

THE RELATIONSHIP BETWEEN

Architectural Design AND MEP Engineering



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Introduction

Why MEP is an Important Part of the Architectural Design Process

MEP (Mechanical, Electrical, and Plumbing) systems are integral to the functionality, comfort, and safety of any building design. Some specific reasons why architects should include MEP engineers as part of the design process are:

1. **Building performance:** MEP systems directly impact the performance of a building, including its energy efficiency, indoor air quality, and overall comfort. Consider these factors when creating high-performance buildings that meet the needs of occupants and comply with local and international building codes.
2. **Coordination and integration:** Coordinating with MEP engineers will ensure that the building's structure, envelope, and aesthetic elements are seamlessly integrated with the MEP systems. This collaborative approach helps to avoid conflicts and ensure that the design is functional, efficient, and aesthetically pleasing.
3. **Space planning and optimization:** MEP systems often require significant space within a building, affecting its layout and overall design.
4. **Cost control:** Be mindful of the long-term costs associated with the MEP systems you incorporate into your designs, as well as the potential for energy savings through efficient design choices.
5. **Safety and compliance:** Architects have a responsibility to ensure that the buildings they design are safe and comply with relevant codes and regulations. This includes understanding and incorporating appropriate MEP systems to provide for fire protection, electrical safety, and other essential safety features.
6. **User comfort and satisfaction:** Collaboration with MEP engineers will provide adequate heating, cooling, ventilation, and lighting that contribute to a positive user experience.
7. **Environmental impact:** The choice of MEP systems can significantly influence a building's environmental footprint. Aim for sustainable design by selecting energy-efficient systems, incorporating renewable energy sources, and minimizing water consumption.

In summary, architects require efficient MEP designs to create functional, efficient, safe, and comfortable buildings that meet the needs of their occupants, adhere to regulatory requirements, and minimize their environmental impact. Collaborating with MEP engineers throughout the design process ensures a holistic approach to building design and the best possible outcomes for all stakeholders.

What is the Importance of MEP Design in Construction?



In 1990, the Bank of China built a 1,204-foot tall skyscraper that cost them \$1 billion. This building arches upwards to the sky and becomes slender and pointed at the very tip.

It is a beautiful marker of human engineering and a broad show of money and power. This is an

extreme example of complicated engineering and construction, but projects requiring both of those things happen on a smaller scale every day. Perhaps such a construction project is on your list.

Hiring MEP engineering consultants (mechanical, electrical, and plumbing experts) can simplify this project. But what services will you actually receive when hiring an MEP consulting firm?

Keep reading to learn all you need to know about these expert consultants!

Why is MEP Engineering So Important?

MEP engineering is vital to almost every part of the building and construction process. MEP stands for “mechanical, electrical, and plumbing” and it includes everything from start to finish.

Every step of the way, it is essential to have the advice and guidance of an MEP engineer. These engineers know how to maximize space and ensure that safety and code standards are followed.

They know where to install fire alarms and how to implement an escape route properly. Each part of the triad performs a separate job to bring the building together. They maximize the available space to ensure energy is not wasted, nor are standards eased.

One prime example in recent years is the need for buildings to have HEPA filters (for [COVID-19 and other particle control](#)). These filters help preserve air quality and prevent the spread of disease. MEP engineers advise building planners on where to place these and how many to install.

They also help plan the layouts of AC and heating units in the ductwork of a building and help ensure the space is used appropriately so that no energy is wasted in the process.

Next, we will explore each letter of the MEP acronym in detail.

The “M” in Mechanical

The “M” in MEP stands for “mechanical”. This portion of the job description refers to the heating, cooling, and ventilation systems in a building.

Mechanical engineers are experts in building airflow and energy utilization including technical guidelines, regulations, common mechanical issues and their solutions, and compliance with global, federal, and state legislation.

They make sure everyone in the building is comfortable and safe in the environment.

[Mechanical Engineering Services](#) include the planning and design of:

- Central Heating & Cooling Systems
- Ductwork Design & Optimization
- Filtration Systems and Dust Control systems
- Exhaust Systems
- Humidity Controls
- Title-24 Compliance
- VRF and one-to-one mini split systems
- Refrigeration systems
- Clean Room systems
- VAV Systems

The “E” in Electrical

The “E” in MEP stands for “electrical”. They specialize in the proper placement of power surges and wiring throughout the building.

Electrical engineers guarantee the wiring is not interfering with the plumbing and ductwork of the building. They know how much power you can use in your space, ensure safe installation and maintenance of all electrical systems, and prevent fire hazards through the proper installation and placement of alarms and detectors.

This branch of MEP design also guarantees the continuous operation of the building by planning the placement of backup generators and electrical protection.

They are part of the energy conservation experts along with the HVAC experts. Through the proper planning of the building's power systems, they can save the building managers a lot of money.

Electrical Engineering Services include the planning and design of:

- Power and Control Design
- Power Distribution
- Lighting Systems
- Control System Upgrade and Replacement
- Energy Audits
- Switchgear design
- Emergency Power Systems
- Power Quality
- Lightning Protection
- Renewable Energy and Solar Design
- Title-24 Compliance

The “P” in Plumbing

The “P” in MEP stands for “plumbing.”

Plumbing engineers are responsible for planning and designing the pipe installation.

A plumbing engineer will design reliable and highly accurate plumbing system designs that meet your sustainability goals. With a good plumbing system design, you can avoid oversized pipes and fittings for your new constructions which reduces the installation cost of your plumbing system.

