# DESIGN OF ELECTRICAL WIRING SYSTEM FOR RESIDENTIAL AREA AUTOCAD

Report Submitted to the Central University of Karnataka, Kalaburagi
in partial fulfillment of the award of the Degree of

**Bachelor of Engineering**

In

Electrical Engineering

By

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2019BEE17

Under the Guidance of

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Certified that the project work entitled " **Design of electrical wiring system for the residential area using AutoCAD**" is a bonafide work carried out by Madhumita Sanjay Patil in partial fulfillment of the requirement for the award of the degree of Bachelor of Engineering in Electrical Engineering, School of Engineering, Central University of Karnataka, during the year 2021-2022. It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated in the Report. The project report has been approved as it satisfies the academic requirements regarding project work prescribed for the Bachelor of Engineering.

| | | |
|---|---|---|
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# Declaration By The Student,

I hereby declare that the work reported in the B.Tech. project entitled **"Design of electrical wiring system for residential area using AUTOCAD "** submitted to Central University of Karnataka, Kalaburagi, India. I hereby declare that this work has not been submitted for the award of any other degree/ diploma of this University or any other institution. I further attest that this work is original and that I am fully responsible for the content of my B.Tech project.

**(Signature of the Student)**

**Madhumita Sanjay Patil**

**Place:**

**Date:**

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**Chapters**

# Chapter 1. Introduction

The electrical system design solves challenges that are related to design and development to ensure that they are economical, safe, and reliable. This also includes electrical layouts, lighting, earthing, voltage drop, and short circuit calculation. Engineers use design for the production, transportation, and distribution of electricity.

Basically, electrical is a field of engineering that deals with the study of electricity. Designing relates to the appropriate size calculation of electrical components or equipment. Drafting is the type of technical drawing to represent the information about lighting and raw power of an electrical project.

Electricity exists in a form that is useful to exploit, however, it will also be important to install electricity as efficiently as possible, and the design of the power distribution system should be convenient so as to minimize power losses. This project analyses the electrical service design of a residential house and a basic commercial area using the lumen method for the lighting calculations.

# Chapter 2. Literature survey

## 2.1. Review of Literature Survey

Before the launch of AutoCAD and other design software, engineering drawings were made on sheets of paper using drawing boards. Multiple pieces of equipment were required to complete a given drawing such as drawing boards, different grade pencils, erasers, T-squares, set squares, etc.

Drafting was indeed tedious and time-consuming. Designing and putting everything on paper was a tough job, which sparked the requirement for a new solution using the latest available technology. The major disadvantage of the paper-based design was that you can not actually change it after it's been put on paper. So if the design was changed, then sketches had to be redone!

Technological advances have caused some professions to cease to exist, but in the case of designers, they just made their desks smaller and tidier.

## 2.2. Problem Statement

Electrical Lighting Layout designs show the position of various light fittings and their control switch positions. This will allow house owners' to confirm correct and complete lighting for their homes. This lighting layout design also shows the control supply is from the Inverter or mains. Master switch-controlled lights on the exterior are shown in this layout.

AutoCAD is a kind of software that is useful in every field of engineering design (even nontechnical fields too). From the layout of buildings, Substations, etc to 3d modeling of machines, jewelry, etc. is possible. For electrical engineers, it's good for making circuit layout to powerplant layouts.

AutoCAD also provides an electric design module that will make electrical designing easier. This module includes a list of electrical schematic components, automatic report generation, and PLC I/O drawing for the spreadsheet.

# Chapter 3. Methodology of the proposed system

## 3.1. Step by step methodology of project

Step 1: Know Your Layout:

Either use software or graph paper and make a scale drawing of the different rooms. Make sure to include features such as cabinets, counters, stove, bed, and other various symbols.

Step 2: Plan it in Advance

After finalizing your layout, focus on your electrical plan. The wirings go through the ceilings, walls, and floor before they are plastered, laid out, and fixed.

Step 3: Calculate RI and CUF for each room

Using the dimensions in the layout plan, find out RI and CUF values using the charts and formulas for each room separately.

$$Room\ Index\ = (L * B)/((L + B)HM)$$

RI table in APPENDIX 1

Step 4: Select the type of light. Select no lamps in each fixture and find Lumens of selected light.

### Classification of Lighting Design

Interior lighting design
Exterior lighting design

**Interior Lighting Design**

Incandescent Lamp:- Available in a voltage range of 1.5V to 300V
CRI: 100

| | | |
|---|---|---|
| Watts | 40 | 60 |
| Lumens | 290 | 840 |

Fluorescent Lamp:-Available in a wattage range of 4W to 60W
CRI: 50-80

| | | |
|---|---|---|
| Watts | 9 | 13 |
| Lumens | 550 | 810 |

Compact Fluorescent Lamp:- Available in a wattage range of 4W to 80W

LED (Light Emitting Diode):- Available in a wattage range of 0.5W to 200W
CRI: 80-98

| | | |
|---|---|---|
| Watts | 6 | 9.5 |
| Lumens | 450 | 800 |

**Exterior Lighting Design**

Sodium Vapour lamp:- Sodium vapor lamps are filled with gas or vapor inside it and these lamps are yellow in color due to the presence of sodium gas.

A sodium vapor lamp can glow continuously without any interruption. This SVL is of three types:

*Low bay Sodium vapor lamp*: is used for up to 5-6 meters of height.

