber-optic cable, and it’s important to know where each type is best used. On your site, campus, or even to transit long-distances inside buildings, you’ll want multi-mode fiber-optic cables. Multi-mode cables are designed to transmit data at speeds from 10 Gigabits to 100 Gigabits over distances as far as 400 meters (a quarter of a mile).

For longer distances, single-mode fiber-optic cables are used. Single-mode fiber will transmit data at 10 Gigabits over distances up to 10 kilometers (6.2 miles).

What Type of Cabling Technology Should You Use?

The only real answer to the question “What type of cabling should you use?” is “It depends.”

It is unlikely that one structured cabling solution will handle all of your needs. In most cases, there is an optimal combination of twisted pair cabling, WiFi, and fiber-optic.

The first thing to do is get clear about how you use and transmit information.

- Do you need to transfer large amounts of data in near real-time?
- Do you need to transfer data over long distances between buildings or within buildings?
- What types of data will you be using? For example, do you need large bandwidth to support lots of video conferences and Zoom meetings?
- Do you need data coverage in building common areas and outside buildings?
- How many devices do you need to support, and what type of connectivity do they require?
- How do your people work and collaborate?
- What level of security do you need?
- Are there significant sources of radio interference in and around your facility?

- What type of construction was used in your facility, and will it allow for WiFi transmission, or will it block transmission?

These questions will help you begin to determine your requirements for data connectivity. Once you have started to answer some of these questions, call my team. Let's sit down and begin to build a plan for upgrading your connectivity.

Key Questions

- What type of data network is required in your facility?
- What type of hardware do you have now, and what type is required to support your most demanding network use?
- What combination of data technologies maximizes network capacity and minimizes cost?

Key Actions

- Investigate the current available technologies.
- Assess your current hardware and cabling.
- Identify the bottlenecks in your current data network.

CHAPTER 11

Other Preventative Practices

Thermography - Detecting Equipment Malfunctions Early

THERMOGRAPHY IS A technique that uses an infrared scanner to detect the heat being emitted from a piece of equipment. Why would you want to use thermography in your facility?

Excess heat is often an early sign that a piece of electrical equipment needs repair or may fail. This is true of your electrical infrastructure—your switchgear and electrical wiring—as well as electrically powered equipment such as machinery, pumps, and motors.

Most facilities will benefit from an annual thermographic scan of your electrical equipment and important machinery. The first time we conduct a scan at your facility, we will establish a baseline heat signature for each piece of equipment.

In subsequent years, we'll compare the baseline scan and the current scan to identify equipment that is beginning to produce too much heat.

Doing an annual scan of your facility will allow you to detect overheating that cannot be seen but has the potential to cause a fire or burn up the equipment.

By catching these issues early, they can often be corrected with simple repairs. However, left uncorrected, we've seen things as simple as a loose switchgear bolt result in so much heat that the switchgear melted. The loose bolt created heat that would have been detected by a thermographic scan. Instead, the scan never happened, the issue went undiscovered for several years, and resulted in a switchgear replacement that cost over \$10,000.

Utility Location

On your site, one of the biggest dangers to your power and data systems come from digging and excavation. Digging may be necessary for a number of reasons—new construction, infrastructure repair, upgrades, irrigation installation and reconfiguration.

Anytime you dig, you run the risk of hitting an electrical, water, sewer, or data line. Across the country, you can call “811” to request a utility location by your local utility company.

The utility company will come out and locate (mark) the locations of their pipes or cables. They will not mark the locations of any private utilities on your property. Your building-to-building fiber-optic line, any site-specific water, sewer, or drainage lines, and any private electrical (for example, lines running from solar panels to the building) are your responsibility to locate.

If you have any private utilities, you'll want to contact our firm, or a similar firm, 1 week to 3 days in advance of digging to have your private utilities located and marked.

WARNING: You may have plans that show the location of underground lines. In our experience, plan locations for underground lines are notoriously wrong. Site conditions often require a deviation from the plan, and the plan documents are rarely updated to reflect the actual location of the lines.