Plumbing Engineering Services include the planning and design of:

- Water Conservation
- Gas Piping
- Sump/pump systems
- Waste Piping
- Process Piping
- Compressed Air
- Vacuum Systems

- Sewage Ejectors
- Grease Interceptors
- Water heating
- Plumbing Vent and other water/gas/sewer system design

What Are MEP Engineering Consulting Firms?

Basically, an MEP engineering consulting firm brings all three of these experts together to help plot out and properly layout your entire building. Between these three types of experts (mechanical, electrical, and plumbing), they know it all. A consulting firm will advise you on where to place each appropriate unit. They will advise you on the proper implications of standards, such as fire escapes. They can also help you meet the legal and regulatory requirements.

Depending on the state in which you are building, there are many regulations. These are often building and zoning laws that can inhibit your construction process. An MEP engineering firm can help you meet the requirements as you build.

This can save you time and money in the long run. You don't want to install your restrooms and find out after the fact that they failed inspection.

Some of the top benefits of hiring an MEP consulting firm include the following:

- Increased efficiency
- Environmentally friendly systems
- Effective execution
- Cost-effective solutions
- Time-effective solutions
- Abidance of local regulations
- Abidance of state/federal regulations

The most appealing aspect of hiring MEP engineering consultants is to ensure efficiency. You do not want to expend money on heating, cooling, and lighting unnecessarily.

An environmentally friendly building is also an important factor in its construction. Especially with the [likely increase in environmental laws](#) in the coming years. An experienced MEP consultant can have your building prepared to meet these coming restrictions.

Lastly, these experts can increase the speed at which your building will be completed. They can help your building project run smoothly and efficiently.

How the Wrong MEP Design Can Jeopardize the Safety of Your Building Occupants

The mechanical, electrical, and plumbing (MEP) systems in a building play a vital role in the safety and well-being of its occupants. These systems are responsible for providing essential services such as heating and cooling, lighting, and plumbing, and they must be designed and installed correctly to ensure the safety of those inside. Unfortunately, many building owners and developers overlook the importance of these systems, which can result in serious safety hazards.

Fresh Air in Multi-Story Buildings

One of the biggest dangers posed by poor MEP design is insufficient supply of fresh air to the space. In multi-story buildings especially, it is important to design for the proper amount of fresh air to maintain good indoor air quality. This fresh air must be carefully controlled to ensure that it meets the needs of the building and its occupants. This is often a code requirement as poor indoor air quality can lead to a range of health problems for building occupants, such as headaches, fatigue, and respiratory issues. Inadequate ventilation can also contribute to the buildup of indoor pollutants, such as carbon dioxide, volatile organic compounds, and biological contaminants.

To meet these code requirements and ensure good indoor air quality, multi-story buildings typically have mechanical ventilation systems in place to bring in fresh air and remove stale air. These systems should be designed with the right fresh air exchange rate to ensure the indoor environment remains healthy and comfortable.

MEP engineers play a crucial role in maintaining and improving indoor air quality by designing and integrating systems that effectively control and circulate air throughout the building. This includes proper air filtration systems to remove pollutants and HVAC systems to control temperature and humidity levels. For example, in a medical facility, the air must be thoroughly filtered to minimize the risk of infection. In a school, the air must be similarly ventilated to minimize the spread of germs and improve learning conditions. By hiring expert MEP engineers, building owners can provide a safe and healthy indoor environment for their occupants and avoid any potential hazards related to poor indoor air quality.

It's also important for MEP engineers to consider the materials used in the building's construction, as some building materials and furnishings can emit harmful pollutants into the air. This is one of

the reasons why it's important for MEP engineers to stay up to date with current IAQ (Indoor Air Quality) regulations and standards and to consider IAQ in their design and integration of building systems.

Power Outages

Another major risk posed by inefficient MEP designs is power outages. In critical facilities such as hospitals and schools, a power outage can be life-threatening. It is essential that backup power is available in case of a power failure, and the MEP design must include backup and emergency power systems to ensure that building occupants are protected.

Carbon Monoxide Hazards

Carbon monoxide hazards are another important consideration in the MEP design of buildings. In parking garages especially, carbon monoxide is a potential hazard that must be taken into consideration, and carbon monoxide sensors must be installed to detect any rise in levels. These sensors must be linked to an alarm system, so that building occupants are alerted if levels become too high. If the MEP design does not include carbon monoxide sensors, it can put building occupants in danger.

Emergency Lighting

In the event of an emergency, it is essential that building occupants can safely evacuate the building. The MEP designs must ensure that emergency exits are well-lit and clearly marked, and that emergency lighting and power systems are in place. If these systems are not designed correctly, it can make it difficult for building occupants to safely evacuate the building, increasing accidents and threats to the occupants at large.



Reillumination, or backup lighting, is a key component of an effective emergency lighting system. It is designed to automatically turn on when the primary lighting source fails, illuminating the paths of egress and ensuring that occupants will safely evacuate.

Building owners and managers should also conduct regular maintenance and testing of the emergency lighting system to ensure it is functioning properly and can be relied upon in the event of an emergency.

Plumbing Systems

Plumbing systems are another critical component of MEP design, especially in schools and medical facilities where hygiene and accessibility are of utmost importance. The plumbing system in a building must be designed to meet the needs of the building and its occupants, and it must be installed correctly to prevent leaks and other issues that could disrupt the water supply.