*Medium bay Sodium vapor lamp*: used for up to 8 meters of height

*High bay Sodium vapor lamp*: used for more than 8 meters of height

Available in a wattage range of 70W to 1250W
CRI: 44

| | | | |
|---|---|---|---|
| Watts | 18 | 35 | 55 |
| Lumens | 1800 | 4550 | 7800 |

Mercury Vapour lamp:-Available in a wattage range of 40W to 2000W
CRI: 17

| | | |
|---|---|---|
| Watts | 70 | 400 |
| Lumens | 6,650 | 38,000 |

Metal Halide lamp:- Available in a wattage range of 70W to 2000W
CRI: 85-94

| | | | |
|---|---|---|---|
| Watts | 250 | 400 | 1000 |
| Lumens | 22,000 | 36,000 | 110,000 |

Room wise lumen and lux chart - APPENDIX 2

Step 5:Calculate No lighting fixtures:

Using the formula Calculate No of lighting fixtures in each room.

$$No\ of\ lighting\ fixtures = (L * B * Lux\ Req)/(CUF * MF * No.of\ lamps * lumens)$$

Step 6: Calculate tonnage for AC

Using formula calculate tonnage for ac according to room size

$$Tonnage = Area\ of\ room\ in\ Sqft/100$$

Ac wattage table in APPENDIX 1

Step 7:Make Load Table

Make load table for lights fans and normal sockets.

Step 8: Make Raw Load Table

Make a load table for AC and power sockets

Step 9: Total load Calculation and find out will it be 3 phase connection or a single-phase connection.

Step 10: Make a load Balancing Sheet

Step 11; Add all the electrical components to your layout and add a wiring diagram

Step 12: Walk Through Your Plan

Once you are finished with your layout, print it out, and walk through your home while holding it. Since there are no walls and electricity, the arrangement can be easily changed; therefore, imagine that you are turning on and plugging in appliances. This will enable you to put switches and outlets in the best places.

## 3.2 Calculation

### Lighting Fixture Calculations

1. For Living room (3.2 X 4.6 $m^2$)

$$RI = \frac{L * B}{(L + B)HM}$$

$$RI = \frac{3.2 * 4.6}{(3.2 + 4.6) * 2.4}$$

$$RI = 0.78$$

$$CUF = 0.66$$

$$NO\ OF\ LIGHTING\ FIXTURE = \frac{3.2 * 4.6 * 300}{0.66 * 0.95 * 1 * 3350}$$

$$NO.OF\ LIGHTING\ FIXTURE = 2.10$$

2. For Bedroom 1 (3.2 X 4.6 $m^2$)

$$RI = \frac{L * B}{(L + B)HM}$$

$$RI = \frac{3.6 * 3.2}{(3.6 + 3.2) * 2.4}$$

$$RI = 0.71$$

$$CUF = 0.58$$

$$NO\ OF\ LIGHTING\ FIXTURE = \frac{3.6 * 3.2 * 250}{0.58 * 0.95 * 1 * 3350}$$

$$NO.\ OF\ LIGHTING\ FIXTURE = 1.56$$

3. For Toilet 1&2 (2.4 X 1.2 $m^2$)

$$RI = \frac{L * B}{(L + B)HM}$$

$$RI = \frac{2.4 * 1.2}{(2.4 + 1.2) * 2.4}$$

$$RI = 0.33$$

$$CUF = 0.58$$

$$NO\ OF\ LIGHTING\ FIXTURE = \frac{2.4 * 1.2 * 150}{0.58 * 0.8 * 1 * 1800}$$

$$NO.\ OF\ LIGHTING\ FIXTURE = 0.51$$

4. Dining (2.3 X 2.4 $m^2$)

$$RI = \frac{L * B}{(L + B)HM}$$

$$RI = \frac{2.3 * 2.4}{(2.3 + 2.4) * 2.4}$$

$$RI = 0.48$$

$$CUF = 0.58$$

$$NO\ OF\ LIGHTING\ FIXTURE = \frac{2.3 * 2.4 * 200}{0.58 * 0.95 * 1 * 3350}$$

$$NO.OF\ LIGHTING\ FIXTURE = 0.59$$

5. For Kitchen(3.6 X 3 $m^2$)

$$RI = \frac{L * B}{(L + B)HM}$$

$$RI = \frac{3.6 * 3}{(3.6 + 3) * 2.4}$$

$$RI = 0.68$$

$$CUF = 0.58$$

$$NO\ OF\ LIGHTING\ FIXTURE = \frac{2.4 * 1.2 * 150}{0.58 * 0.8 * 1 * 1800}$$

$$NO.OF\ LIGHTING\ FIXTURE = 0.51$$

6. For Bedroom 1 (3.2 X 4.2 $m^2$)

$$RI = \frac{L * B}{(L + B)HM}$$

$$RI = \frac{3.2 * 4.2}{(3.2 + 4.2) * 2.4}$$

$$RI = 0.75$$

$$CUF = 0.58$$

$$NO\ OF\ LIGHTING\ FIXTURE = \frac{3.2 * 4.2 * 250}{0.58 * 0.95 * 1 * 3350}$$

$$NO.OF\ LIGHTING\ FIXTURE = 1.8$$

7. For Balcony (3.2 X 1.2 $m^2$)

$$RI = \frac{L * B}{(L + B)HM}$$

$$RI = \frac{3.2 * 1.2}{(3.2 + 1.2) * 2.4}$$

$$RI = 0.36$$

$$CUF = 0.58$$

$$NO\ OF\ LIGHTING\ FIXTURE = \frac{3.2 * 1.2 * 150}{0.58 * 0.8 * 1 * 1800}$$

$$NO.OF\ LIGHTING\ FIXTURE = 0.68$$

AC Calculation

1. For Bedroom 1 (3.2 X 4.6 m²)

$$Area\ in\ Sqft = 12.22 * 10.8$$
$$= 131Sqft$$
$$Tonnage\ of\ AC = \frac{131}{100}\text{T}$$
$$= 1.3T$$
$$Approx = 1.5T$$

2. For Bedroom 1 (3.2 X 4.2 m²)

$$Area\ in\ Sqft = 10.6 * 14.2$$
$$= 150Sqft$$
$$Tonnage\ of\ AC = \frac{150}{100}\text{T}$$
$$Approx = 1.5T$$

