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April 6th, 2020

Mr. David Agnew
President of Seneca College
1750 Finch Ave E,
North York, ON M2J 5G3

Dear Mr. Agnew

Proposal Submission: Smart Buildings Collaborative Project

We are pleased to share with you our documented research for the Smart Buildings Project. The shared research report contains data gathered from various resources to better educated oneself regarding installation of systems in the residential building.

Research was done on Lighting, HVAC, and Elevator installation in commercial buildings in dept by our research teams. We paid extra attention to the safety side of the systems and recommended products that would be most secure and comfortable for the local residents.

We have had a team of experienced professionals that worked on this project. Moreover, our recommendations provide quality goods for a reasonable price.

As a result, residents will be very satisfied to live, feel secure, and enjoy the environment that we provide. We have made sure to give the best as we are always doing. Important note to mention is that the result of our installation will protect the equipment from overheating, freezing, and moisture. This falls under the performance and sustainability portion of the report and will be discussed in dept.

Quick Tec Corp. dedicated its time to provide you with authentic research. Our team put a vast amount of time into creating this report.

Thank you for taking time to read this.

Sincerely,
Quick Tec Corp.

SMART BUILDINGS COLLABORATIVE PROJECT

Hazkeel Qureshi Ahmad Ludin Ashtawn Higgs Soheil Najafi

8th April 2020

SMART BUILDINGS
COLLABORATIVE PROJECT

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Institution
Seneca College Applied Science & Engineering Technology

Course Code
TEC400NBK

Date
8th April 2020

Submitting To
Professor Gigi Estragadinho

EXECUTIVE SUMMARY

The topics discussed in this report are HVAC, Lighting, and Elevators. Our objective is the installation of the aforementioned topics. Our goal is to present our client a proposal with information regarding benefits, costs, resources, safety concerns, and general operation for installation of Lighting, HVAC, and Elevators for the Smart Building.

Lighting, HVAC, and Elevators are essential needs for a person to have a comfortable environment to live in. This document contains all the possible information that our client needs in order to make a decision on whether these installations will benefit the residents or not.

Our main focus of discussion is safety towards the residents, the workers, the employers, and the community. Our team also focuses on making this project eco-friendly. Secondly, we also have to keep in mind the expenses and resources spent on the project are reasonable and within the limits of our client's expectations. Lastly, the satisfaction of our client is also a priority, therefore we will discuss the performance of our systems with our clients.

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INTRODUCTION

In this report, we will be talking about the HVAC system, the elevator system, and the lighting system. We will discuss the performances of all three of the systems, the safety precautions and much more interesting, and simple information for owners and people with the idea of purchasing these systems. To add on, we will also talk about why and how each system is used, the cost of a new system if to purchase, the cost to install them and we will discuss the process in which they are installed and how long they take to install.

This report will give you all the basic and important information you need on all three of these systems to know how they work so you could operate them. After reading and understanding this report, you will also learn how to be energy efficient when it comes to these three systems. As a result, the purpose of this report is to educate you regarding Lights, HVAC, and Elevators installation.

HVAC SYSTEMS

Introduction

What is HVAC?

The word HVAC is short for heating, ventilation, and air conditioning. The framework is utilized to give warming and cooling mechanics to structures. Central air frameworks have become the necessary business standard for development of new structures. Prior to the production of this framework, the three components were typically part between at least three gadgets.

There are four main types of HVAC systems. The four types of HVAC systems are split systems, hybrid systems, duct-free systems, and packaged heating and air systems. Every one of these kinds of HVAC units have master's and con's and realizing these components can assist you with concluding which is best for you.

Split HVAC frameworks consist of an indoor air taking care of unit, and an open air consolidating unit. They are regularly found in private or littler business structures, and are utilized distinctly for cooling. In split-frameworks, the indoor air dealing with the unit contains a fan, a cooling coil (which cools the air that disregards it), and an extension gadget. The outside consolidating unit comprises a blower and a condenser loop. Of all accessible cooling frameworks, split-frameworks have the most noteworthy vitality effectiveness rating. Makers likewise give shoppers a regular vitality productivity rating. In situations where a cooling just split-framework is introduced and warming is required, specialists realize that the warmth would need to originate from another source inside the structure.

A package system joins all the components of a split-framework into one unit. The unit is set outside, and air is circled through the framework and goes into the structure through an air dissemination framework. Throughout this report I will be discussing the different types of HVAC systems, the usage of the HVAC systems, and also the costs of HVAC systems. There are many interesting, simple, and life saving facts about the HVAC system that many people including homeowners don't know about. I will discuss all of these facts and also, the performance of the HVAC system, the resources and the sustainable ways to sustain them.

Overview

The principal reasons for a Heating, Ventilation and Air-Conditioning (HVAC) framework are to help keep up great indoor air quality through satisfactory ventilation with filtration and give warm solace. Air conditioning frameworks are among the biggest vitality purchasers in schools. A HVAC framework deals with warming, ventilation, and cooling in a structure so you can live in an agreeable domain that vents away stale air while presenting crisply warmed or cooled outside air (room air dispersion).

Warming, ventilation, and cooling (HVAC) frameworks are answerable for giving warm solace and natural air to building tenants. This is shockingly difficult, and thus, HVAC frameworks devour a normal of 39% of an office's vitality use. These frameworks are frequently probably the greatest wellsprings of vitality squander, yet in addition give the absolute biggest open doors for both vitality and money related reserve funds. Numerous enhancements to HVAC vitality proficiency are among the "low hanging organic products" and can be accomplished at next to zero expense. Bigger activities can likewise pay for themselves rapidly. These upgrades make finding some kind of harmony among solace and effectiveness simple, and help guarantee:

- Worker productivity
- Occupant satisfaction
- Personal health
- Lower operating cost throughout the life cycle of the facility
- Reduced risk exposure to fluctuating energy prices

Describe the System

HVAC alludes to the various frameworks utilized for moving air among indoor and open air territories, alongside warming and cooling both private and business structures. They are the frameworks that keep you warm and comfortable in the winter and feeling cool and crisp in the mid year. They additionally are the frameworks that channel and clean indoor air to keep you sound and keep up dampness levels at ideal solace levels. Central air frameworks come in various sizes and plans. Be that as it may, there are four fundamental highlights regular to all HVAC framework air appropriation framework, air exhaust framework, air dealing with unit and outside air consumption. A few units contain an arrival framework that assists come back with airing molded air back to the air taking care of the unit.

The air-dealing with the unit draws air all things considered. It channels the air to expel allergens, shape and residue. It at that point warms or, when the cooled air returns, it is re-separated, reconditioned and recycled inside the room or building. This is done through channels associated with the arrival framework. The conduits associate with each room where air is moved back to the air taking care of the unit. Beside ducted returns, whole returns can likewise be utilized to draw air from rooms and into the negative weight roof plenum. Air, be that as it may, is returned through channels and basic courses. Not all the air anyway is circled back to the room or building. Some leave through the air exhaust framework.

General Operation

The motivation behind a HVAC framework is something other than warming or cooling a space. Rather, it serves to improve indoor air quality and give solace to everybody inside a structure. Every segment in your home might be isolated, for example, a brilliant framework joined with window cooling units. In any case, it is increasingly basic for joined frameworks, for example, focal warming and AC frameworks that utilize a solitary blower to course air through inside conduits in a home, or with a ductless framework for various rooms or zones in the house. While there are a few distinct sorts of HVAC frameworks, they all start with similar basics.

To begin with, there is a wellspring of natural air consumption all things considered or from inside the home. This procedure is called ventilation, and it occurs in two unique ways. Common ventilation is available in many homes and alludes to the manner in which air ordinarily moves in and out through windows, entryways, vents, and different openings. This trade of air is important to recharge oxygen, and to evacuate scents, carbon dioxide, horrendous smells, and inordinate dampness. Mechanical ventilation utilizes a mechanical framework - the V in HVAC- - to move air in and out. Previously, there was a lot of normal ventilation in many homes from holes and splits in the development alongside opening and shutting of entryways. In any case, present day development is making homes that are unquestionably more firmly fixed so ventilation is turning into an inexorably significant part in home HVAC frameworks. When the air is acquired, it is brought into the air taking care of the unit where the work starts. Here, air is attracted through channels to evacuate soil, residue, allergens, and different particles.

Next up is comfort. Air is either sent to be warmed or sent to be cooled and have abundance mugginess expelled. When the air is spotless, crisp, and at an agreeable temperature, it is coordinated into the home. For focal frameworks, this implies traveling through a system of pipes and registers to various rooms. For different frameworks, this generally implies being coordinated directly into the space. There are nine sections to your HVAC framework that you ought to be acquainted with: the air return, channel, exhaust outlets, conduits, electrical components, outside unit, blower, curls and blower.

- Air Return- Your air return is the piece of your framework that denotes the beginning stage of the ventilation cycle. This arrival sucks in air, draws it through a channel, and afterward passes it into the primary framework. Ace tip: Make sure to tidy your profits every now and again as flotsam and jetsam and residue can without much of a stretch develop on your channels.

- Filter- Your filter is the second piece of the air return in which the air is drawn through. Master tip: Make sure to change your channels normally to keep your framework fit as a fiddle.

- Exhaust Outlets- Another piece of your framework is the exhaust outlets where the fumes made by the warming framework is ousted. Master tip: Check your fireplace pipe or vent stack every year and tune it up if essential.

- Ducts- Your ducts are the diverts in which the warmed or cooled air goes through. Ace tip: Get your channels cleaned each 2 to 5 years so as to keep everything in working condition.

- Electrical Emework you consider when somebody makes reference to a HVAC framework. The open air unit houses the fan which gives wind current. Ace tip: Keep your unit away from flotsam and jetsam and vegetation as it can cause significant issues if plants are sucked into your fan.

- Compressor- As a piece of the open air unit, tlements- This piece of your framework can be somewhat trickier, however frequent issues start here first. Professional tip: If something isn't working right check for a stumbled breaker or dead batteries in your indoor regulator.

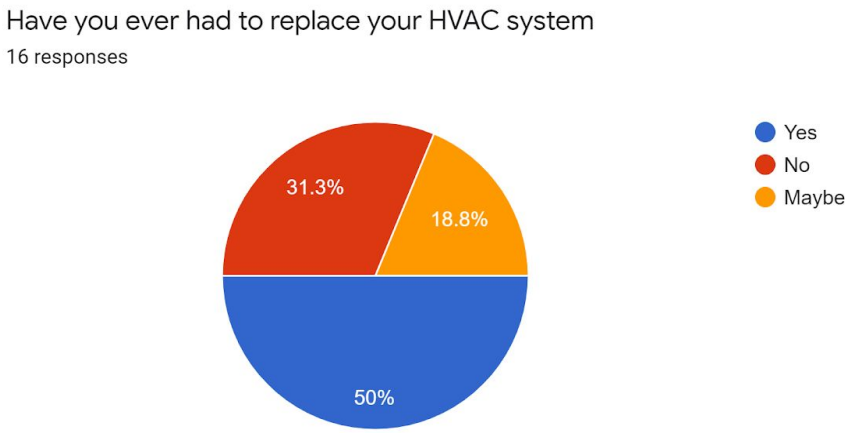
- Outdoor Unit- This is likely the piece of your frahe blower is liable for changing over refrigerant from a gas to fluid and sends it to the loops. Star tip: If something isn't working very right, check your blower. It is regularly the reason for some framework disappointments.

- Coils- Normally another piece of the open air unit, loops cool the air as it goes through with a little assistance from the refrigerant. Expert tip: Check your curls every year. On the off chance that they freeze up you might need to check your channel or potentially refrigerant levels.

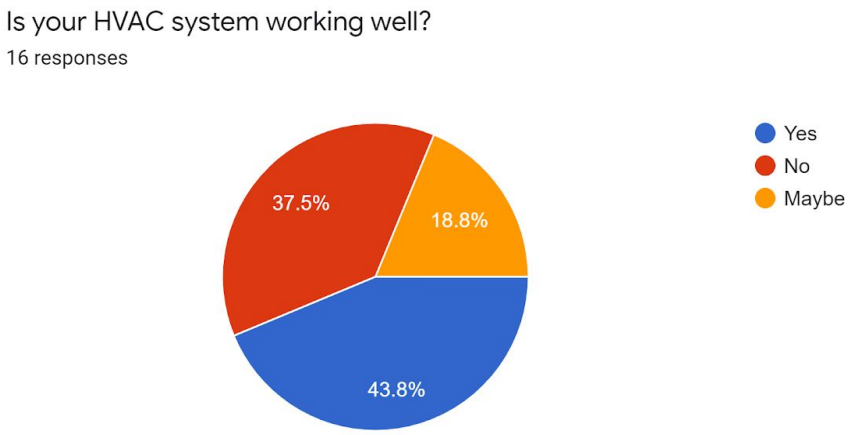
- Blower- The blower attracts warm air through the primary area of the unit. Ace tip: The more proficiently this air travels through, the more strong your framework will be.