In schools and medical facilities, hand sinks must be in the right location for maintaining good hygiene. In schools, hand sinks should be located in convenient, easily accessible locations near restrooms, food preparation areas, and other high-traffic areas. In medical facilities, hand sinks should be located near patient care areas, such as exam rooms, to facilitate handwashing and reduce the spread of germs.

In addition to proper placement, it is also important to consider the height and accessibility of hand sinks in these facilities. According to the [Americans with Disabilities Act \(ADA\)](#), plumbing fixtures, such as hand sinks, must be installed at a height that is accessible to people with disabilities. This typically means a height between 29 and 34 inches from the floor to the top of the sink. An experienced MEP engineering company can ensure that the plumbing system meets these requirements and provides a reliable water supply to all areas of the building.

The Importance of Mechanical, Electrical, and Plumbing Engineers in the Construction of Your Building

Mechanical, electrical, and plumbing (MEP) systems play a crucial role in the design and construction of buildings. While architects focus on the design of the building's structure and its aesthetic features, MEP engineers are responsible for the design and integration of the building's critical systems, including HVAC, electrical, plumbing, and fire protection systems.

MEP engineers work closely with architects and other members of the design team to ensure that the building's systems are properly integrated into the overall design and meet the needs of the building's occupants. This includes ensuring that the systems are energy-efficient, meet code requirements, and provide a comfortable and safe environment for building occupants.

MEP engineers also play an important role in identifying potential issues with the building's systems during the design phase and providing recommendations for resolution. This helps to avoid potential problems and ensure that the building's systems are designed and installed correctly from the outset.

Hire an Experienced MEP Engineering Consultant

It is essential to work with an experienced MEP company to ensure that the MEP systems are designed and installed correctly. Regular maintenance and inspections should also be performed to ensure that the systems continue to function properly and to prevent potential hazards. An incorrect MEP design can result in numerous hazards such as poor indoor air quality, power outages, carbon monoxide hazards, emergency exit challenges, and subpar plumbing systems. It is crucial to engage a knowledgeable and experienced MEP company to design and install the MEP systems correctly. By doing so, building owners can make their building the very best environment it can be for the occupants!

5 Key Strategies for Making a Building More Efficient

Did you know incorporating energy-efficient solutions in commercial buildings can drastically decrease bills while improving net income of the building owner?

Commercial construction with efficient features also improves occupancy rates and helps property owners create a healthy and

comfortable environment. As [5.9 million commercial buildings](#) use more than 18% of energy in the US, efficiently designed projects can decrease the emission of greenhouse gas.

Whether it is the building's electrical, energy, or water consumption system, MEP engineers can help you design and install them optimally. As a result, you will be able to significantly reduce commercial leasing build-out, operating costs, and resource usage.

Before we plunge into the strategies you can use to make commercial buildings more efficient, let's briefly discuss the benefits.



Benefits Of Making a Building More Efficient

- Cost Effective- Using efficient building design tactics lowers the cost of your energy bills.
- Environmental impact- As efficient building reduces greenhouse gas emissions, it controls fossil fuel usage while impacting the environment positively.
- Occupant Comfort- The comfort of the building's occupants can be improved, boosting output and satisfaction.
- Building value- Being more appealing to potential purchasers or tenants will increase the value of an efficient property.

Why Smart Buildings ARE Important

Smart buildings, also called efficient buildings, use technology to improve human comfort, safety, and productivity. Residential, commercial, and industrial structures all use this idea.

It is feasible to achieve automated control for the functioning of a building. Thanks to the capability acquired by Internet of Things (IoT) devices to gather, process, and analyze data from various elements and locations, MEP engineers can use advanced construction methods to improve these architectural spaces' accessibility, safety, usability, and energy efficiency.

The whole-building concept, which views a building as a unified energy system where each component influences the performance of the whole building, is a specialty of mechanical, electrical, and plumbing engineers.

Typically, the whole-building strategy effectively utilizes water, power, and other natural resources. Additionally, it seeks to reduce waste and requires all building experts to know each component that impacts a building's energy use.

Ways to Make a Building More Efficient

1. Use of Renewable Energy Sources

Fossil fuels, such as natural gas, oil, and coal, were utilized as fuel before the development of technology that enabled energy to be gathered from nature. While there is still a considerable use of fossil fuels, new techniques are replacing traditional fuel collection methods.

Unfortunately, using fossil fuels can damage the environment and deplete natural resources. Renewable energy sources, however, generate relatively little waste and will be available for years to come.

Advancements in technology include solar cells, a form of renewable energy. Solar cells can convert sunlight or solar energy into a usable form of renewable energy. This allows commercial construction to be more efficient. Other renewable energy sources include hydroelectric power, wind turbines, hydrogen fuel cells and nuclear energy.

2. High-Security Features

Undoubtedly, high-security features are vital to make a building more efficient and safer. This is why highly qualified MEP Engineers combine artificial intelligence, machine learning, and the IoT to design buildings that can control sophisticated security systems and instrumentation.

Let's examine a couple of instances:

- The central system is coupled with a monitoring system that continuously tracks building accesses and provides real-time and archived reporting. This data and analysis is used for vulnerability reduction and prevention.
- When a fire signal is activated, it is examined visually by the video surveillance system, along with the number of times false alarms have been generated.
- Interconnection is the most critical component of an efficient building. Internal networks are used by the system, but data can also be accessed anytime and from any location over the Internet.