**Load table**

| Loction | CFL(24W) | FL(48W) | Fan | E-Fan | Normal Socket |
|---|---|---|---|---|---|
| Hall | | 2 | 2 | | 2 |
| Bedroom1 | | 2 | 1 | | 2 |
| Toilet 1 | 1 | | | 1 | 1 |
| Toilet 2 | 1 | | | 1 | 1 |
| Dining | | 1 | 1 | | 2 |
| Kitchen | | 2 | | 1 | 1 |
| Bedroom2 | | 2 | 1 | | 2 |
| Balcony | 1 | | | | 1 |
| Total | 3 | 9 | 5 | 3 | 12 |

$$\text{Total load} = \sum \text{Total Fixture} * \text{Watt}$$

$$\text{Total Load} = (3*24) + (9*36) + (5*48) + (3*50) + (12*100)$$

$$= 1986\text{W}$$

$$\text{Total Load} = 1.986\text{KW}$$

**Raw Load table**

| Loction | Power socket | AC |
|---|---|---|
| Hall | 2 | |
| Bedroom1 | 1 | 1.5T |
| Toilet 1 | 1 | |
| Toilet 2 | 1 | |
| Dining | 1 | |
| Kitchen | 2 | |
| Bedroom2 | 1 | 1.5T |
| Balcony | 1 | |
| Total | 10 | 3T |

$$\text{Total Raw load} = \sum \text{Total Fixture} * \text{Watt}$$

$$\text{Total Load} = (10*600) + (3*1400)$$

$$= 10200\text{W}$$

$$\text{Total Load} = 10.2\ \text{KW}$$

## Total connected Load

Total Connected Load= 1.9+ 10.2
=12.1KW

## Load Balancing Sheet

| LOAD BALANCING SHEET FOR OVERALL LOAD | | | | | | | |
|---|---|---|---|---|---|---|---|
| S. No. | CKT | CB | CABLE (SQ. MM) | LOCATION | R | Y | B |
| 1 | R1 | 10A | 2.5 | Hall,Bedroom1 | 688 | | |
| 2 | Y1 | 10A | 2.5 | Toilet1,Toilet 2,Dinning | | 570 | |
| 3 | B1 | 10A | 2.5 | Kitchen,Bedroom 2,Balcony | | | 468 |
| 4 | R2 | 20A | 4 | Hall,Dining,Kitch en | 3000 | | |
| 5 | Y2 | 20A | 4 | Bedroom1 | | 2700 | |
| 6 | B2 | 20A | 4 | Bedroom2 | | | 2700 |
| 7 | B3 | 20A | 4 | Balcony | | | 600 |