Primary Research

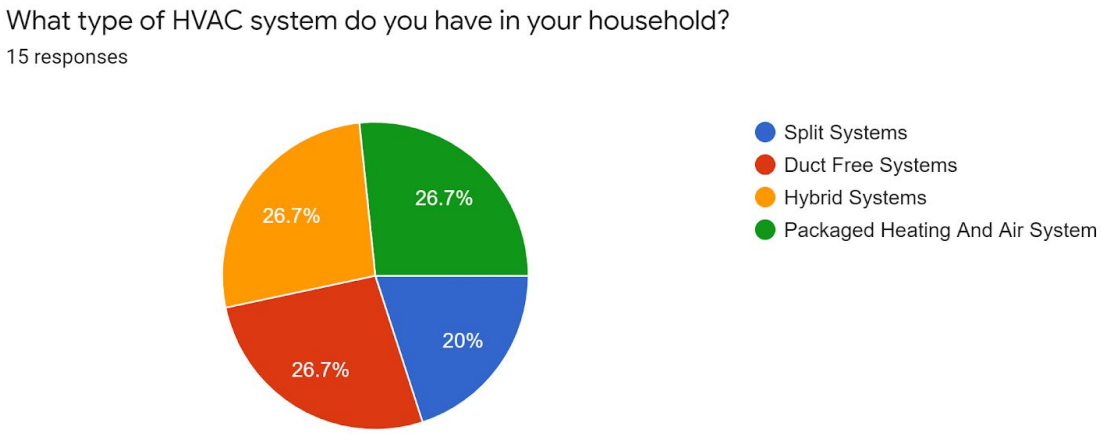
Graph 1.



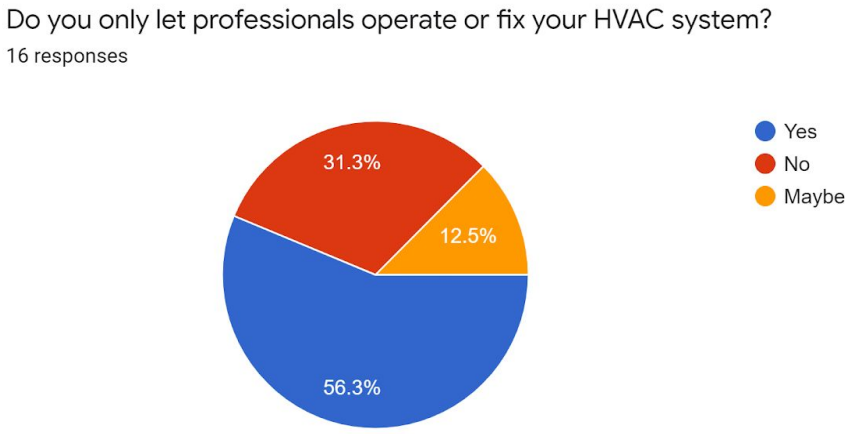
Graph 2.



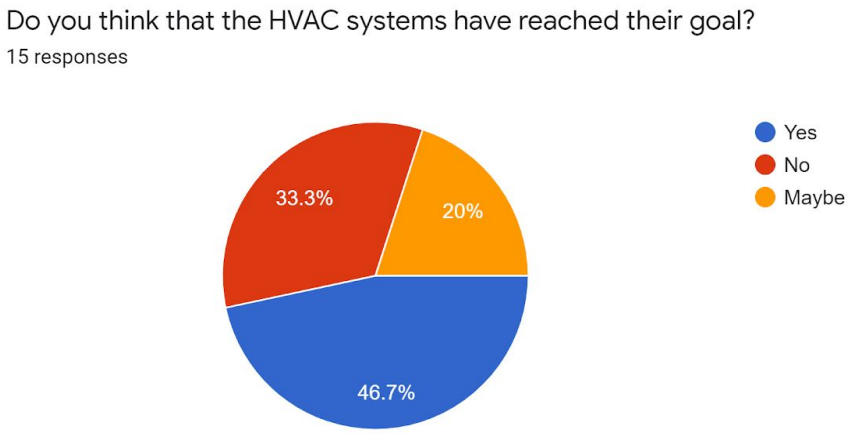
Graph 3.



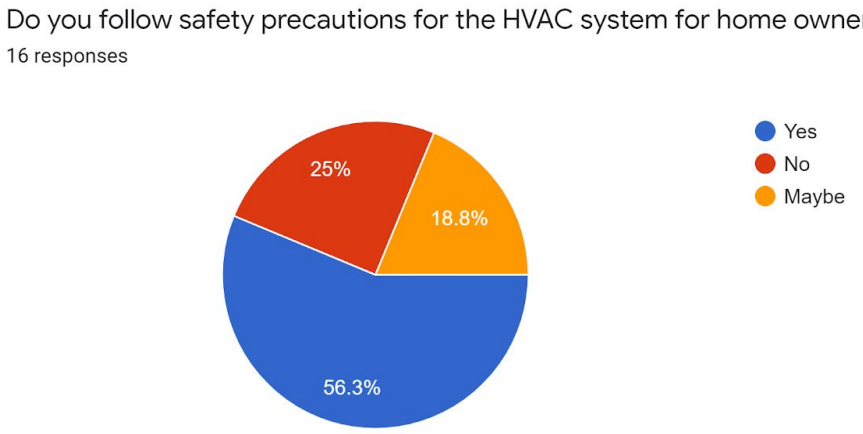
Graph 4.



Graph 5.



Graph 6.



There are four main types of HVAC systems. The four types of HVAC systems are split systems, hybrid systems, duct-free systems, and packaged heating and air systems. Every one of these kinds of HVAC units have master's and con's and realizing these components can assist you with concluding which is best for you. The most well-known sorts of HVAC frameworks are the heating and cooling split frameworks

Heating and Cooling Split Systems

The framework is part between two primary units, one for warming and one for cooling. These frameworks are remarkable in light of the fact that they contain both indoor and outside units, which are effectively conspicuous. These kinds of HVAC units have a cooling framework outside, which utilizes refrigerant, blowers and curls to cool air, and a fan to victory sight-seeing. These are generally the

enormous AC units set outside the home, which run throughout the mid year. The warming and cooling split frameworks additionally has a radiator, normally situated in a storm cellar or other extra room, which uses gas to warm the house. This is scattered by either a fan, or evaporator to circle the air. This framework utilizes a customary indoor regulator to deal with the temperature, and can keep most houses at your ideal temperature. Most units are additionally bundled with purifiers, and humidifiers so regardless of the climate your home or working environment is kept agreeable. These frameworks are most broadly utilized in light of the fact that they are most commonly material, without explicit necessities or natural elements.

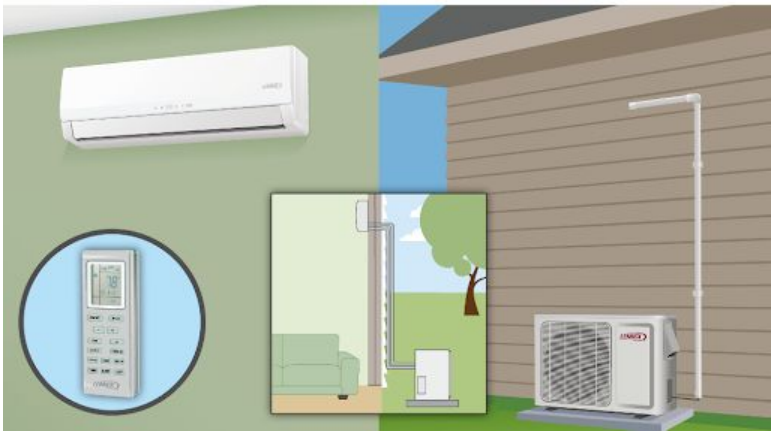
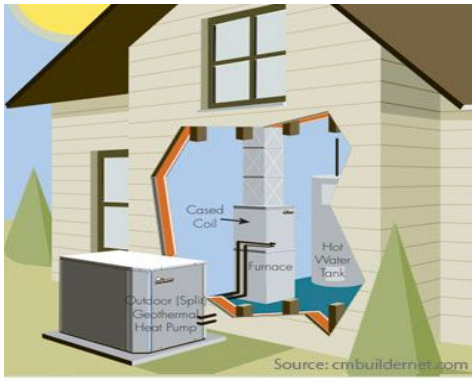


Figure 1. Heating and Cooling Split System.

Hybrid Split System

A half and half framework sorts of HVACs are comparable to the part frameworks, however with some key contrasts. These frameworks are on the ascent because of their capacity to relieve vitality costs through their electric crossover warming framework, which separates them from different kinds of HVAC frameworks. This key distinction, generally set by the proprietor, sets these sorts of HVAC frameworks separated from the remainder of the pack. The capacity to switch between gas power, which is faster and increasingly complete, to electric, which is progressively productive and calmer, permits property holders to choose how they need to warm their home. Valuable in increasingly gentle atmospheres that are fit for exploiting this during months where it isn't excessively cold, and electric warmth will do fine and dandy.

This framework utilizes conventional pipes, just as indoor regulators, and gives all the advantages of a split framework, yet with the additional alternative to save vitality, and diminish service bills.



An example of a outdoor dual fuel split unit installation matched with a cased coil Figure 2.

Duct Free

A pipe free, or small scale split framework is an extraordinary framework with enormous forthright expenses, yet huge advantages for specific needs and applications. These sorts of HVAC units are singular units in each room, giving more prominent free control. These units are mounted on dividers inside, and are typically appended to an open air blower. This establishment procedure is costly, and outwardly clear for the proprietors. These units are ideal for new options to homes, such as carports, options, or extra structures, since it is simpler to introduce, and permits free control of the unit. These kinds of HVAC units are additionally gainful for administration organizations, for example, inns or settings, permitting inhabitants to control singular temperatures and conditions. Another advantage is vitality protection, since singular rooms that are being utilized are being warmed, it shields outside or unused rooms from squandering vitality. This is the reason people resigning or scaling down could look to introduce these frameworks, keeping the rooms they utilize warm and the rooms they don't use from sapping vitality. These frameworks require ordinary and escalated cleaning and upkeep, which is critical to stay aware of as the expense of all out fixes and substitutions are costly.

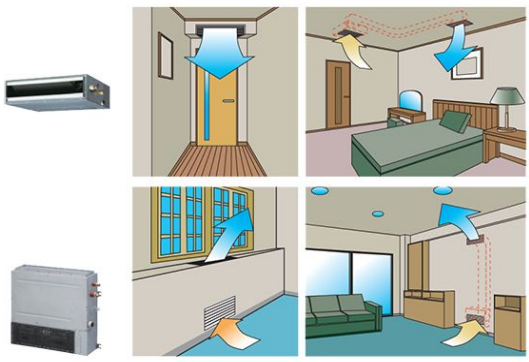


Figure 3. Small scale split framework.

Packaged Heating and Air

Out of the considerable number of sorts of HVAC units, bundled Heating and Air is the most specialty. The framework is a contained warming and air unit, that is put away inside the house. It is normally kept in an upper room or highest floor extra room, and serves to both cool and warmth a house. Its minimized size makes it helpful for littler spaces or houses, and permits it to be set inside the home if an outside isn't an alternative. These kinds of HVAC frameworks are likewise ready to be

proficient, and effectively kept up. They are commonly utilized in hotter atmospheres, since the warming framework isn't as incredible as different choices. The warmth is commonly electrically created, yet different structures can join gas and electric capacities.

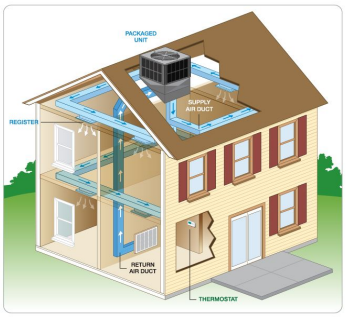


Figure 4. Flowing process of heating and air unit.

In summary, the Split framework is the most by and large utilized, however half and halves are on the ascent because of their vitality effectiveness. Little split frameworks are ideal for particular families or administration industries, and bundled warming is ideal for little places, or warm atmospheres.

Cost

HVAC System Cost

The normal expense to supplant a HVAC framework is $4,820 to $9,350, which incorporates the blend of another focal climate control system unit and another gas heater. Establishment of another HVAC framework with ventilation work costs somewhere in the range of $6,820 and $12,350 altogether.

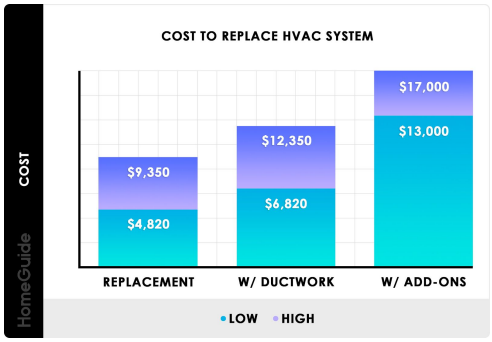


Figure 5. This diagram shows the cost to replace a HVAC system with Ductwork and With addons.

Cost To Replace HVAC System

Estimating relies upon the size of your home, the brand and productivity rating of your new HVAC unit, the length of your ventilation work, and work costs. Ductwork alone costs $2,000 to $3,000 to install, and upgrades like a humidifier, zoning system, or air cleaner will increase the price by $2,000 to $4,000 more.

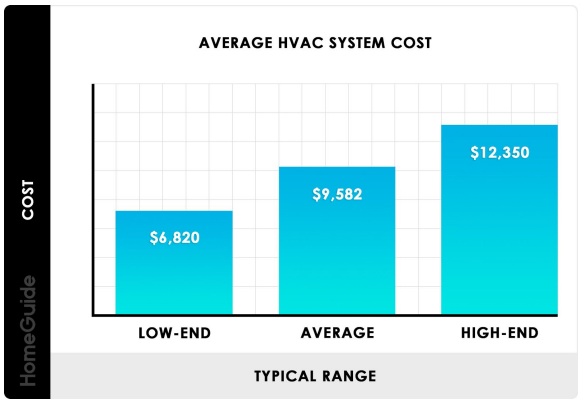


Figure 6. This diagram shows the cost to install a HVAC depending on the type of house you live in.