This allows you to manage and control a building remotely with an internet connection and secure access.

3. Glazing Systems of an Efficient Building

The design of an efficient building should include energy-efficient skylights, doors, and windows appropriate to the climate zone of the property.

Remember that direct sunlight-facing structures heat up more quickly and use more energy to maintain cooling. Avoid letting direct sunlight enter the building by covering the windows. Think about insulating the building's climate-controlled spaces and enhancing insulation using solar screens, awnings, and solar films.

Inspect the doors and windows for leaks because they affect the inside environment. MEP engineers can install a glazing system, including energy-efficient doors and windows, that will provide ventilation, light, and warmth while reducing energy bills.

4. Smart Building Devices

A practical solution to save money and energy while enhancing building safety is to incorporate smart building products into the design of a structure.

Ceiling tiles, motion sensors, smart lighting control systems that shut down lights when the building is not occupied, programmable thermostats, integrated air purification systems, and various air quality alarms are a few examples of smart building products.

5. Insulated, Waterproof Slab Foundation and Plumbing Fixtures

A compressively designed commercial construction finance plan considers smart electrical and plumbing solutions. It includes using automated plumbing fixtures designed to function with less water, which will save large quantities of water.

For instance, toilets that once used 7 gallons to flush now only require 1.3 gallons, saving more than 80%. Plumbing and building codes mandate water-saving plumbing fittings in many locations.

Concrete slabs with stiff foam insulation underneath the slab are used to create an energy-efficient building design. Concrete's great thermal mass traps radiation and makes a building's interior cozy and dry.

Summing Up

Commercial construction is an expensive endeavor. You can take the initiative and avoid using more energy than you intended. Cost-effective tactics put into practice techniques that cut waste and boost efficiency, and lower expenses.

To make the most of the strategies mentioned above, seek the help of professional MEP engineers.

5 Sustainability Practices to Include in Your Next Commercial Construction Project

Incorporating sustainable elements into your design and construction process can not only make a positive environmental impact but can also elevate the services you offer your clients.

But how do you know where to start? And are there specialists that can help you navigate the world of sustainable commercial construction?

This article explores five key points to consider when it comes to sustainable design and how a Mechanical, Electrical, and Plumbing (MEP) Engineering Designer can support your sustainable construction goals.

What Is Sustainability in Design?

In a nutshell, sustainable design in architecture involves the building materials, methods used, materials sourced, and design choices in general for your project.

By taking these factors into account, you're helping preserve natural resources and potentially cutting energy consumption by a significant amount.



That's a win for the environment and a win for your business.

An essential part of sustainable commercial construction is working within your client's budget to make their eco-friendly design dreams come true. But oftentimes clients don't know exactly what it takes to incorporate sustainability into their project.

For example, is it feasible and cost-effective to use solar panels in your designs? Are there different recycled materials that would work best in your particular region (e.g., wood or stone)?

These types of questions can serve as guiding points during your client conversations to ensure you're achieving sustainability in every aspect of your commercial construction project.

What To Consider for Sustainable Commercial Construction

1. Minimizing Environmental Impact

Minimizing environmental impact is at the top of our list because eco-friendly and sustainable designs seek to produce less waste and benefit the planet. If you're under contract with a property owner, work together with them to set sustainability goals before the project starts. These goals can include the percentage of energy saved, whether or not the building will be self-reliant for energy, what materials you can use that are upcycled or eco-friendly, and more.

While sustainability has become a more widely talked about and researched topic in recent years, the reality is that raw materials have been rising in cost and certain eco-friendly materials are not cost-effective. However, the payoff of having a sustainable commercial building will be greater than the initial cost, not just in terms of money, but also in terms of job creation, waste reduction, and longevity of our planet.

Additionally, many city and state governments give out tax breaks, grants, and other incentives for sustainable building practices. For example, if your building is Leadership in Energy and Environmental Design (LEED) certified, [you can receive financial, permitting, or other cost or time-saving benefits from most state governments.](#)

2. Using Renewable Resources

Sourcing materials ethically is one thing; finding renewable resources is another.

When it comes to renewable resources, you're really looking for things that can be naturally replenished in a short amount of time. In some cases, this could mean finding recycled items to upcycle in your design. It can also mean choosing a material like steel, for example, instead of wood or concrete for framing. Steel frames generally cost [5-7% less](#) than wood or concrete frames. Aside from cost, steel is also more durable and resistant to elements that can negatively affect wood or concrete.

No matter what your ultimate architectural plan is, working within your specific locale is vital when it comes to making eco-friendly choices.

3. Incorporating Green Infrastructure

In 2019, Congress passed the [Water Infrastructure Improvement Act](#). This impacted the way we utilize runoff from stormwater and created more opportunities to actually filter and absorb stormwater where it falls.

[Incorporating green infrastructure](#) in your sustainable design projects can significantly impact the water and soil quality in your area. Anything from a small park outside your office building, a garden in the courtyard, a rain barrel that funnels water into another part of your building, or a row of trees to welcome guests into your space can impact the way water is efficiently used.

This is where an MEP Engineer can be your most valuable asset. They know the city codes, and their knowledge and expertise can help you intelligently use this exterior water runoff in your sustainable design.