# Chapter 4. Experimental setup, Results, and discussions

## 4.1 CAD Drawings

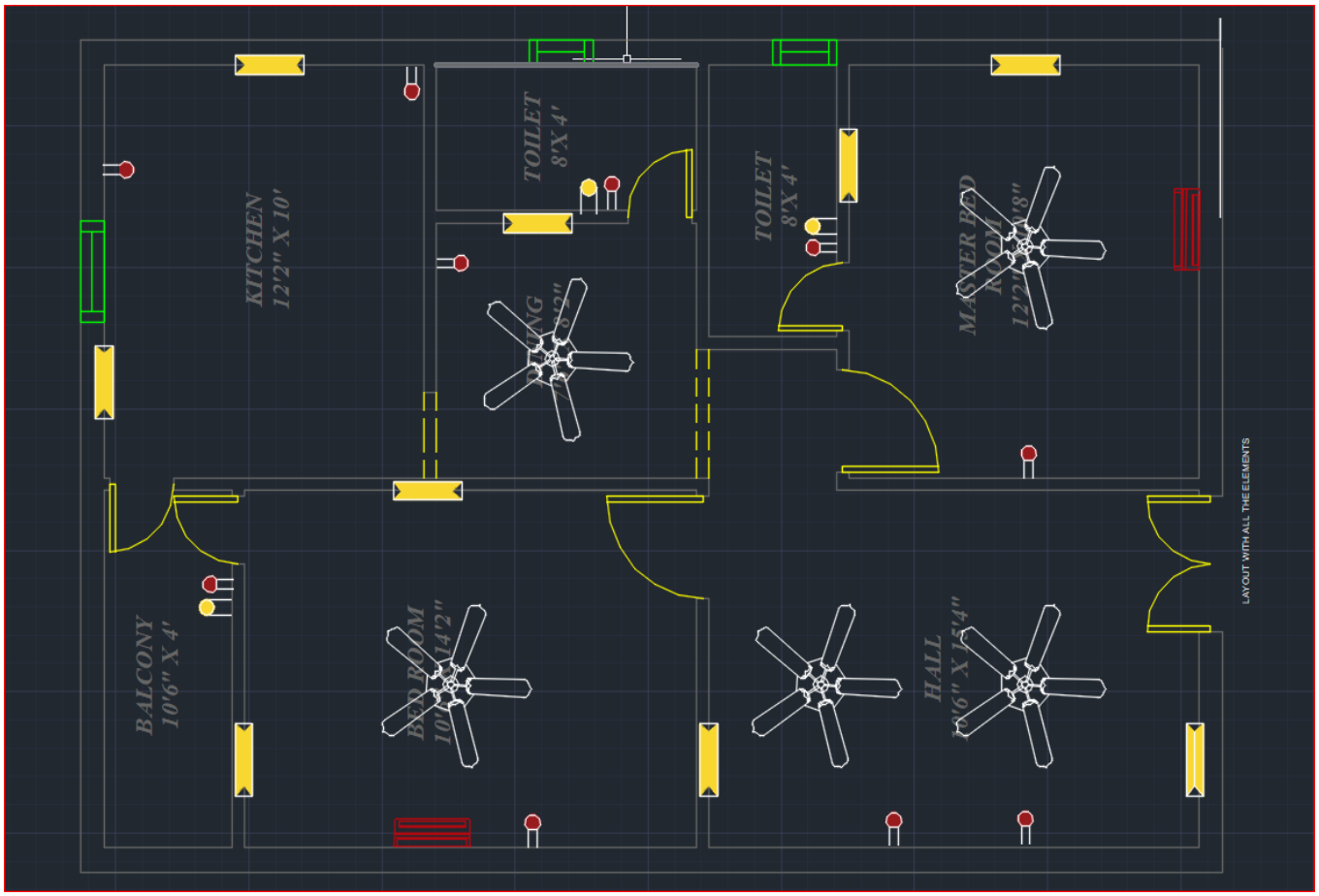


Fig4.1 Layout of house

WIRING OF R1

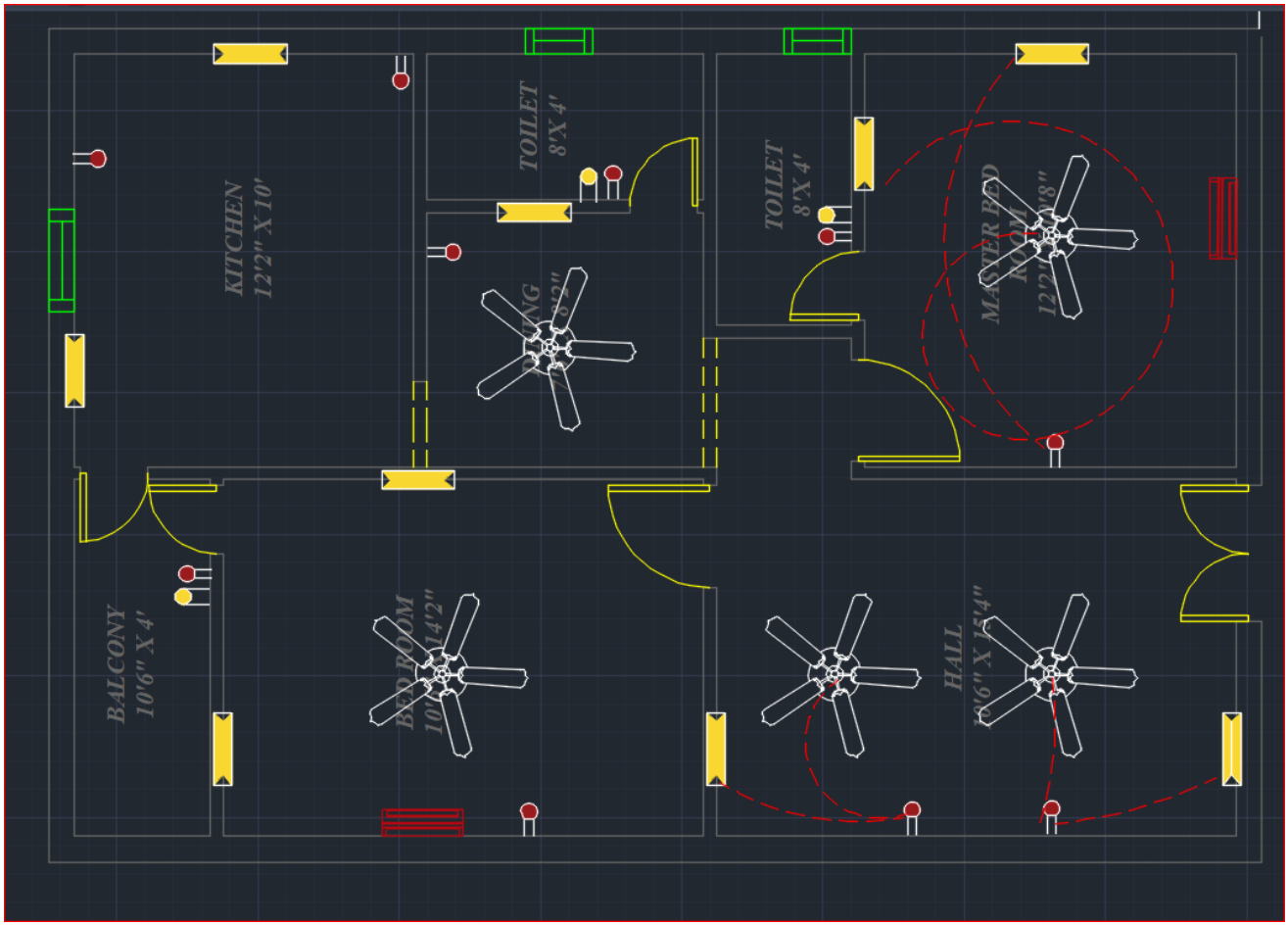


Fig 4.2

WIRING OF Y1

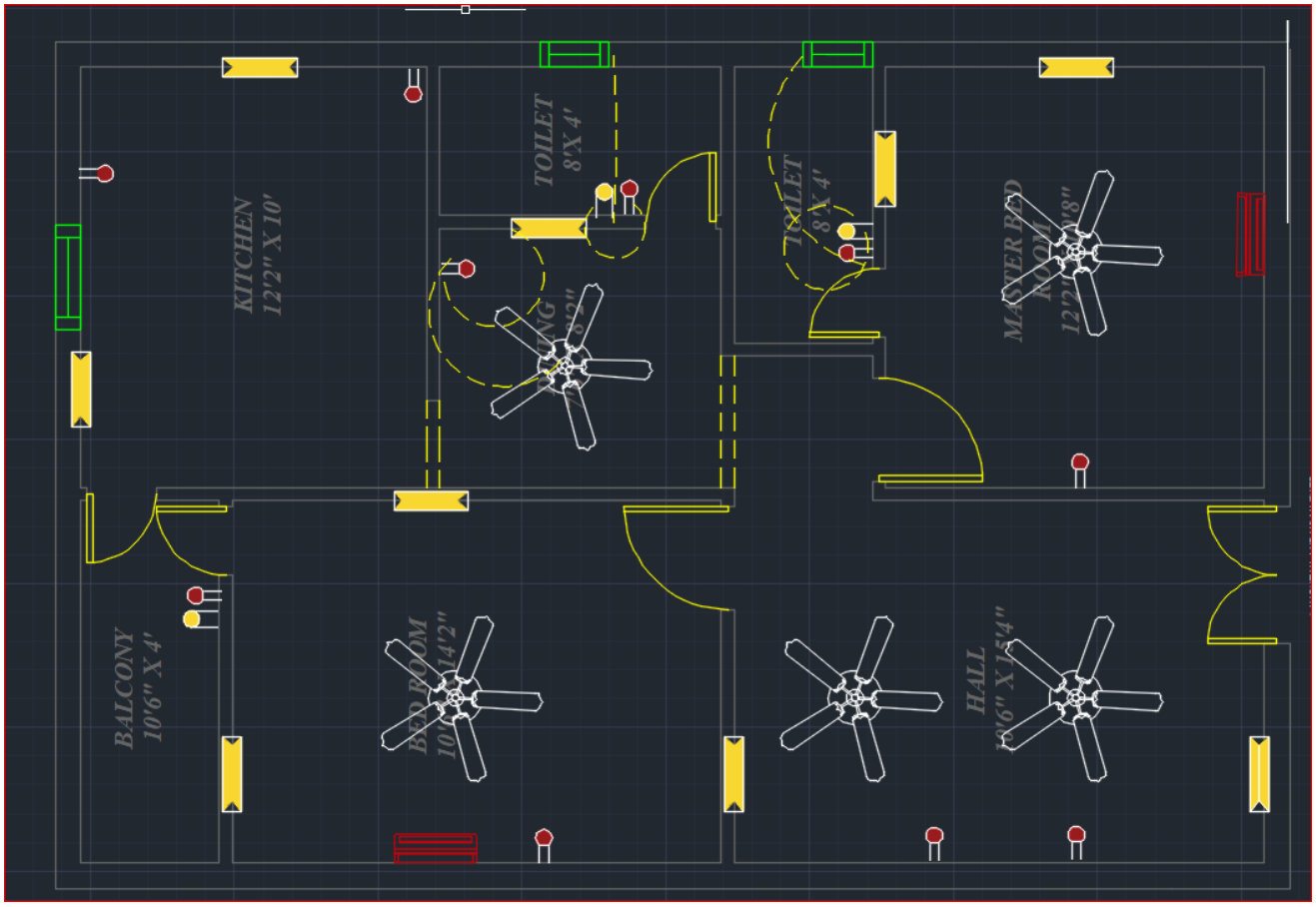


Fig 4.3

WIRING OF B1

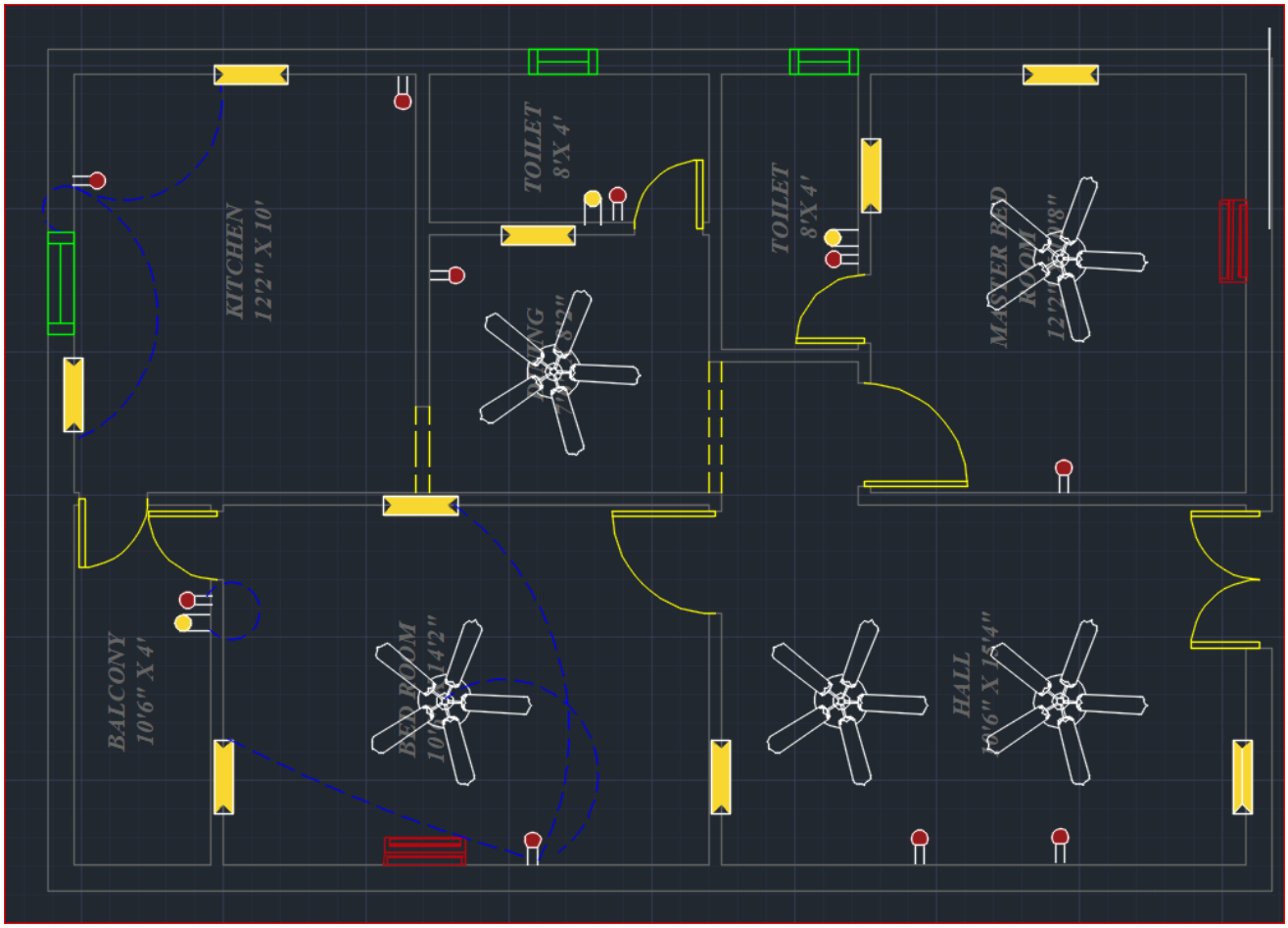


Fig 4.4

WIRING OF R2

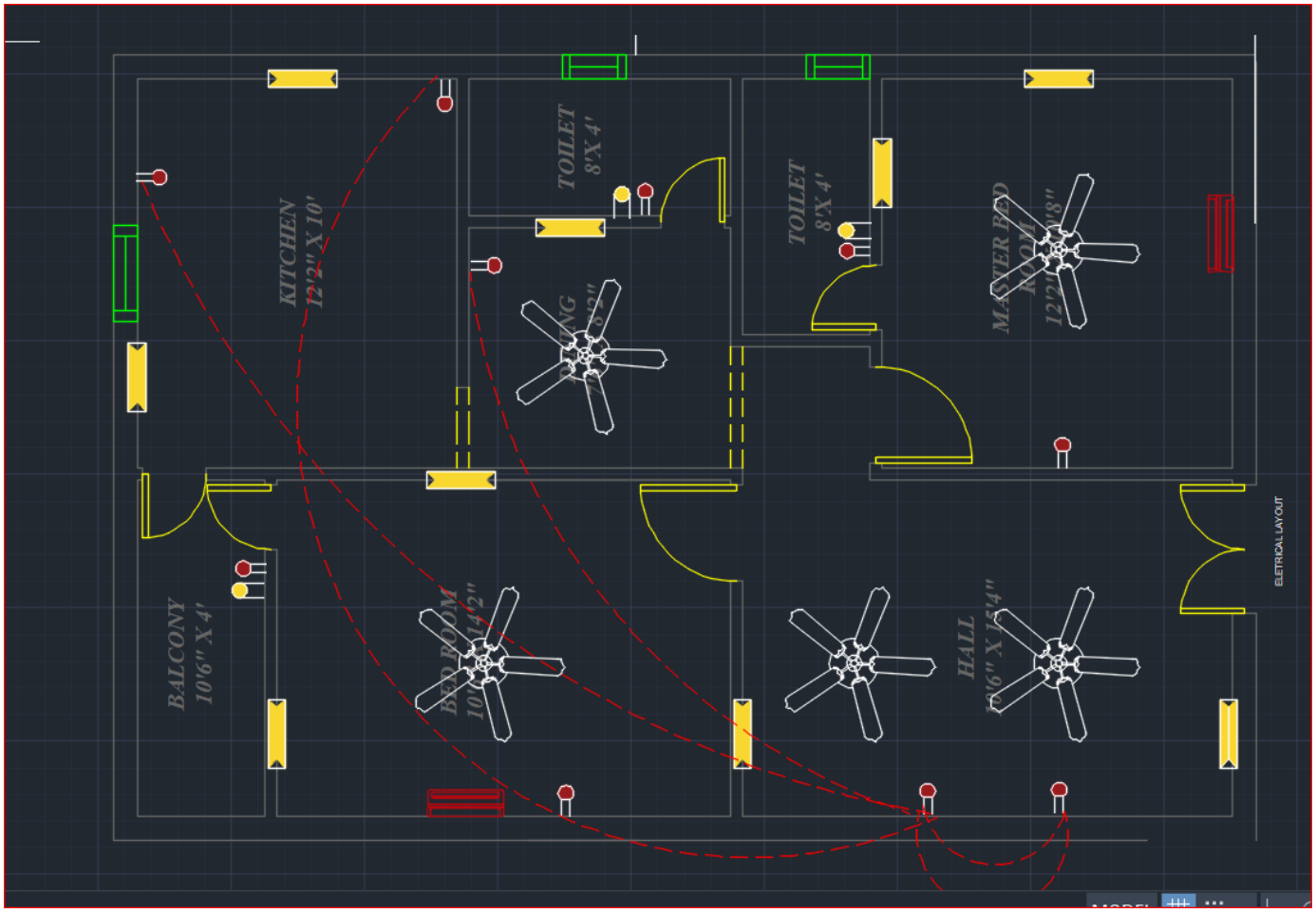


Fig 4.5

WIRING OF Y2

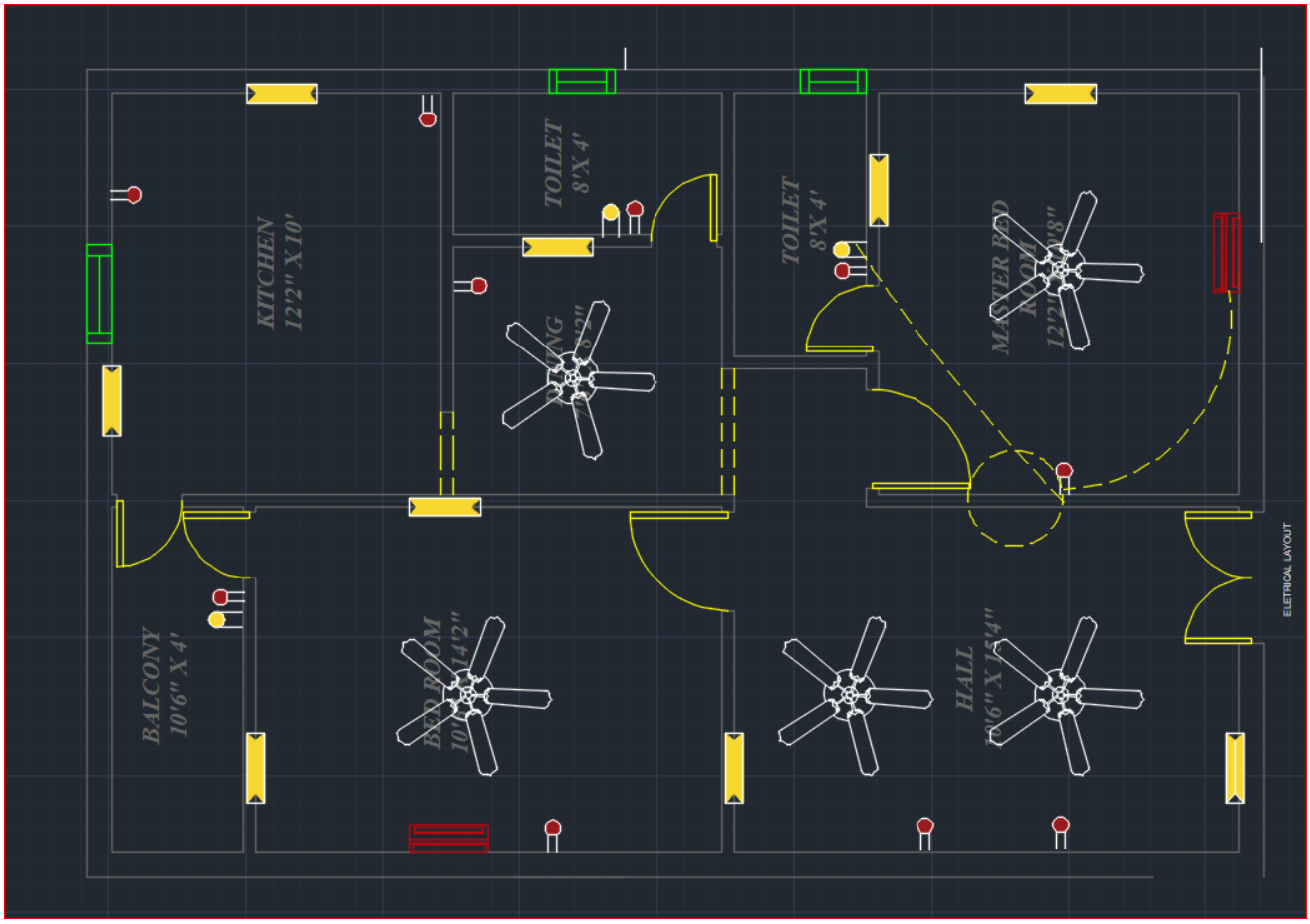


Fig 4.6

WIRING OF B2 & B3

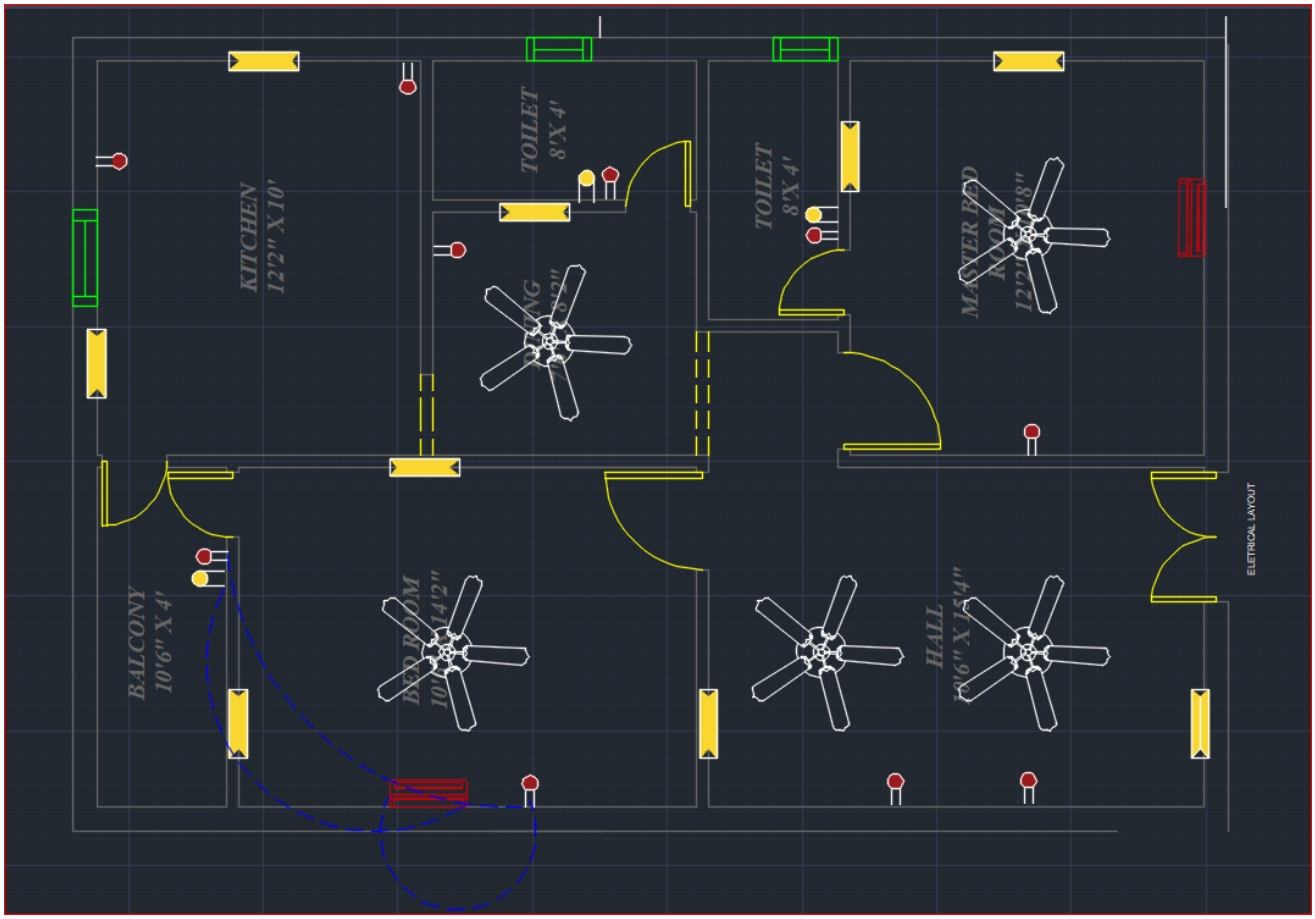


Fig 4.6

# Chapter 5. Advantages & Applications

## 5.1 Advantages

- Better Productivity: Since AutoCAD Electrical is a software which is specially designed to electrical control designers, it has built-in features and benefits that will let the users to intensely increase the efficiency during the project's design phase while maintaining a smooth integration with the conventional AutoCAD environment. Based on a study, it was revealed that an increase in productivity of up to 80% can be achieved by shifting from AutoCAD to AutoCAD Electrical. AutoCAD Electrical helps manufacturers to market their products, consultants to finish their designs, and contractors to build the projects, ahead of time.