HVAC Installation Cost

HVAC System Installation: $4,820- $9,350
HVAC Ductwork Installation: $2,000- $3,000
HVAC Air Handler: $2,500- $3,500
Install Zoning System: 2,300- $3,500
Install Thermostat: $200- $500

There are three kinds of HVAC establishment bundles: the change-out, which incorporates another forced air system establishment and another warming framework, the full establishment which incorporates all the HVAC gear and ventilation work, and the full introduction that incorporates extra highlights, for example, a zoning framework.

Change Out HVAC Installation Cost

Supplanting your HVAC framework costs somewhere in the range of $4,820 and $9,350 and takes about a day to finish. A change-out is essentially supplanting out the fundamental parts of your HVAC framework with no new ventilation work. You should possibly get a change-out if your ventilation work is in great condition. Remember, over 80% of HVAC establishment occupations will require new ventilation work. Air conditioning contractual workers will attempt to push change-outs since introducing ventilation work is the most tedious and testing some portion of the activity.

HVAC Installation Cost With Addons

Another HVAC establishment with extra highlights can cost from $13,000 to $17,000 and take 4 to 7 days to finish. Introducing a zoning framework can add $2,300 to $3,500 to your HVAC framework establishment. Extra redesigns incorporate a variable speed fan, an entire house humidifier, or UV lighting.

HVAC Unit Cost

Another HVAC unit costs about $1,900 without establishment for a 1,000-square-foot home and up to $5,600 for a 3,000-square-foot home. The expense of the HVAC unit will for the most part rely upon the size of your home and the brand and effectiveness rating of the new unit.

Furnace and AC Combo: $4,820- $9,350
Central Air Conditioner: $3,350- $5,910
Ductless HVAC: $1,300- $4,500
Air Handler: $2,500- $3,500
Gas Furnace: $1,800- $4,000
Electric Furnace: $1,600- $2,500
Oil Furnace: $4,200- $6,900
Boiler/ Radiator: $1,500-$3,500
Air Source Heat Pump: $5,000- $8,000
Geothermal Heat Pump: $20,000- $25,000

Furnace And Air Conditioner Replacement Cost

Another heater supplanting costs $2,150 to $5,900 with most mortgage holders paying around $3,100. You'll require first to have your home examined to check whether your current ventilation work can hold up to the new heater establishment in size and protection abilities. The normal expense of a heater and climate control system substitution is $4,820 to $9,350.

Air Quality

Indoor air quality has become a significant wellbeing and security concern.
Regular issues related with IAQ include:

- Ill-advised or insufficiently kept up warming and ventilation frameworks
- Tainting by development materials, pastes, fiberglass, molecule sheets, paints, synthetic compounds, and so on.
- Increment in number of building tenants and time spent inside.

Indoor Air Quality (IAQ) alludes to the air quality inside and around structures and structures, particularly as it identifies with the wellbeing and solace of building tenants. Understanding and controlling basic poisons inside can help lessen your danger of indoor wellbeing concerns. Indoor contamination sources that discharge gases or particles into the air are the essential driver of indoor air quality issues. Lacking ventilation can increase indoor poison levels by not acquiring enough open air to weaken outflows from indoor sources and by not doing indoor air contaminants of the region. High temperature and mugginess levels can likewise expand centralizations of certain contaminants.

Immediate Effects

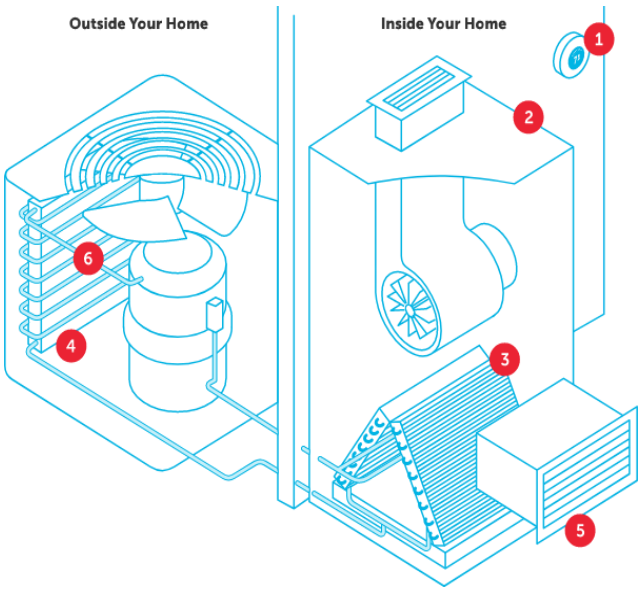
Some wellbeing impacts may show up not long after a solitary presentation or rehashed exposures to a poison. These incorporate bothering of the eyes, nose, and throat, migraines, tipsiness, and weariness. Such prompt impacts are typically present moment and treatable. Once in a while the treatment is essentially wiping out the individual's introduction to the wellspring of the contamination, in the event that it tends to be distinguished. Not long after presentation to some indoor air contaminants, side effects of certain maladies, for example, asthma may appear, be irritated or exacerbated. The probability of prompt responses to indoor air poisons relies upon a few components including age and prior ailments. Now and again, regardless of whether an individual responds to a contamination relies upon singular affectability, which changes enormously from individual to individual. A few people can get sharpened to organic or synthetic contaminations after rehashed or elevated level exposures.

Long Term Effects

Other wellbeing impacts may show up either years after introduction has happened or simply after long or rehashed times of presentation. These impacts, which incorporate some respiratory illnesses, coronary illness and malignant growth, can be seriously incapacitating or lethal. It is reasonable to attempt to improve the indoor air quality in your home regardless of whether manifestations are not perceptible. While toxins generally found in indoor air can cause numerous unsafe impacts, there is extensive vulnerability about what fixations or times of introduction are important to create explicit medical issues. Individuals likewise respond diversely to presentation to indoor air toxins. Further research is expected to all the more likely comprehend which wellbeing impacts happen after presentation to the normal toxin focuses found in homes and which happens from the higher fixations that happen for brief timeframes.

Interconnection with other parts

Figure 7. This diagram shows the different parts of the HVAC system.



1. **Thermostat:** This is the most evident part of your HVAC framework, and the piece you'll cooperate with most. Normally introduced on an effortlessly gotten to dividers, it tends to be set physically and customized to keep your home at your optimal temperature. At the point when the surrounding temperature gets excessively hot or cool, the indoor regulator triggers your HVAC framework to begin circling air varying.

2. **Furnace:** Your heater is the star of your HVAC framework, and it very well may be tremendous—it'll require the most space out of the entirety of the various segments. The heater is intended to warm air, which is then circulated to various parts of your home by means of ventilation work or funneling. Heaters utilize changed warmth sources, including sun based vitality, heat siphons, electric obstruction, and ignition.

3. **Evaporator Coil:** The evaporator coil is utilized to chill off the air when your indoor regulator is set to a lower temperature. This virus air is then piped all through your home.

4. **Condensing Unit:** This unit is found outwardly of your home and loaded up with what is called refrigerant gas. At the point when the refrigerant is cooled, the consolidating unit siphons this fluid to the evaporator curl to be changed into gas once more.

5. **Vents:** These are the outlets that help convey warmed and cooled air from the conduit framework into the different rooms of your home. They're commonly found close to the roof with edge supports, intended to send the air descending. It's imperative to guarantee these vents don't get blocked.

6. **Refrigerant Lines:** These lines convey refrigerant to the consolidating unit as gas. This gas is changed to fluid structure, at that point moved back to the evaporator loop.

Safety

HVAC systems are a fundamental piece of any cutting edge home. Short for Heating, Ventilation, and Air Conditioning, HVACs keep a home's inner condition agreeable and safe. Be that as it may, they can likewise represent a risk to homes and families if basic and legitimate consideration isn't taken. Keep in mind, HVAC frameworks require gas and power to run and, while they are intended to run securely and without an issue, there are as yet potential dangers similarly as with any home machine.

HVAC Safety Tips For Homeowners

There are simple, reasonable approaches to limit such dangers. With the accompanying HVAC wellbeing tips, you can help forestall such issues as flames, carbon monoxide releases, poor air quality, or framework breakdown.

Get An HVAC Tune Up

Every year, you ought to have an expert HVAC specialist go to your home and give your framework a check up. This strongly suggested support administration incorporates security checks, inside cleaning, and a careful examination of different parts.

Clear The Area

To help forestall fire, keep the zone around your heater away from an excessive number of articles. Keep boxes, papers, textures, and whatever else that can burst into flames a protected good way from the heater. We propose putting away those things in another room out and out.

Vacuum The Area

Go above and beyond and keep the zone around your framework liberated from dust and different flotsam and jetsam also. Once in a while, you should vacuum around the machine to ensure nothing is developing that could without much of a stretch catch.

Use Tight Seals On Flammable Liquids

With regards to forestalling fire, it isn't simply getting combustible things far from your heater, it's likewise being progressively aware of their fumes. We question you would put combustible fluids near your framework. However, what you may not consider are the fumes that are discharged from these fluids. Indeed, even the exhaust from combustible or burnable fluids can possibly light, so ensure you store fluids like lamp fuel, gas, and acetone in compartments with tight seals. Much the same as other combustible articles, we prescribe putting away combustible fluids securely in another room.

Install Carbon Monoxide Detectors

While a considerable lot of these tips will assist you with decreasing the danger of carbon monoxide spills, we despite everything suggest you introduce carbon monoxide indicators all through your home and test them consistently. As indicated by the CDC, in excess of 20,000 individuals visit the crisis room every year because of carbon monoxide harming. Carbon monoxide can be dangerous, and it is difficult for people to distinguish. On the off chance that there is a break from your framework - or another machine in the home these identifiers can spare your life.

Figure 8. This diagram shows an example of a carbon monoxide detector.

Install UV Lights

Here's a HVAC security tip very few consider – or have even known about: UV Light for your HVAC framework. UltraViolet light can help improve air quality by forestalling the development of form and green growth, giving clean air to your home. Cleaner air can forestall ailment and will help keep sensitivities under control.

Only Use Professionals

Regardless of whether you're getting a check up, having an UV light introduced, getting another framework inside and out, or simply have a few inquiries, just utilize an expert, authorized organization – like Charest. Central air experts are prepared to deal with a wide range of frameworks, and they know HVAC wellbeing. You wouldn't go to an unlicensed specialist to get a registration, so for what reason would you have an unlicensed individual work on your costly home framework?

Usage

The Main Functions Of The HVAC System

A HVAC framework is intended to control the earth in which it works. It accomplishes this by controlling the temperature of a room through warming and cooling. It additionally controls the moistness level in that condition by controlling the development and appropriation of air inside the room. A Heating, Ventilation and Air Conditioning framework, otherwise called HVAC framework, expels contaminants noticeable all around and conditions indoor air either cooling it or warming it to give comfort. Air contains numerous contaminations. In the event that you let it into your home without sanitizing it, you or your family may wind up becoming ill. Having four unique seasons likewise means that temperature can go from outrageous cold to extraordinary hot. Having a cooling and warming framework guarantees that you can keep an agreeable temperature in your home regardless of what the outside temperature is. A HVAC framework may seem like making a basic showing however the parts and the support is more than straightforward. Try not to leave your HVAC framework in the hands of undeveloped specialists.

Resources/ Quantity

How to save on your cooling bill?

Use your windows to gain cool air and keep out heat

In the event that you live in an atmosphere where it chills around evening time, turn off your cooling framework and open your windows while resting. At the point when you wake toward the beginning of the day, shut the windows and blinds to catch the cool air.

Operate your thermostat efficiency

Set your indoor regulator as high as serenely conceivable in the late spring. The littler the contrast between the indoor and open air temperatures, the lower your general cooling bill will be. Keep your home hotter than typical when you are away, and bring down the indoor regulator setting to 78°F (26°C) just when you are at home and need cooling. A programmable indoor regulator can make it simple to interfere with your temperature. Set your indoor regulator as high as easily conceivable in the late spring. The littler the distinction between the indoor and open air temperatures, the lower your general cooling bill will be. Abstain from setting your indoor regulator at a colder setting than typical when you turn on your climate control system. It won't cool your home any quicker and could bring about over the top cooling and superfluous cost.

Use fans and ventilation strategies to cool your home

In the event that you use cooling, a roof fan will permit you to raise the indoor regulator setting about 4°F with no decrease in comfort. Mood killer roof fans when you leave the room. Recall that fans

cool individuals, not rooms, by making a breeze chill impact. At the point when you shower or clean up, utilize the restroom fan to expel the warmth and stickiness from your home. Your pantry may likewise profit by spot ventilation. Ensure washroom and kitchen fans are vented to the outside (not simply to the storage room).

Keep your cooling system running efficiently

Timetable normal support for your cooling gear. Abstain from setting lights or TV sets close to your room cooling indoor regulator. The indoor regulator detects heat from these machines, which can make the climate control system run longer than should be expected. Vacuum enlists consistently to evacuate any residue development. Guarantee that furnishings and different articles are not obstructing the wind stream through your registers.