4. Enhancing Energy Efficiency

Efficient heating and cooling can make all the difference in your sustainable commercial construction. For example, you'll want to make sure all of your wiring, lighting, and appliances are energy efficient. Using elements like LED lightbulbs can improve your building's energy efficiency. Aside from energy efficient lighting and appliances, you can also reduce the cost of heating and cooling by using modern double-paned or triple-paned windows in your designs. Using double-paned or triple-paned windows can bring down the amount of heat gained and lost through windows by [25-30%](#).

This is also an area to explore alternative energy sources, such as wind or solar power. These sources can often be implemented at small- and large-scale, so your architectural plans can take size of building, location, and budget into account before deciding which one is right for your client.

5. Optimizing Water Use

While we touched briefly on this in the Incorporating Green Infrastructure section above, optimizing water use is a key factor in eco-friendly design.

As you're building out your basic mechanical, electrical, and plumbing plans, consider which plumbing fixtures minimize water use and allow for low flow as much as possible.

In addition, account for any city regulations when it comes to stormwater runoff and utilize it within your commercial design.

Sustainable Design• Hiring an MEP Engineer

Sustainable design takes careful planning, thoughtful questions, and a passion for minimizing environmental impact.

MEP engineering is a vital part of the process — from start to finish. From the proper placement of plumbing and ductwork to ensuring all safety and energy codes are followed, MEP engineers help everyone stay safe and can help you save time and money along the way.

15 Tips for Effective Commercial Lighting Design

Commercial lighting design can improve the productivity and efficiency of employees by providing the right amount of light for them to be able to do their jobs safely. For example, a warehouse where employees are often using heavy machinery will need brighter, more expansive lighting than a restaurant or individual office will. Keep reading for fifteen tips to consider for your next lighting design project.

1. Be Aware of How Much Light You Need

Lighting in a space is usually measured in “foot-candles,” or the number of Lumens per square foot. Here are some general guidelines for how many [foot-candles different types of spaces should have](#):

- **Retail:** 50 foot-candles
- **Department Store:** 40 foot-candles
- **Auto shop:** 50 foot-candles
- **Classrooms:** 40 foot-candles
- **Factories:** 30-100 foot-candles
- **Hallways:** 20-25 foot-candles
- **Warehouse:** 10-30 foot-candles

A useful equation for knowing how many lighting fixtures you need for a space is: “multiply the space’s total square footage by the suggested number of foot-candles and then divide that number by the lumen output of the fixture you wish to use” ([Steel Lighting Co.](#)).

2. Use a Consistent Light Temperature

Lighting fixtures and bulbs come in a range of colors and temperatures. Using a consistent temperature is key to creating the ambient environment of a space as well as unifying the design.

As [ConTech Lighting says](#), “Correlated Color Temperature, or CCT, is a measure of a lamp’s color appearance when lighted. All lamps are given a color temperature based on the color of the light emitted. White light falls into three general categories: warm, neutral and cool, measured in Kelvin (K).

White light with a hint of yellow-like candlelight is called “warm white” (below 3000K); it enhances reds and oranges, dulls blues, and adds a yellow tint to whites and greens.

Neutral white (3000K – 3500K) enhances most colors equally and does not emphasize either yellow or blue.

Bluish white, like moonlight on snow, is considered “cool white” (above 3500K); enhancing blues, dulls reds and imparts a bluish tint to whites and greens.

Warm light makes a space feel smaller, more comfortable and familiar, where cooler light makes areas appear more spacious.”

More intimate spaces like restaurants, residences, bars, and individual offices tend to have warmer CCT than larger spaces such as warehouses, department stores, and large, open office buildings.

3. Consider the Color Rendering Index (CRI)

CRI uses a scale from 0 to 100 percent and indicates how well a light renders color.

ConTech Lighting says, “Color Rendering Index is a measure of how a light source renders colors of objects compared to how a reference light source renders the same colors. CRI can be used to compare sources of the same type and CCT.

A palette of specific reference colors is used, and each R value calculation is the difference between each color sample illuminated by the test light source and the reference source. The group of samples is averaged, and a score between 0 and 100 is calculated, with 100 being the best match between light sources.

APPEARANCE	
R1	Light Grayish Red
R2	Dark Grayish Yellow
R3	Strong Yellow Green
R4	Moderate Yellowish Green
R5	Light Bluish Green
R6	Light Blue
R7	Light Violet
R8	Light Reddish Purple
R9	Strong Red
R10	Strong Yellow
R11	Strong Green
R12	Strong Blue
R13	Light Yellowish Pink
R14	Moderate Olive Green

The higher the CRI of a light source, the better – and more natural – colors appear. For products to be presented in a true-to-life way, which increases visual comfort, a CRI value of 80 – 100 is recommended”.



Low CRI



High CRI

The higher the CRI, the clearer and more vibrant colors will appear in the space.

4. Save Energy

LED lights may be more expensive up front, but they last for a long time and are more energy efficient than traditional light bulbs. Using energy-saving options like LEDs will end up saving you and your client money in the long run plus improving the sustainability rating of the building.

Aside from their energy-saving and green benefits, LEDs are also a lot less likely to burst from a power surge or a breach in the integrity of the glass.

5. Match the Lighting to the Work Environment

Again, the amount, brightness, placement, color, and temperature of your lighting design should all complement the purpose of the space. What will this building be used for? Does it need bright, cool, consistent lighting to allow workers to operate heavy machinery easily and safely? Or is it a restaurant that needs warmer “mood” lighting and accent lights to highlight the art on the walls?