- Reduction of Errors: The generic CAD software tools being used by design engineers for their electrical controls design make them more prone to errors and design discrepancies. A software's ability to eliminate errors before they even reach the fabrication floor can definitely be a significant advantage. AutoCAD Electrical includes automatic electrical-auditing capabilities that help designers to perform real-time analytics to identify problems before the project's construction phase.
- Compliance with Industry Standards: Aside from the strategic error-checking capability of AutoCAD Electrical, it also helps design firms to compete in the global marketplace by offering support both for regional and international standards (IEC, JIC, IEEE, NEC, AS/NZ, etc.). You can also use your client's own standards. There are around 350,000 components from the industry's leading vendors and more that 3,000 intelligent PLC I/O modules. A comprehensive library containing popular manufacturer components is available on AutoCAD Electrical, enabling users to produce a standard-based, consistent designs.
- Manage Design Information:Upon design's completion. It is necessary to share accurate design and parts information with the panel builder. Creating sophisticated parts lists, bill of materials and cable schedules using software that is not built specifically for these tasks can use up a lot of valuable time and resources. AutoCAD Electrical includes vigorous automated reporting tools in order for the design data being shared with subsequent users to be correct and up to date. In addition, AutoCAD Electrical is firmly integrated with AutoDesk Data Management applications, which enables efficient secure exchange of design data and promotes earlier collaboration between design and manufacturing workgroups.

5.2 Applications

- Enable Collaboration:AutoCAD Electrical allows both the Mechanical and Electrical teams to work together as a team by enabling easier sharing of electrical design intended for cables and conductors directly with other team members using Autodesk Inventor® software. This adds valuable electrical controls design information to the digital model.Users can also publish DWF files directly from AutoCAD Electrical and securely coordinate on 2D and 3D designs with customers, suppliers, and external users. Different workgroups can manage and track all components of a digital prototype with the free Autodesk® Design Review