Don’t heat your home with appliances and lighting

On hot days, abstain from utilizing the broiler; cook on the stove, utilize a microwave, or flame broil outside. Introduce productive lighting that runs cooler. Just about 10% to 15% of the power that brilliant lights expend brings about light—the rest is transformed into heat. Limit exercises that produce a great deal of warmth, for example, running a PC, consuming open flares, running a dishwasher, and utilizing hot gadgets, for example, hair curling accessories or hair dryers. Indeed, even sound systems and TVs will add some warmth to your home. Wash just full heaps of dishes and garments. Consider air drying the two dishes and garments.

Sustainability/Maintenance

Central air frameworks are focused for supportability upgrades in numerous offices as a result of the significant expenses identified with their establishment, activity and upkeep. An appropriately planned and introduced HVAC framework can give long stretches of solace to inhabitants, lower vitality charges and improved water utilization. Be that as it may, an absence of appropriate arranging can risk material expenses for preventive upkeep exercises, vitality expenses and inhabitant comfort. Here are eight (8) ways to ensure that your HVAC system is sustainable.

- **Geothermal Energy**
  - Geothermal warming and frameworks take their vitality from the Earth. Where it counts inside our planet are surges of high temp water and steam, the more profound underground you go the more sweltering it will get. Indeed, even only a couple of feet underneath the surface water temperature stays around 5 to 26 degrees Celsius (contingent upon area). Geothermal innovation takes this warmth and transforms it into vitality which would then be able to be utilized to warmth or cool any structure. Warmth siphons are introduced in the ground close to the structure that at that point utilize the consistent temperature to warmth or cool the structure. The fluid inside the siphons assimilates the warmth in the ground to warm the structure in the winter and the other way around in the late spring.

- **Solar Power**
  - Sun oriented force has become old news regarding vitality effectiveness, at the same time, in the event that it isn't broken don't fix it! Sun based force works in two different ways. The manner in which we think when we consider sunlight based force with rooftop boards and so forth., and with detached sun based force. Inactive sunlight based innovation utilizes a structures dividers, windows, rooftops and floor to gather the sun's vitality. For instance, direct increase frameworks utilize the daylight that goes through windows and convert it to warm vitality which the dividers and floor at that point store as warmth vitality. In the event that the temperature of the room drops the warmth vitality will emanate into the space, keeping it warm. Likewise, funnels can likewise be put away in the dividers of structures. When the dividers are warmed by the sun the water in the funnels will store that heat vitality which would then be able to be siphoned all through the structure.

- **Hydronic Heating**
    - Hydronic warming is significantly more established news than sun powered force (in all honesty). We have a single word for you, radiators. In current terms however, hydronic warming frameworks utilize high temp water that is channeled through cylinders introduced under sections of flooring, through radiators or along baseboards. Boilers can be controlled by sun oriented force (the board kind) or a warmth siphon. Warmth is moved by means of conduction, convection and radiation. This is the way underfloor warming works!

- **Ice Powered Air Conditioning**
    - An ongoing innovation has been built up that will change over water to ice which would then be able to be utilized to run a cooling unit. The air-con units convert the ice during the night and use it to cool the structure during the day, diminishing power bills! The units freeze the water through an arrangement of copper loops. The ice is then put away. As the temperature of the structure rises the ice cools the hot refrigerant and cuts vitality utilization by about 30%.

- **Wind Power**
    - Presently, we're not recommending you introduce a monster wind ranch or turbine outside your home or place of business, little turbines can deliver enough capacity to run a water radiator. Understudies at Oregon State University demonstrated this in 2006 by making a turbine that turns various magnets connected to a metal plate, those magnets will turn near a copper plate. The obstruction of the magnets will warm the plate. As the plate warms water is siphoned through copper loop tubing on the rear of the plate. This water would then be able to be siphoned all through the structure.

- **DeVap**
    - The Desiccant-Enhanced Evaporative Air Conditioner (DeVAP) is another HVAC innovation that joins the cooling intensity of vanishing with the dehumidifying intensity of condensed desiccants – that stuff in those parcels you get in shoe boxes. This mix frames a savvy climate control system. So new that it's not available yet, the models have exhibited a 90% decrease in vitality use.

- **Smart Thermostats**
    - Air conditioning joined with Home Automation (look at our Home Automation center here)! Savvy indoor regulators can associate with cell phones and tablets

to permit property holders and offices supervisors to control their HVAC frameworks remotely. You can set them to modify consequently, and indicate individual inclinations. They can likewise advise you of support issues and lessen and screen vitality utilization.

- **Digital Ceilings**
  - A wonder made by Cisco, this framework has been named the fate of building robotization. Roofs are fitted with an assortment of sensors which can identify movement, inhabitance, temperature and even carbon dioxide levels. The can control a structure's lighting, security and HVAC frameworks. The sensors can get familiar with the everyday propensities for a structure's tenants and naturally change air and light settings.

Performance

What Is HVAC System Performance?

Performance is a term that is being hurled around the HVAC and building businesses reckless nowadays. Tragically what's regularly being guaranteed as HVAC framework execution is a mix of prescriptive measures and some exhibition components, with no estimation of conveyed framework execution. While probably the most current industry measures are presently highlighting a few components of execution, they despite everything don't demonstrate a framework is really performing. It resembles saying your vehicle is performing great as long as your motor is running, you have great tires, and your transmission works alright. For a vehicle to perform well, its motor should effectively convey the appraised torque. This is much the same as cooling gear conveying the perfect measure of Btus at its appraised EER (Energy Efficiency Ratio) which in straightforward terms is Btus over Watts.

So the initial step is to gauge genuine BTUs of the gear to get a pattern of introduced hardware execution. Next we have to quantify conveyed wind current and Btus at the registers. At the point when this is done appropriately, it considers the impacts of the channel framework on the gear. As such, poor conduit framework estimating and establishment influences gear execution. Estimating conveyed wind current likewise represents execution of channels themselves, both regarding spillage and brilliant misfortunes from their surface. At the point when we know the Btus of the hardware, by estimating Btus into the adapted space, the thing that matters is what is lost by the air conveyance framework. This resembles estimating vehicle execution where things become real truly. In the event that we know the motor's presentation without anyone else, at that point connect it to the transmission and in this way, the "remainder of the framework," we'll know how the vehicle proceeds all in all. For what reason is this significant? In the first place, we can distinguish if terrible showing is brought about by the motor, or originating from the transmission forward.

The last piece is comfort. This is the place the vehicle relationship closes, in light of the fact that in a vehicle, a large portion of the vitality conveyed by the motor is fueling the drive train and at last making the vehicle push ahead or in reverse. In a HVAC framework, we normally don't have only one register in the house or building, so the last execution measure is ensuring the Btus are dispersed proportionately to where they're required. Room-by-room load estimations help decide what number of cfm of wind stream you need at each register to keep each room agreeable. This is additionally where air adjusting comes in. Air adjusting systems can be utilized to test if rooms are getting the perfect measure of cfm. When you measure every one of these elements, you can decide whether a framework is genuinely performing. In case we're to become execution based as an industry, we can't overlook these real factors. Different strategies that just incorporate a few components of execution, however not real "elastic meets the street" execution, have come up short, and will proceed in the event that they don't change. In any case, most frameworks can, inside a sensible spending plan, be brought into the mid to high 80% conveyed Btu go. That is with generally excellent hardware execution, and an all around structured, introduced, protected, and fixed channel framework.

Conclusion

In conclusion, the word HVAC is short for heating, ventilation, and air conditioning. The four types of HVAC systems are split systems, hybrid systems, duct-free systems, and packaged heating and air systems. Every one of these kinds of HVAC units have master's and con's and realizing these components can assist you with concluding which is best for you. The most well-known sorts of HVAC frameworks are the heating and cooling split frameworks.

The principal reasons for a Heating, Ventilation and Air-Conditioning (HVAC) framework are to help keep up great indoor air quality through satisfactory ventilation with filtration and give warm solace. A HVAC framework deals with warming, ventilation, and cooling in a structure so you can live in an agreeable domain that vents away stale air while presenting crisply warmed or cooled outside air (room air dispersion). They are the frameworks that keep you warm and comfortable in the winter and feeling cool and crisp in the mid year. Central air frameworks come in various sizes and plans. The normal expense to supplant a HVAC framework is $4,820 to $9,350, which incorporates the blend of another focal climate control system unit and another gas heater, but the establishment of another HVAC framework with ventilation work costs somewhere in the range of $6,820 and $12,350 altogether.

Final Recommendations

- Individuals living in hot or cold atmospheres may go for a solitary stage framework, intended to create simply warming or cooling. These will in general be economical, but at the same time are fairly wasteful and will commonly be working at limit in any event, when it's not required.

- Further developed models will offer variable fan velocities to eliminate power use, anyway they stay wasteful when contrasted with multi-arrange frameworks, and are therefore increasingly costly to run over the long haul.

- Zoned frameworks, then again, have been intended to warmth or cool individual pieces of your home. This is finished by structuring zone valves and dampers inside the vents and ventilation work that specifically obstruct the progression of air. For individuals with bigger properties this is of unfathomable incentive as it keeps the framework from warming or cooling zones in the home that are not being used.

LIGHTING SYSTEMS

Introduction/Purpose

Light is an important aspect of our daily life. We might not realize it but without light in our schools, workplace, houses, bedrooms, and washrooms we would be unable to live a comfortable life. This report provides detailed information regarding the installation of the light system in the new Seneca residence. We care about the safety of the general public and every proposal, suggestion, and recommendation is done with that fact in mind. In this report, our final recommendation includes the most efficient source of light system with as low as possible. On top of that few of the other topics discussed are performance of the systems, resources used in the completion of this system, and maintenance of the light system. Lastly, we have also gotten an external opinion from a professional to strengthen our results and recommendations.

Overview - Design Goal (Context)

Our goal is to install a light system in all areas of the building. Places such as elevators, stairwells, rooms, hallways, offices, staff rooms, kitchens, washrooms, car parking (if required), and storage areas. We want to install a high performance light system that is low cost. However, we do not intend to jeopardize the lifestyle of the residents that will be living in the building.

We will be going through three types of light systems in this research report. Incandescent bulbs, fluorescent lights, and LED lights for apartment/commercial buildings. We intend to differentiate the advantages and disadvantages of each light system and recommend the best option for installation.

Describe the System

The light system will be placed flat on the ceiling of each area of the building. LED bulbs are a light source which emits light as current is flown through them. Out of the three types of light bulbs, led is the most efficient as it saves energy and lasts longer.

Regarding the hallways, main lobby, and car parking (if required) we would use LED panels as they emit more light than a typical light bulb and they cover for ground as well. LED panels are rectangular in shape and they are mainly attached to the ceilings. They are mounted to the ceiling so they do not pop out. For bedrooms, washrooms, kitchen, and elevators, the best option is to use the bulkhead lights as they are small and efficient when used in a small area. Bulkhead lights are circular and shaped like an oval that emits light from one end and are stuck to the wall from the other.

Figure 9. Example: Elevator and Hallway lights.

General Operation

In terms of using energy, our ideal light system should save as much energy as possible. An ideal light system should only use energy to emit light when it is needed by a person. Having lights on at midnight in the hallways is inefficient. Therefore, our light systems will also include sensors to detect movement. When movement is detected, lights will turn on in that location and then afterwards go dim again. Ultimately, we want to include sensors in hallways, car parking (if required), washrooms, storage rooms, common area, etc. However, places such as the main lobby and elevators will always have lights on. Lastly, bedrooms and such other places will have light switches for the people living there to use.

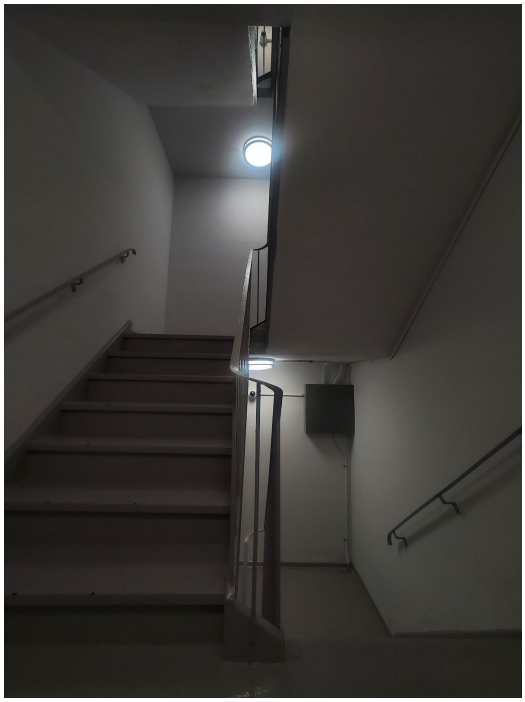


Figure 10. Dimmable Lights.