To schedule a utility location call: 610-253-3081.

Key Questions

- Who is responsible for utility location for your project?
- When was the last time you performed a thermography scan?
- Do you have any equipment that is overheating or is in imminent danger of failure?

Key Actions

- Call for a utility location at least three business days before your project should start.
- Create an annual plan for thermography scanning.
- Ensure your as-built drawings are up to date.

CHAPTER 12

Key Considerations for Electrical Systems in New Construction

RATHER THAN TRY to give you a prescription for what type of electrical system to install in a new facility—it is simply too complex to do so—in this chapter, I want to give you the key things you should consider when building a new facility or expanding an existing facility.

Who Will Do the Electrical Design? Will you hire an electrical engineer, or will you have an electrical contractor do the design? Beware, some contractors will “underdesign” the project to give you a favorable (low) bid price and then make up the difference with change orders once you’re under construction and stuck. And, you may not know enough to spot the problems before construction begins.

Understand the Permit Process and Code Requirements. Building codes are constantly being “upgraded” to increase safety and energy efficiency. What may have been acceptable a decade ago may now be disallowed. Involve an electrical contractor early in your concept and design process to account for new code requirements and to plan enough time for the permitting process.

Plan for Longevity. You're going to invest significant time and money in construction. You want to make sure that the electrical hardware you put into your new building will last. Like everything else in life, you get what you pay for.

Beware of “Alternates”. Keep an eye out for contractors switching to *alternate hardware* and deviating from what was specified in the building design. Often this is the contractor's attempt to cut their costs and increase profit by substituting lower cost/quality equipment.

Account for Product Lead Time. Many electrical components are made in Mexico. During times of high demand, be sure to order components early to avoid delays that will impact your construction schedule.

Adequate staffing. Ask about the staffing level of your electrical contractor. You want to make sure that they are large enough to properly manage and staff your project from start to finish. We have been called in to “rescue” projects when another contractor disappeared from the site for weeks, halting construction.

Prior Experience in Your Type of Project. Not all electrical contractors are the same. Like any profession, some professionals specialize in certain types of projects. When you're selecting a contractor, you will save aggravation and money by ensuring that the contractor you choose has specific experience in projects like yours. You'll benefit from all of their prior experience and knowledge. Often, an experienced and specialized contractor can save you money by helping you avoid over-building where you don't need it and save you future

headaches by planning enough capacity for future upgrades where it counts.

Upgrade Opportunity. If you are adding to an existing building, will you use this as an opportunity to upgrade older systems in the existing building? This may be a great time to make those upgrades and save money at the same time.

Integrate with Older Systems. If you need to integrate the new construction with older systems, you want to ensure that the system can be integrated and that you plan for the integration during the design phase to avoid delays during construction.

Guarantees and Warranty Period. Electrical equipment and the labor involved to install it should come with a warranty period of one year. Be sure to know what the warranty period being offered by the contract is, and make sure it is documented in your contract.

Key Questions

- Who will design the electrical systems in your new project?
- What's the best voltage type and service size for your building?
- What permits will be required, and how long will it take to obtain them?

Key Actions

- Make sure your project accounts for future expansion requirements.
- Allow for appropriate product lead time in your construction schedule to avoid delays.

- Ensure that the electrical contractor you hire has specific experience in your type of project.

How to Get Help

THE ELECTRICAL, LIGHTING, life safety, security, data, sustainable energy, and power backup systems in your facility are highly technical. This book is not designed to make you an expert, but instead, to arm you with some basic knowledge and the key questions you should ask of any electrical contractor you work with.

If you come across a situation and you have questions and need help, we are here for you.

Simply call my office, email me, or contact us through our website, and we will help.

Phone: 610-253-3081

Book a time to talk with me online: www.talktogray.com

Email: kgray@grayconnective.com

Website: www.grayconnective.com

Keep this book on your desk or bookshelf as a ready reference when you have an electrical issue pop up on a site you manage or own.

We look forward to being there for you when you need help!