The intended purpose of a space should be the number one influence on your lighting designs and plans.

6. Highlight the Landscaping

Highlight unique and important landscaping features on the outside of the [commercial property](#) (if there are any). A variety of techniques can be used to make the landscaping look dynamic and aesthetically pleasing at night, such as uplighting, downlighting, colored lights, and statement lights.

Using warmer-toned lights outside will help the business look more inviting and friendly to visitors. You can blend the lighting in with the landscaping by placing lights in trees or among bushes and even add strategically placed colored lights to emphasize certain features or match the brand colors of the business.

If the building has a long pathway or stairs leading to the entrance, try placing some statement lights such as lanterns or fairy lights along the pathway to not only enhance the aesthetic of the building's entrance but also provide enough light for people to safely navigate paths and stairs in the dark.

7. Accentuate the Brand

Exterior lights can be a great way to display the brand colors and make the building stand out. For example, T-Mobile's headquarters in Bellevue, WA are lit up at night with the company's signature pink color and they stand out from the buildings around them.



8. Don't Underestimate the Importance of Natural Light

"Every space can benefit from windows that bring in light from outside. Natural light can help boost our energy and overall mood. Don't forget, one of the key advantages of LEDs is their high CRI value or similarity to natural light. Mixing the two can create a bright and inviting space" (Lumenture). Large windows can help utilize natural light as well as make the space feel more open.

9. Use Layered Lighting

Using "layers" of lights will help you light the space evenly and in a visually interesting way. For example, you could use recessed lights in the ceiling alongside some strategically placed accent lighting and finish the space off with some floor or table lamps.

10. Use Task Lighting Selectively

As ConTech Lighting states, “Task lighting is used to illuminate an area for a specific task, providing a focused, localized, and higher level of illumination. Necessary to the functioning of a space, it is important to use energy efficient sources to reduce operating costs.” Task lighting could be an additional light placed over a workstation or moveable lamps on desks or drafting tables.

11. Strategically Place Emergency Lighting

When creating your lighting design plans, don’t forget to include the placement of emergency lighting, such as exit signs and directional signage. Place emergency lights and signs where they are easily visible and effectively help guide employees and/or customers to the nearest exit.

12. Consider How Long the Lights Will Be On

What are the business hours of the company? Do all the lights need to stay on during operating hours? Make sure to consider these questions when choosing lighting fixtures and bulbs so you can keep your lighting design as energy efficient as possible.

13. Factor in Potential Glare and Reflection

Make sure to account for how light will be reflected off various surfaces in your lighting plans. Surfaces with a higher reflection rate will bounce light back into space, creating higher illumination.

ConTech Lighting says, “Light reflectance is based on a scale of 0, total surface light absorption, to 100, total light reflection.

Spread reflection materials, such as brushed aluminum, have a high, though diffused, reflection, reflecting 5-10% of light. Diffused reflection materials, as

simple as a white painted wall, give a uniform brightness, and are good reflecting backgrounds for coves and smaller spaces”. See the chart above for reflection levels of different materials.

MATERIAL	REFLECTANCE PERCENT
<i>Diffuse: Uniform surface brightness</i>	
Limestone	35-60
White Paint	75-90
White Structural Glass	70-80
<i>Spread: General diffuse reflection</i>	
Brushed Aluminum	55-60
Etched Aluminum	70-82
Processed Aluminum (Diffuse)	70-80
Satin Chrome	50-55
<i>Specular: Directional control of brightness at specific angles</i>	
Chrome	60-65
Metal coated plastic	75-95
Mirrored and optical coated glass	80-95
Polished aluminum	69-70
Stainless Steel	55-65

14. Use Lighting to Create Contrast

Lighting a space should include contrast, otherwise colors will be difficult to see, and the space will appear flatter.

15. Create a Cohesive Environment

Whatever techniques you use when creating a lighting design plan for your projects, the most important thing to remember is to create a cohesive environment that provides the functionality required by the business while maximizing energy efficiency and employee productivity.

Design Ideas for Commercial Spaces

Lighting should always be part of the initial design phases for any project. Interior and exterior lighting designs have the power to transform the space.

A Guide for Creating the Perfect Warehouse Office Design

Why Office Layout is Important

In order for an office layout to be considered as conducive for productivity, it needs to have a balance between private and collaborative spaces. This will allow employees to choose which environment suits them best depending on what they are working on.



In recent years, more and more companies have been converting old buildings into modern office spaces, storefronts, restaurants, homes, and more, usually to take advantage of cheaper rents and more space. Unused warehouses make up a large portion of buildings that are being renovated and repurposed.

Since a warehouse is generally a wide-open, functional space, there are endless ways to turn one into offices. The new layout of the building can be whatever you want it to be, renovating a warehouse is like starting with an empty shell and creating/filling in the insides to fit its new function, provide comfort, and create a cohesive modern space.

Important Considerations When Designing a Warehouse Office Building

When you are contracted to design and create office spaces within an old warehouse, whether the entire warehouse is being transformed into an office building or an active warehouse just needs space for their administrative staff, there are some important things to consider.

- The size and shape of the space to be designed.
- The number of people who will be working in the space.
- The budget for the project.
- How much customization is desired for furniture, finishes, and other features.
- The style that best suits the business needs and brand personality.
- The type of work that will be conducted within the new space.
- The practical needs of the company and employees.