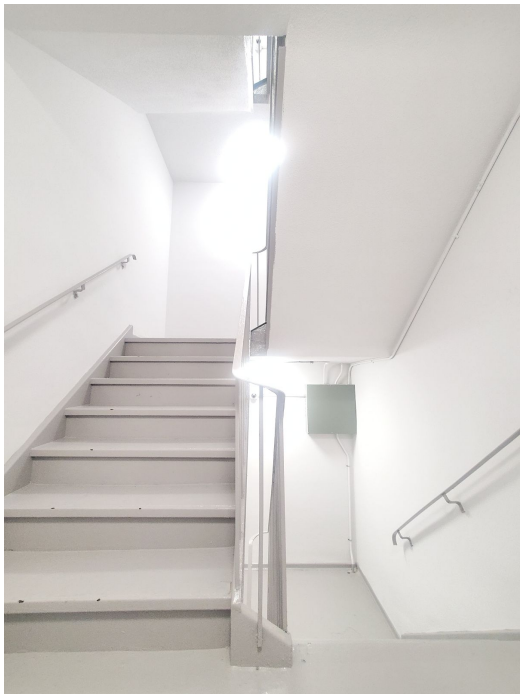
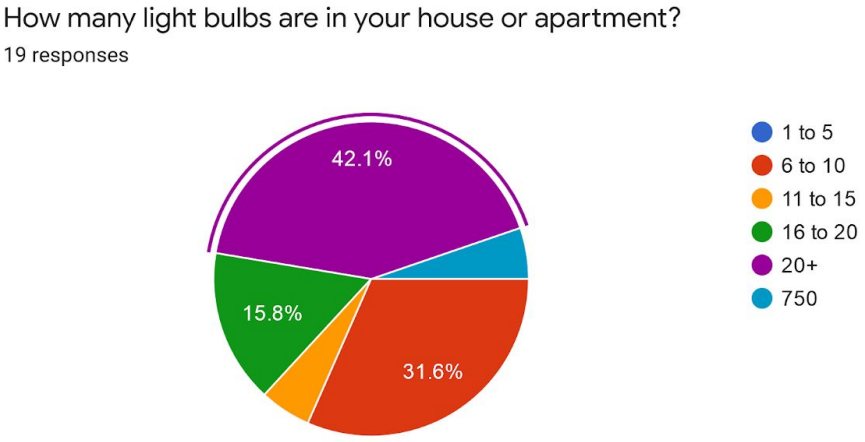


Figure 11. Full Bright Lights.

Primary Research - Survey

Graph 7.



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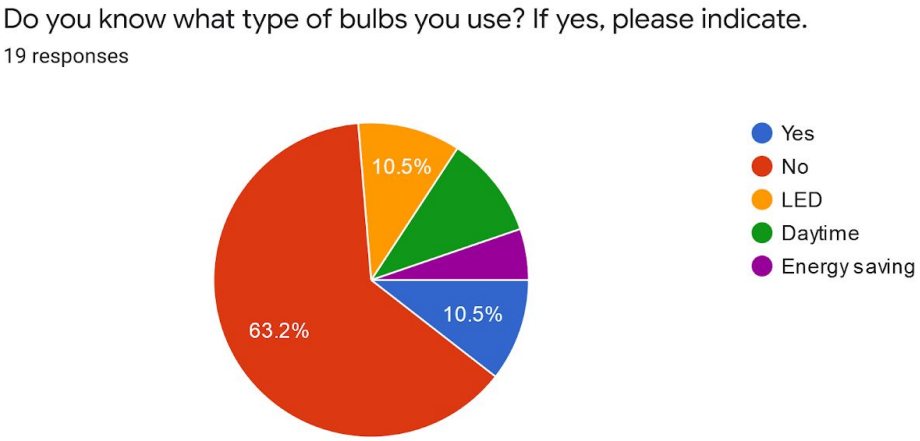

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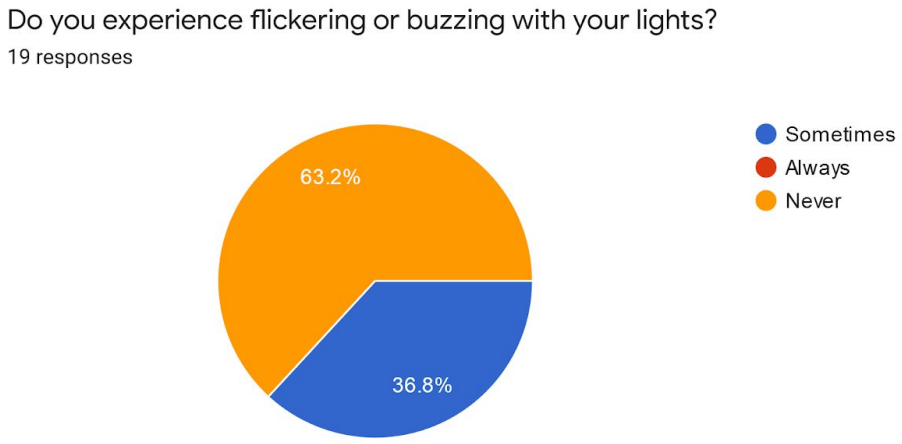

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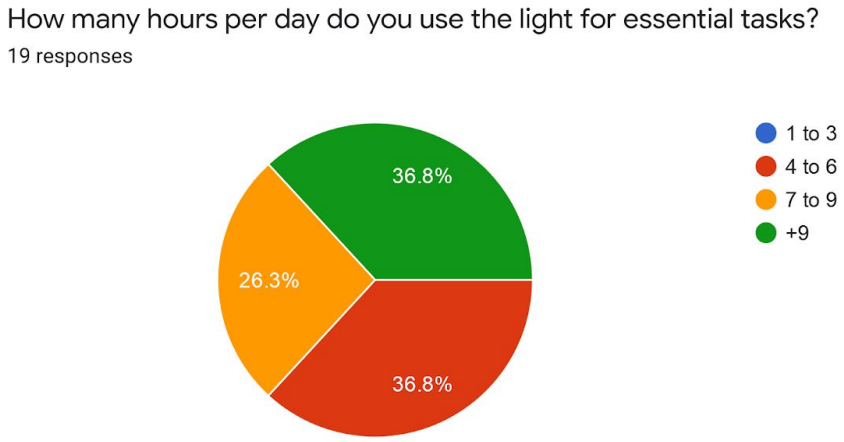

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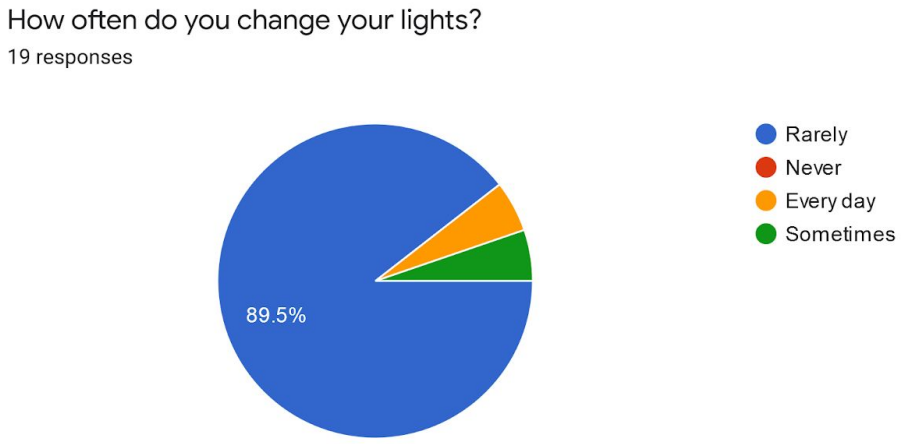

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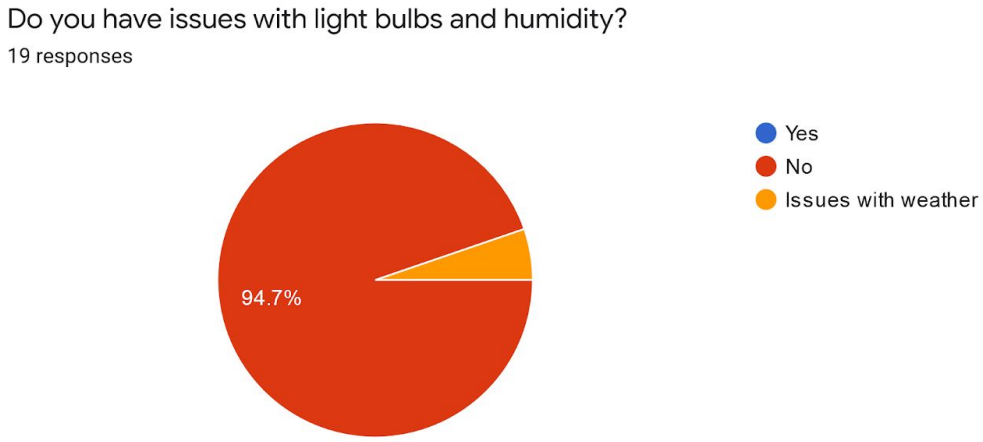


Cost

Effective and high performance resources aren't cheap. If you want goods that last long you need to be able to spend more money. Advantage that comes with spending more is that your resources will be reliable and will last long. Below is a table showing data made on a rough estimate of what the cost of resources will be.

Area	**Expenses**	**Number of Light Bulbs**
Apartments	$55,000 - $65,000	3,120
Hallways	$5,000 - $6,000	260
Elevators	$200 - $300	12
Storage Rooms	$100 - $200	6
Garbage Disposal Room	$200 - $300	13
Main Lobby	$100 - $200	8
Common Area on Level 1	$200 - $300	10
Parking Lot	TBD	TBD
Main Office	$100 - $200	4
Laundry Room	$100 - $200	8
Total	$61,000 - $72,900	3441

Table 1. Summary of data for the expense of the light system.

Safety

Safety of the Resident is the utmost priority of the Quick Tec Corp. and we want to create a comfortable and welcoming atmosphere for everyone.

One issue that must be tackled regarding this topic is, what do we do in case of an emergency? When we think about safety, we need to be prepared in case of a black out. Therefore we need to have an emergency light system. There are two types of emergency lights, Egress Pathways and Standby Lighting. Egress Pathways are light systems that glow in the dark during a power outage or a blackout. In case of an emergency of a fire or the need to exit a building. The emergency light system is automatically switched on and provides the pathway through the exit route. Another type of emergency light system is Standby Lighting. In case of an emergency, if it is required for you to stay in doors and proceed with your regular activities, you would need light to accomplish your tasks. Hence, the Standby Light system is used to help you as a backup light system. (Emergency Lights, 2019)

Eye discomfort should also be avoided for many safety reasons, such as headaches, pain in neck and shoulders, eyestrain, and dry eyes. One of the main reasons for eye discomfort is due to poor lighting. (Canadian Centre for Occupational Health and Safety, 2020). Therefore, Quick Tec Corp. Prepared this report to explain differences in types of lighting. So we can use the most safe and high quality light system.

Usage

Bulkheads

Bulkheads light bulbs small in size and are great for use in small areas, such as stairwells, elevators, hallways, etc. Bulkheads are a new innovation that are more resourceful as well as last longer than typical light bulbs. They are also perfect for use in case of an emergency blackout. Adding a motion sensor with bulkheads is an efficient way to use energy since there wouldn't be any need to manually turn off lights.

Panels

Light panels are typically used in commercial buildings that belong to businesses. They are cheap and easy to install. They are convenient to install which is why they are used in offices, meeting rooms, etc. LED panels are rectangular in shape. They are mounted to the suspended ceilings. The frame is made with aluminum therefore it is light in weight and it also prevents light leakage.

Spotlights

LED Spotlights are commonly attached to the ceilings. They are often found in small rooms, such as kitchen, bedrooms, storage rooms, etc. They use 10% energy of what a typical incandescent bulbs use meaning they are cost efficient. LED Bulkheads are dimmable as well therefore they can be adjusted to the users needs.

Motion Sensor

A motion sensor does exactly what its name is. It detects movement and when it senses a presence in a certain distance, it turns on the lights. Motion sensors are also available with certain types of light systems. They are good for saving energy and can last very long.

Induction Lights

Places that are tougher to access such as parking lots, use induction lights. They emit high frequencies of light which is a useful asset in large areas. Induction lights have an unbelievable amount of life in them, they can last up to 100,00 hours.

Resources/Quantity

Light installation is a delicate and complicated process. Compared to switching bulbs in a household, adding light systems to a commercial building requires experts and experience. The following data developed by Quick Tec Corp. provides a brief estimate of the essential resources required for the initiation of this project.

- Seneca residences in Markham and Newham have about 13 levels and more than 40 apartments per level.
- Ideally, one apartment would have a room, a bathroom, a kitchen, a living room, and a hallway. This would require only 5 light bulbs per apartment. Realistically there could be a need for extras.
- Commercial buildings often have lights on the walls instead of the ceiling, which is inefficient and expensive. Ideally with more than 40 apartments per floor we can estimate that we would need roughly 20 lights per floor.

Quantity of Resources

Area	Number of Areas	Number of Light Bulbs
Apartments	520+	3,120
Hallways	13	260
Elevators	3	12
Storage Rooms	1	6
Garbage Disposal Room	13	13
Main Lobby	1	8
Common Area on Level 1	1	10
Parking Lot	1	TBD
Main Office	1	4
Laundry Room	1	8

Table 2. Estimate of the quantity of lights in the building.

Sustainability/Maintenance

Research shows that 40% of electricity in a commercial building is used towards lighting. Our objective is to maximize energy saving. Utilizing the electricity to bare minimum would allow the us to save money on expenses. One way to achieve this goal is by using daylight harvesting systems. Purpose of this system is that it will automatically dim the light according to the brightness of the daylight.

Regarding maintenance, many light systems have software installed which allows us to determine when a malfunction took place and exactly where it happened. This can be determined through a light control system which would be able to detect any faults.

Figure 12. Full Bright Lights.

Figure 13. Dimmable Lights.

Performance

LED Lights

Advantages

- LED lights have a 100,000 hours of lifetime (11 years).
- LEDs are slowly becoming standardized in automobile lights and traffic lights.
- LEDs of +25 LuMens/Watt are available commercially.
- LEDs use less than 50% energy of what incandescent and fluorescent lights use.
- Regardless of the low temperature, LEDs switch on instantly making them resistant to cold.

Disadvantages

- Environmental factors such as temperature have negative effects on LEDs.
- The initial cost of LEDs is more expensive than incandescent and fluorescent lights.

Incandescent Lights

Advantages

- Incandescent light bulbs are cheap and available at local hardware stores because they are inexpensive to produce.
- They instantly switch on with full brightness with no flickering.
- They are safe and do not contain any combustible or toxic material making them recyclable.
- They are warm in temperature making them an asset during winter.

Disadvantages

- Incandescent light bulbs require a large amount of energy to run, therefore your electricity bill is deemed to increase.
- Incandescent light bulbs have a low variety of colour range.
- Lifetime of an Incandescent light bulb is only 1,000 hours.
- They are fragile and need to be handled cautiously.

Fluorescent Lights

Advantages

- Fluorescent lights have high energy efficiency and they use 20% energy of what a traditional Incandescent light would use.
- They do not produce extra heat, hence they save energy.
- They have a lifetime of 10,000 to 50,000 hours.

Disadvantages

- Fluorescent light bulbs contain 4 milligrams of mercury which is essential for their operation. However it is an extremely small amount compared to the traditional thermometers which contain 500 milligram of mercury.

- The initial cost of Fluorescent light bulbs is at least three times higher than traditional light bulbs.
- Initially, Fluorescent lights used to have flickering problems and they used to make buzzing noises. However due to the latest advancement in technology, that issue is resolved and newly improved Fluorescent lights are being released.

Conclusion/Recommendations

Light is an essential element for humans to live. We need light to complete our daily tasks such as school work, jobs, driving, cooking, cleaning, eating, etc. Quick Tec Corp. goal is to install a light system that is reliable, safe, high performance, and cheap. The comfort of residents of the building is our top priority. Therefore we propose to install LED lights in large areas of the building since they have the most lifetime and they use the least amount of energy than any other type of lights. However, depending on the needs of the residents, we could decide whether we want to use incandescent lights or fluorescent lights in small areas. A typical light system in large areas will be mounted on the ceiling so that it doesn't cause safety issues later on. Lastly, we hope this data helps you realise the importance of a safe light system.

ELEVATOR SYSTEMS

Introduction/Purpose

Elevator is a motor that moves to carry passengers between floors, at the present time every tall apartments at least got one elevator, Hydraulic elevator works with piston and cylinder, pump and piping, hydraulic oil reservoir and control system that rises on single-stage about 14'-20' and maximum 2 to 3 stops, electric power clearly becoming worldly and most modern elevators are propelled by electric motors as I describe at the beginning, it works counterweight by pulling above wire hoist ropes. Some of the basic elevator components are car, hoist way, machine/drive system, control system and safety system. Nowadays elevators are much smarter than before, they don't need doors and you can give them orders or if there is a problem it is bottom for emergencies.

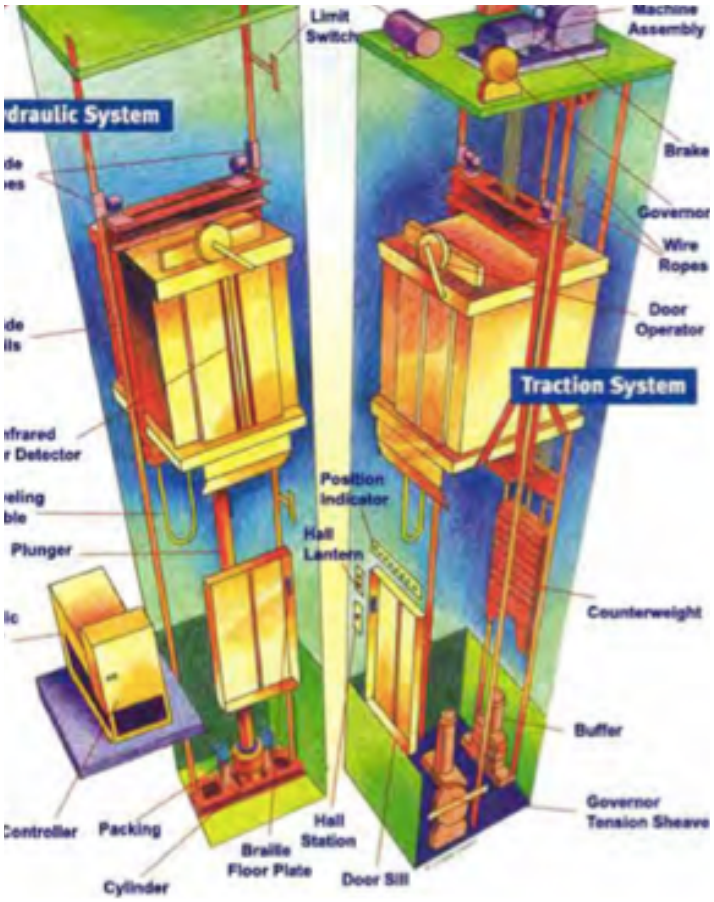
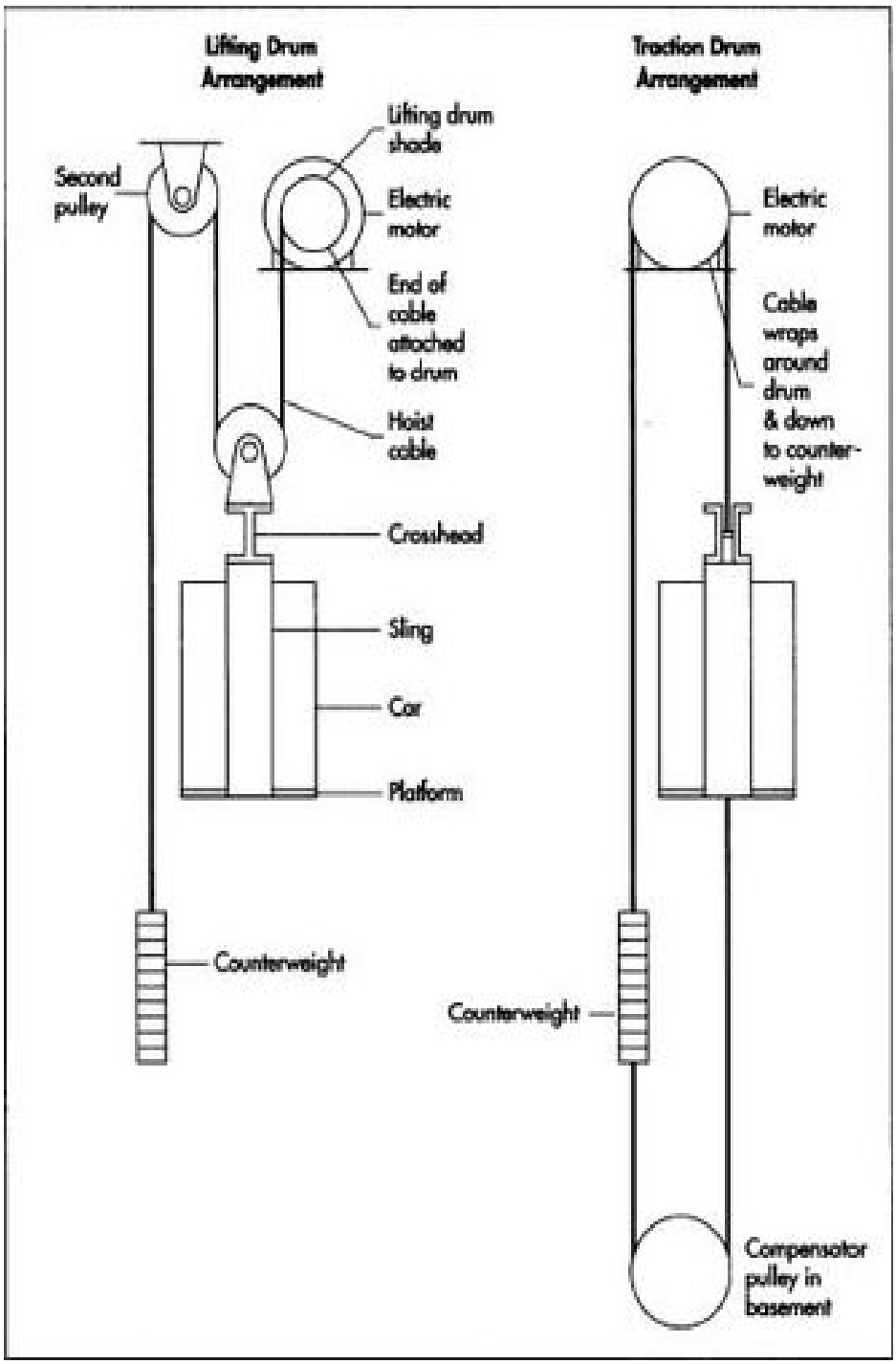


Figure 14. Hydraulic system and traction system.

Overview - Design Goal (Context)

Figure 15. Elevators design.



Elevators are simple and they have only one function and it works counterweight and there can't be more than one intention, elevator only made with 6 parts such as Cylinder, Piston, Fluid reservoir, rotary pump, valve and hydraulic fluid.

Safety is important than everything we have to make sure ropes are working very well and check out other stuff for safety then weight is important to, it should describe maximum weight and we have to make sure there are enough spaces for people after that we need to design elevators with good quality so they can last long.

Describe the system

Elevators are simple motor that can move passengers from level to another level and they moving by giving them orders with the bottom inside of cabin, some part of elevators called control unit, pulley, electric motor, governor, hoist ropes, door opener, car, traveling cables, counterweight guide rails, counterweight, car guide rails and car buffer, and elevators are not only for human, sometimes they are used in ships, dams, and such specialized structures as rocket launchers. Gearless traction can high-rise above 20 stories and speeds of 500 feet per minute or above, door safety is new modern that means when someone is stuck in a door, the door opens automatically.

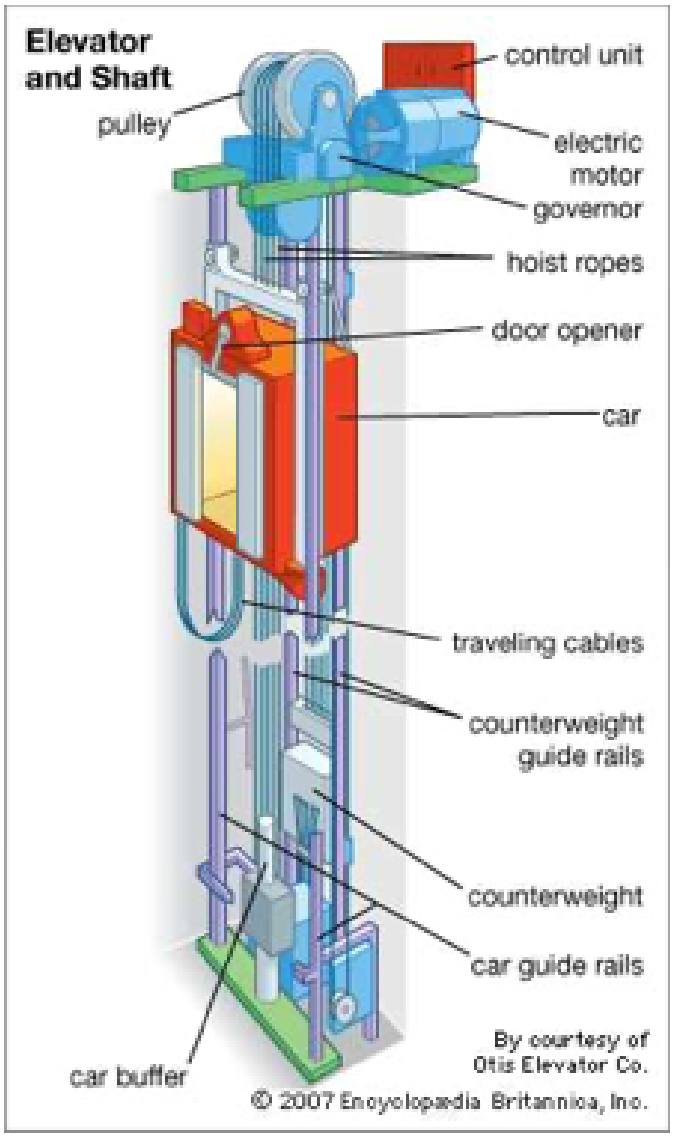
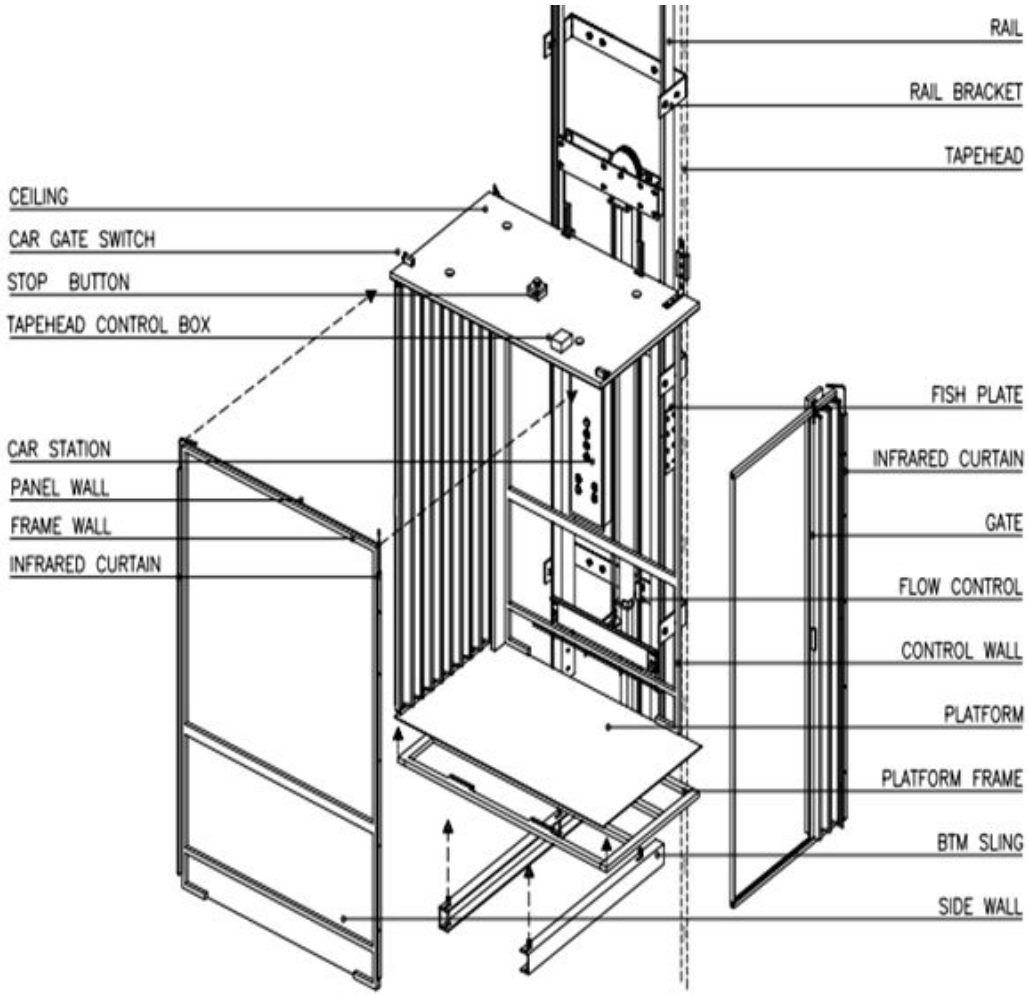