- Design features that match the company's brand colors, messaging, and overall company culture.
- Natural light sources – are there existing windows and where do you need to add windows to increase the natural light in the space?
- Practical MEP design needs – where will the bathrooms be located? Will there be a kitchen or kitchenette area or other space that will need running water? Where will artificial lighting be placed? How many outlets and how much electrical output will the company need? How will the space be heated or air conditioned?

These practical and aesthetic requirements of the job should inform your design choices for the space. Below are a few examples of design types you could utilize.

Example Design Style 1- Clean and Simple

The first example of warehouse office designs is a simple and clean look. The materials used are mostly wood and metal. This type of space is often inspired by minimalism and efficiency.

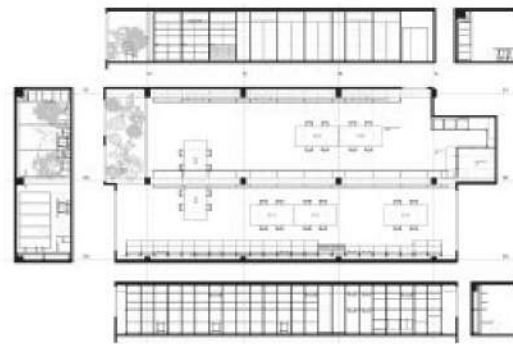
The warehouse is designed to be efficient in terms of space and storage. It also provides a modern look that will attract clients and future employees.

The clean and simple design may use white walls with minimal decoration to make the space feel airy and open while still providing enough storage space for all the company's needs.

The below images are of an old coffee roasting warehouse that was turned into a [collaborative office space by TT Architects](#) in Japan.



Another example is the below image and floor plan of a [warehouse-turned-flexible co-working space in Barcelona](#), created by Appareil for their new office and studio space.



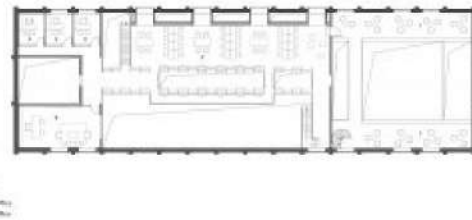
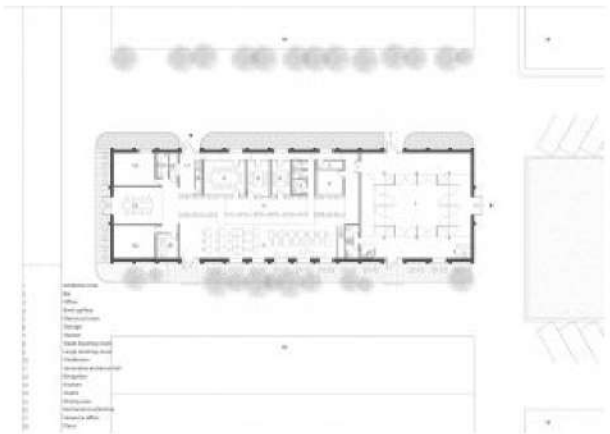
A popular trend in refurbishing old buildings is to use recycled or repurposed materials and objects, as seen in the below [warehouse office designs by DH Liberty in London](#).



Example Design Style 2: Industrial & Creative

Industrial warehouses are not usually known for their beauty. But with some creative thinking and a little ingenuity, they can be turned into something that is both functional and aesthetically pleasing. Creative office space designs have been around for a while now, with some companies going so far as to redesign their buildings from scratch when they move in. These spaces are well known to make employees happier and more productive as the latest research has shown that they help to cultivate a culture of innovation, collaboration, and creativity among all staff members.

The below images are of a large warehouse in Beijing that was [converted into the new home of Lens Magazine by Trace Architecture Office \(TAO\)](#).



Another example of industrial warehouse office design is the below [converted warehouse by Overland Partners](#) in San Antonio, Texas.



The next example uses a two-story design and features some of the original warehouse equipment and structure as part of the industrial design. A Berkley, CA-based firm, [Marcy Wong Donn Logan Architects](#) were in charge of the project.



A creative design may include features that you wouldn't expect to see in a typical office building. For example, the below pictures are of a [warehouse space converted into offices by Space Encounters](#), a Dutch architecture firm. The design includes greenhouses that can double as meeting spaces.



Example Design Style 3- Contemporary & Colorful

The last design style examples combine a contemporary office feel with pops of color for a relaxed and creative space.

The below offices were [created from an abandoned Brooklyn, NY warehouse by Macro Sea and Marvel Architects](#).



Another example of a contemporary office design utilizing pops of color is the [warehouse-turned-offices by ARRO Studio](#) in Paris.



Designing Corporate Offices in Warehouses

As the need for space continues to grow, many companies are turning to warehouses as a cost-effective option. Warehouses are perfect for office spaces because they come with a lot of open and flexible floor plan options. This is especially useful for companies that have a lot of different teams working together.

Designing warehouse office spaces can be challenging, but there are many creative ways to make it work. For example, you can use furniture that is made out of recycled materials and only use colors and patterns that reflect the company's values.

What You Need to Know to Stay Compliant When Building Commercial or Multi-Family Residential Properties

As a commercial construction or multi-family residential developer, you take pride in knowing that you've built a safe and resilient property. When people enter it, they shouldn't have to worry about their personal safety because they know that the construction is robust and will endure the test of time and nature. People are justified in expecting that their properties are safe, and building codes and standards are the foundation of this expectation.