Figure 16. Description of elevators.

Usage/Resources

Elevator is a form of vertical motion that moves from one floor to another. It is the main part of residential or commercial buildings. Nowadays all buildings have a legal requirement to install elevators to make them convenient for residents. To keep in mind, residents will have an emergency service connection 24 hours and fire emergencies that will be automatically connected with wireless connection. Moreover, it is also important to mention some of the main parts of elevators such as: Hall door, Hall station, Landing area, Car station, Handrail, Telephone cabinet, Machine room and Controller. Additionally, it will provide important notes for users inside and outside of the elevator to keep everyone safe, easy to use and reduce hazard.

Figure 17. Main parts of the elevator.



Maintenance

It's very clear that maintenance of elevators is a very important part to keep residents safe and also to save the owner from spending a lot of money to fix the elevator. Therefore, it needs proper guidelines for maintenance. The schedule for maintenance is usually arranged by the service company. Some of important guideline are listed below:

- Checking regularly machine room:

  A) check there is no oil leakage and minimum oil level when the elevator is at the top floor.

  B) making sure that that oil tank is clean.

  C) expiry date of emergency battery

  D) burnt wiring

  E) cleaning all dust

- Inspect the shaft for the following:

  A) make sure that all switches are in good shape

  B) check light are functioning

  C) pit should be clean and dray

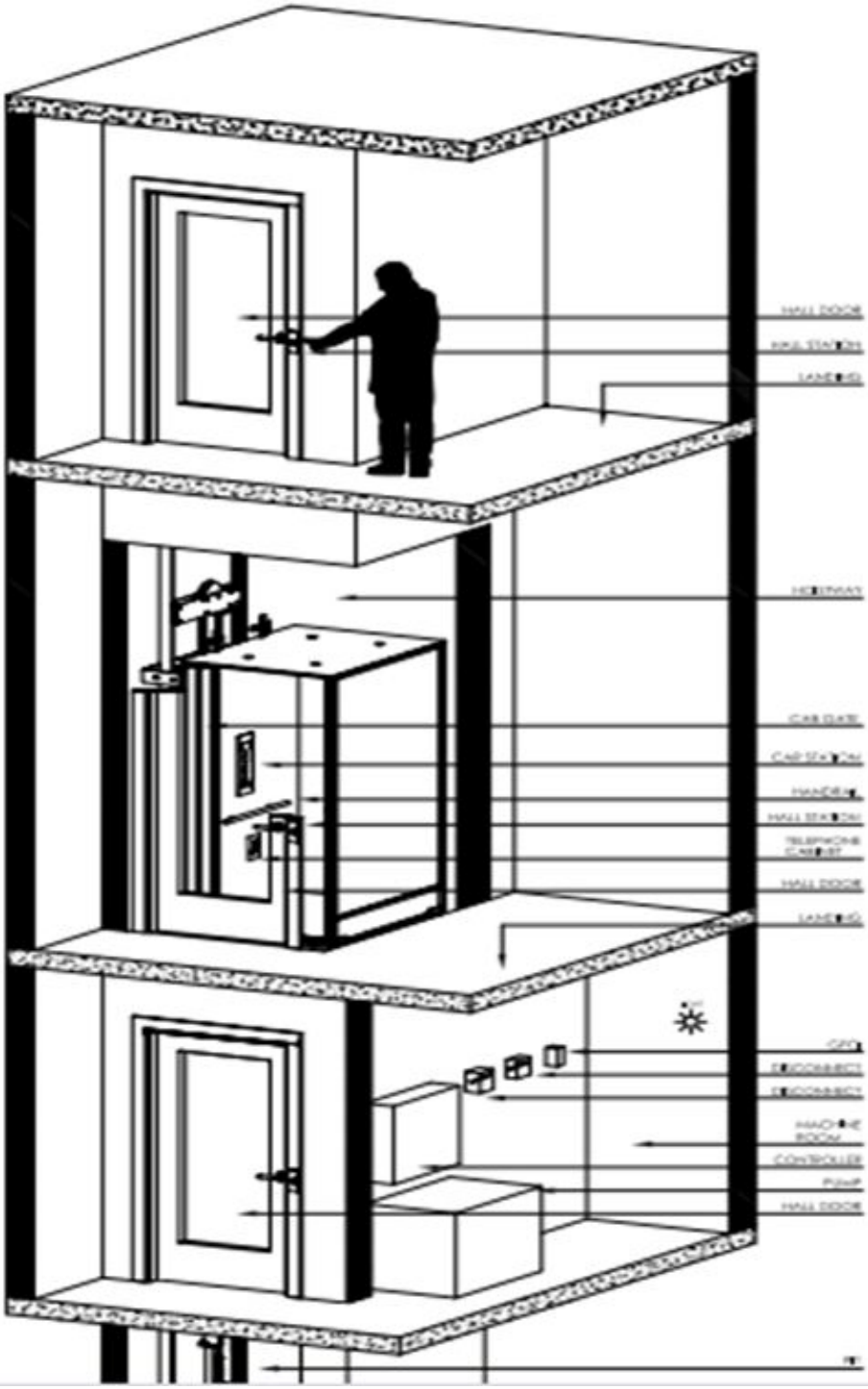
  D) ropes should be undamaged and that rope attachments are secure

- Cable should be hanging correctly
- All frames not damaged
- The door interlocks are attached sturdily
- The spring door closer is connected strongly
- Call buttons works normal
- Lights working well
- Walls and handrails are retaining

Some other requirements for maintenance are important to follow:

- Once every month have to check machine room manually traction elevators
- Once every month have to check performance of elevator
- Adjustment of door opening and closing, accelerate and decelerate of elevator

Figure 18. To maintain have to know where each element of elevators are.



Performance

To make a perfect plan for the performance of an elevator have to work when traffic quantity is massive throughout morning and late afternoon. Because, residents are leaving or returning to the building. Therefore, the best condition of elevator performance is journey time. It needs to figure out and find out the waiting time and ride time of the Car. Performance of the elevator system is regulated from the Control Room. This system is dealing with Speed, Hall calls, Digital load information, Car calls and handling capacity of elevators. Elevators can manage speeds between 500 ft/min to 2,000 ft/min so it depends how tall the building is to designate the speed of the elevator. In fact, 5% electrical energy spent on a building, by installing intelligent software Energy saving our project will save a large amount of energy.

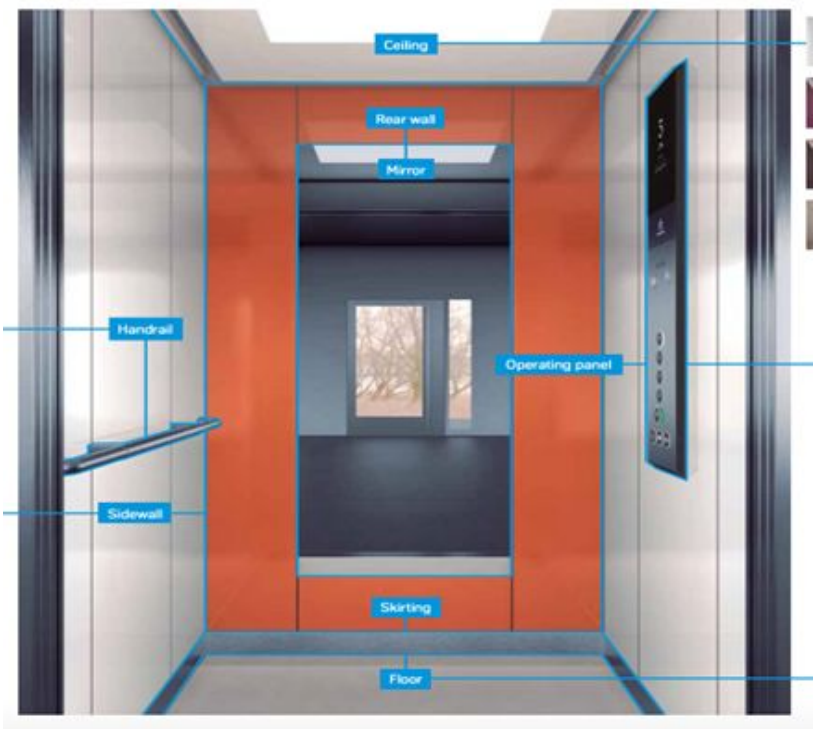
Table 3. Common Requirements for Residential Elevators.

	Luxury Residential	Normal Residential	Economy
Handling Capacity (% of population per 5-minutes)	**7% - 8%**	6% - 7%	5% - 6%
Interval	**< 50 secs**	< 60 secs	< 70 secs

Design

All elevator systems have the basic function, such as moving up and down, open and close. But new technologies and designs will provide users with a great environment, that they can feel safe and feel happy. Synergy and evolution are the new design for elevators that have significant styles and conditions. All elements that will provide standard and high quality that perfectly meets owner taste and needs. Synergy design is very subtle for low-rise buildings with low- to mid- level traffic requirements, that will display a more functional and stout design line. Evolution design is very organized for mid- rise buildings with hid- to high- level traffic requirements. The technology and design line architecture are high level performance and very comfortable. Both designs offer cabins, walls, mirrors, skirting and handrails, ceiling and floor with different colors that look perfect with building. Cabins and wall materials will be rust proof that will keep elevators clean and fresh. Ceiling will be white painted that will elevate the reflection of the light from the LED panel light to make the elevator brighter and well. Mirrors for elevators also have a significant role in our design line, at the side or rear wall it will be 5mm tempered safety glass, and part of the design will build the cabin very bright with ceiling light reflections. Door of the elevator will be provided in rustproof steel and power door operation. Car operating panel design line for elevators is also a key point of architecture that makes users feel secure and easy to use elevators. There are different options to choose for car operating panels for instance, Moon, Edge, Alto, Edge high, Alto full height and IL variable.