These codes and standards comprise a thorough set of related regulations that govern the construction, remodeling, renovation, demolition, and repair of commercial and multi-family residential properties. As numerous as the objectives of building codes are, the main goal is to protect the wellbeing, safety, and health of the public when it comes to the building and occupation of these types of properties.

Building codes are either [model or adopted](#). Model codes consist of rules, recommendations, or suggested practices for others to follow when it comes to the construction and occupancy of these properties. They are not legal requirements but may become so if the federal, state, or local government adopts them. Adopted codes (or simply, "codes") are the decree of the jurisdiction, and they define a minimum standard to which commercial and multi-family residential builders must adhere.

A code addresses a specific aspect of building performance. For example:

- Building code addresses the design and construction of a commercial or multi-family residential building.
- Energy code regulates energy conservation.
- Fire code covers life safety for protection against fire and related risks during occupancy.

Sometimes, a jurisdiction — such as the federal, state, or local government — may supplement or amend model codes to suit regional needs. Thereafter, they may adopt the model code into law and make it part of the jurisdiction's building, energy, or fire code. Upon adoption, the codes become enforceable by law to ensure compliance. The relevant authorities may order property owners, designers, or builders who fail to meet code requirements to make repairs or cease construction.

Failure to heed the orders may lead to a fine, revocation of the building permit or an order to demolish all or part of the building. Likewise, failure to meet code requirements may lead to the cancellation of insurance, serious legal issues, or an inability to secure a connection to utilities. The authorities may deem the property unfit for occupation because it poses serious safety risks. For these reasons, compliance with building codes is imperative.

Code Types and Examples

The following are [examples of documents and information that must be produced and codes](#) to which all commercial construction or multi-family residential developers need to adhere when building new properties.

Architectural Plans

1. Demolition Plan listing quantity of hazardous waste (such as asbestos) or materials, if any, to be removed
2. Foundation and Structural Floor Framing plans
3. Floor plans, existing and proposed.
4. Exterior Elevations
5. Structural Material Specifications
6. Structural and Architectural Details
7. Typical Cross Sections in each direction
8. Shear Wall
9. Stairway Rise and Run, Framing, Attachment and Dimensions of Members
10. Shear Transfer and Holdown Bolt details
11. Prefabricated Fireplace with approved listing number
12. Section R301 Design Criteria

Mechanical, Plumbing, and Electrical (MEP)

1. Location and size of HVAC equipment
2. Location of plumbing fixtures
3. Location and size of fixtures, outlets, smoke detectors, switches, main electrical panels, and subpanels
4. Equipment Clearance Requirements
5. Compliance with energy codes
6. Compliance with fire codes

7. Electrical Grounding Systems
8. Emergency alarm systems (where required)
9. Compliance with California plumbing code

The codes change or are updated every couple of years. While the above lists may not be exhaustive, they give a good sense of the codes any commercial construction or multi-family residential developer should expect to encounter when building new properties. One way to stay compliant and make sure your designs and plans meet all code requirements is to hire an MEP engineering consultant firm that can work with you to create the most robust plans possible.

Compliance Requirements Continually Evolve

As compliance requirements for constructing a commercial or multi-family residential property become increasingly stringent, the conversation around the role of safety becomes more relevant. Consequently, the construction of these properties continually evolves to match the design and climatic challenges. Codes are vital in the establishment and maintenance of a building that is safe, sustainable, resilient, and efficient. Well-defined regulations, provisions, and guidelines create a framework that safeguards the structure and its occupants.

As energy, building, and fire codes intensify, the standards and code provisions for insulation will become increasingly important. The growing complexity of building envelope design necessitates the understanding of relevant codes and standards in order to design and build competitive properties. From acoustical specifications to fire safety to thermal resistance, the plethora of codes and standards for building commercial or multi-family residential properties will evolve.

The development of standards and codes continues to be a collaborative and transparent process that benefits from the innovations, knowledge, best practices, and advancement of all the stakeholders in the commercial and multi-family residential construction industry. Coupled with ongoing revision, an effective framework of codes facilitates the consistency needed for the manufacturing and business environment to remain competitive. This consistency is also essential for economic robustness and conducive to advancements in products, materials, and practices of construction. As a result, the commercial and multi-family residential construction industry can grow and match the needs of the modern world, serving the people and organizations who contribute to thriving societies.

Contact Pro Engineering Consulting for Your MEP Design Needs

Established in 1985, Pro Engineering Consulting is a regional, family-owned MEP engineering firm with deep industry experience and knowledge. We deliver professional designs and services for mechanical, plumbing, electrical and custom MEP engineering projects that meet industry requirements and clients' goals for all types of construction jobs.

Pro Engineering Consulting is headquartered in San Diego, with offices in Orange County, the Bay Area (Northern California), Nevada and continuing to expand. We are professionally licensed in 22 states.

Our pragmatic solutions save clients' resources, time, and money by creating quality designs that are cost-effective and meet project requirements, reducing liability, violations, and fees.

As the go-to firm for architects and contractors, our specialized team can provide an array of designs and services for HVAC, plumbing, fire protection design, energy conservation, LEED and commissioning. Our experience allows us to deliver projects that can range from commercial to retail, single family to mixed-use, and industrial to healthcare.

We believe in a collaborative, responsive and solution-oriented approach to our work. Our goal is to forge lasting relationships built on honesty and value.

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