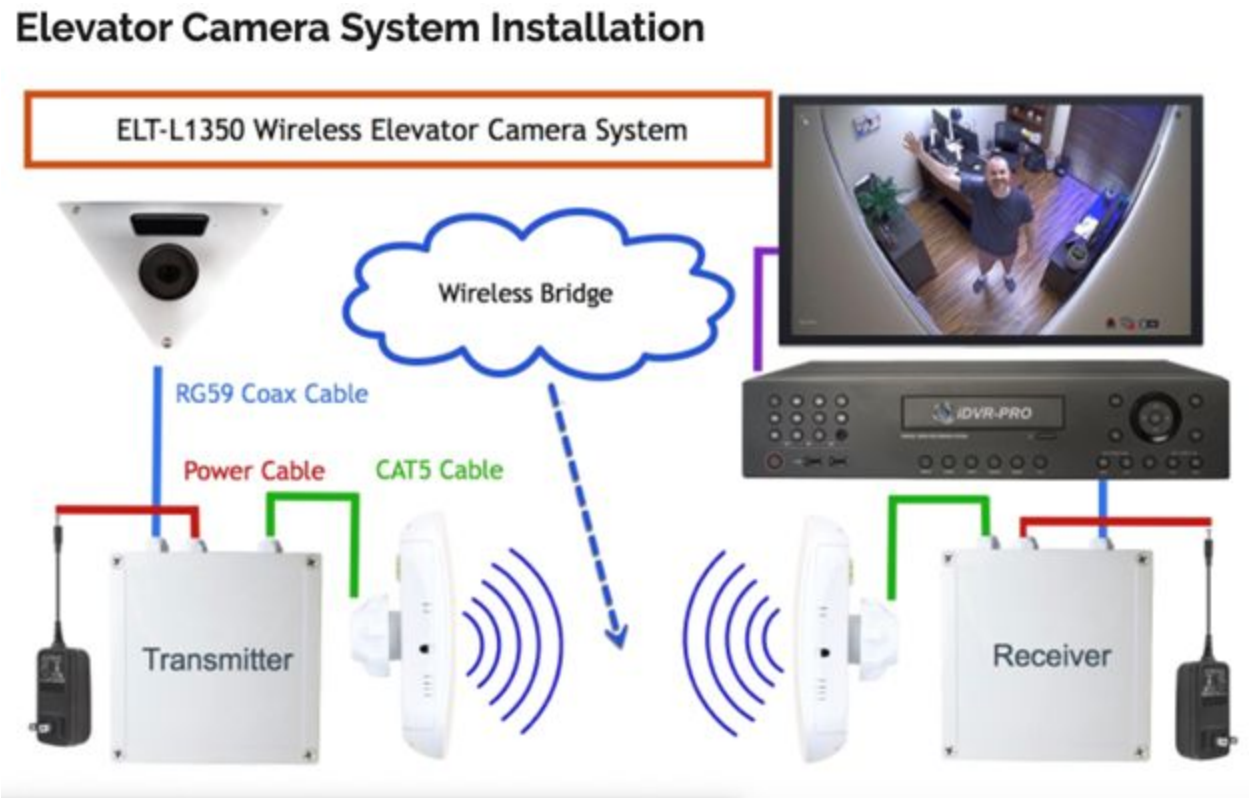
Figure 19. Elevator decoration.



Camera

As we know that safety is a key factor for everyone. So, in our research we summarized that Video surveillance in elevators is the main key for cameras. Video surveillance is necessary in such an environment that will make students feel comfortable and safe. In this part of the project, it will be made clear to understand which kind of camera is good for elevator ambience. To understand which kind, it's necessary to identify camera systems that make them more effective all around the elevators. Company will provide all important tools for installation. Important to keep in mind that placing a camera in an elevator is always a challenge because of moving elevator cabins. So, we have to keep in mind that cable for elevators is different from regular one. It can break over and over that will make a safety risk or images are not clear. Therefore, wireless systems are uniquely designed for elevators. This particular design will keep elevators from safety risk and jerk free with quality images. Moreover, wireless digital camera design will: easy to install, no cable hanging around the elevator, clear and high-quality image, enough storage and covering all elevators.

Figure 20. Camera system in elevator.



FINAL REPORT CONCLUSION

As a result, we know that secure and reliable systems are expensive. Sustainability and performance are the main factors when installing systems in commercial buildings because having maintenance done due to system failure is inconvenient for everyone. Therefore choosing the best goods will leave the consumer satisfied and happy. High performance systems are usually reliable enough to be safe as well. So consumers don't have to worry about safety issues in that regard.

Heating, ventilation, and air conditioning system is responsible for the heating and cooling temperature indoors. They make the environment comfortable and fresh. Lighting is an essential element in a person's daily life which provides help with one's daily tasks, especially at night. Having high performance light systems which are safe to a person's eyes also helps with productive behaviour. Elevators are a big safety concern in terms of commercial buildings or buildings in general. Elevators are the heart of a building. They help people get to their destination. Under no condition should there be equipment used that is unreliable for the elevator installation. Otherwise, the outcome is possible to be life threatening injury or even death. Ultimately, each topic is unique and requires different perspectives in terms of safety, goods, performance, cost, maintenance, sustainability, and purpose for a safe and comfortable environment.

GLOSSARY

Air Conditioner- A gadget that changes dampness levels, temperature or nature of air.

Air Handler- Indoor piece of the cooling framework including the flowing fan and evaporator (summer)/condenser (winter) loop.

BTU- British Thermal Unit is the estimation of the measure of warmth required to raise or lower the temperature of one pound of water one degree Fahrenheit.

CFM- (Cubic feet per minute)An estimation of wind current volume.

Coil- The loop, or evaporator coil, is associated with the wind stream outlet of the heater. Molded refrigerant is coursed through the loop to cool the structure in the mid year and warmth in the winter. As warm indoor air goes through the indoor or evaporator curl, temperature and moistness are evacuated making cooler indoor air. Introducing an accurately measured and evaluated evaporator loop is basic for getting the best and solace from your focal cooling or warmth siphon framework.

DuctWork- A system of metal, fiberboard or adaptable material streaming all through a space which conveys air from a HVAC unit to the separate zones of a home or office.

EER- The Energy Efficiency Ratio of a specific cooling gadget is the proportion of yield cooling vitality (in BTU) to include electrical vitality at a given working point.

Filter- A focal warming and cooling framework may utilize different channels. The air channel is necessary to the framework consumption ducting, keeps contaminants from entering the gear and should be kept up or supplanted at normal intervals. There is additionally a channel in the refrigeration framework, likewise alluded to as a drier, which acts like a strainer to expel soil and undesired particles from the framework

Furnace- The significant gas terminated part in warming a home. A gadget that encourages the ignition of fuel and air to make warmth and afterward courses it through the home by methods for a fan.

Heat Pump- A gadget utilized for either the warming or cooling of a space by moving warmth between two supplies.

HVAC- Heating, Ventilation and Air Conditioning

IAQ- Indoor Air Quality

Split system- An open air unit joined with an indoor unit (rather than a bundle unit), by and large giving more effectiveness and arrangement alternatives.

Thermostat- A divider mounted gadget that screens and controls the yield of a HVAC framework.

Vacuum- A space where the weight is fundamentally beneath that of standard barometrical weight.

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Figure 9. Figure 10. Figure 11. Figure 12. Figure 13. Pictures were physically captured by Hazkeel Qureshi.

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APPENDIX A. HVAC SYSTEMS

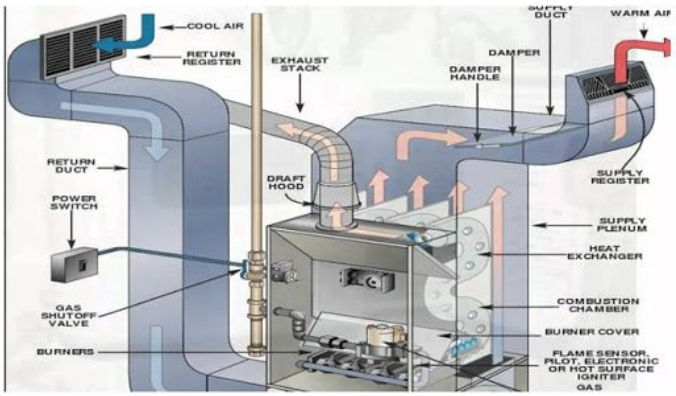


Figure 21. This diagram below shows the parts of the system labelled and the process in which it goes through.

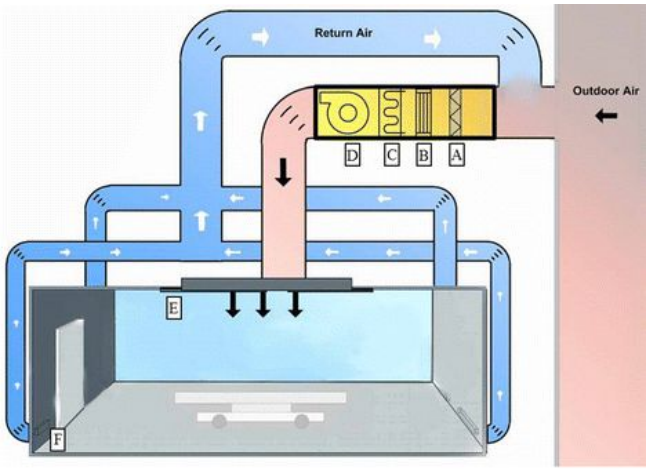


Figure 22. This diagram just shows the direction in which the air goes throughout the system.

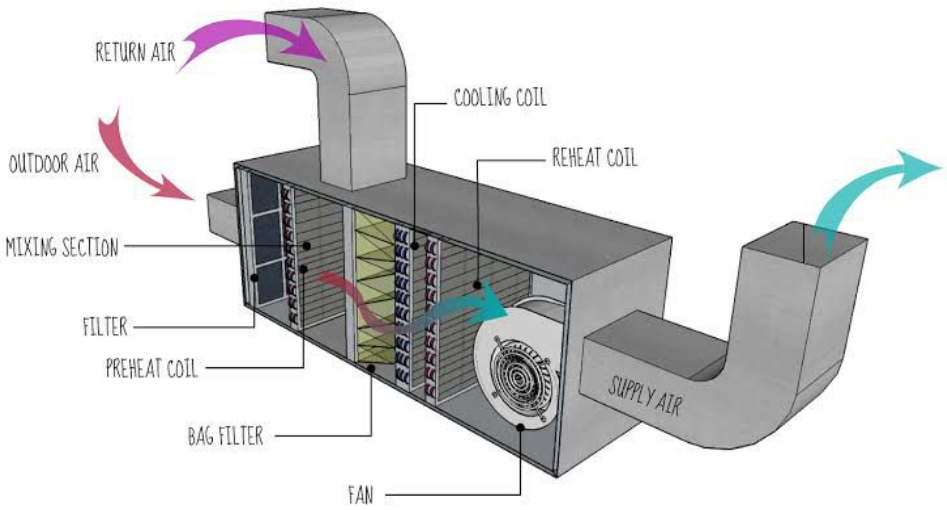


Figure 23. This diagram also shows the different parts of the HVAC system and the direction the air goes.

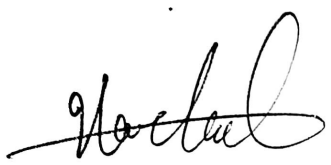
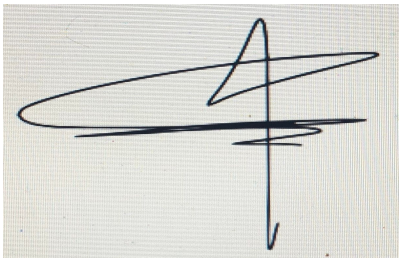
ACADEMIC HONESTY PLEDGE

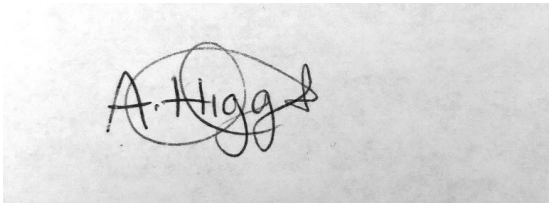
THIS FORM MUST BE SIGNED BY ALL TEAM MEMBERS AND ATTACHED TO YOUR FINAL REPORT.

USE THIS LIST AS A CHECKLIST AS YOU EDIT YOUR DOCUMENT BEFORE SUBMISSION.

By signing below, we certify that research information has been included in this report using the APA style and ethical standards, which include the following:

1. **Brief summarized and paraphrased information includes in text source information and full documentation in the References list.**
2. **Quotes of no more than one brief paragraph have been employed. Quotation marks have been used to indicate the quotes, and in text source information follows the quoted information. Full documentation is listed in the References list.**
3. **No amount of text has been copied from sources and placed in our report--without indication of sources in text and in the References list.**
4. **No amount of text has been copied from sources and placed in our report without quotation marks—even if the source is placed below the copied paragraphs.**
5. **All images, charts, graphs, photos are numbered, captioned, and sourced—below each visual aid and in the References list.**

Name	Signature
Hazkeel Qureshi	
Soheil Najafi	

Ashtawn Higgs	
Ahmad Ludin	

Writing Tasks Information

Please provide information about writing responsibilities for this report (what did each team member write?):

Name	Document Topics	Page Numbers
Hazkeel Qureshi & Ahmad Ludin	**Letter of Transmittal**	
Hazkeel Qureshi	**Title Page** **Cover Page** **Executive Summary** **Table of Contents** **List of Figures** **List of Tables** **List of Graphs**	
Ashtawn Higgs	**INTRODUCTION**	
Ashtawn Higgs	**HVAC SYSTEMS** - **Introduction** - **Overview** - **Describe the System** - **General Operation** - **Primary Research** - **Cost** - **Air Quality**	

	- Interconnection with other parts - Safety - Usage - Resources/Quantity - Sustainability/ Maintenance - Performance - Conclusion - Final Recommendations	
Hazkeel Qureshi	**LIGHTING SYSTEMS** - Introduction/ Purpose - Overview - Design Goal (Context) - Describe the System - General Operation - Primary Research Survey - Cost - Safety - Usage - Resources/ Quantity - Sustainability/ Maintenance - Performance - Conclusion/ Recommendations	
Soheil Najafi	**ELEVATOR SYSTEMS** - Introduction/Purpose - Overview - Design Goal (Context) - Describe the System	
Ahmad Ludin	**ELEVATOR SYSTEMS** - Usage/Resources - Maintenance - Performance - Design - Camera	
Hazkeel Qureshi	**FINAL REPORT CONCLUSION**	
Ashtawn Higgs	**GLOSSARY**	

Ashtawn Higgs **Hazkeel Qureshi** **Ahmad Ludin** **Soheil Najafi**	**REFERENCE**	
Ashtawn Higgs	**APPENDIX A. HVAC SYSTEMS**	