software, the fully digital way to review, measure, mark up, and track changes to designs enabling better reuse of critical design data, management of BOMs, and collaboration with other teams and partners.

# Chapter 6. Conclusion and Scope for Future Work

AutoCAD is significantly faster than the traditional method of manual Drafting. It accelerates the task of preparing a bill, reports, scaling, etc. of content — tedious work of drawing each line on paper done in a few mouse clicks. As CAD software removes repeated iterations, large amounts of time are saved.

By using CAD, drawing templates can be created that have a few details and that can be used repeatedly. A collection of these individual CAD files can then be utilised to create a database, which can be easily accessed, modified and used to create new drawings.

In CAD drafting, drawings need not be filed and stored in folder, unlike in manual drafting. They can be easily saved on the computer server and can be accessed from anywhere with an Internet connection. This means that they can be printed or used in the future for reference. Drawing components can be made standard. There is a greater possibility of losing documents in manual drafting. Drawings created through CAD can be stored in multiple locations, such as on a pen drive, hard drive or in the cloud, creating several back-ups in case of unexpected developments. Multiple project stakeholders can access the CAD drawings as required.

As CAD drawings can be saved electronically, it is also an environment friendly method. The use of paper and felling of trees required in manual drafting is reduced drastically when an entire industry goes digital.

The most realistic way to virtually represent a structure is in 3D. A manually created model just does not look as realistic as a 3D model generated by AutoCAD. Software, such as AutoCAD, breathes life into the 3D model and helps visualisation. Creating 3D views manually is a challenging, time-consuming and tiresome job. AutoCAD makes it much easier and helps create drawings with additional elements and information.

Building Information Modelling, or BIM, is a technology that needs 3D CAD drawing services to help manage physical and functional characteristics of a building. Using BIM can bring project stakeholders together in the early project stages and make construction data more intelligent for informed decision-making. The parametric modelling techniques of BIM, using CAD drawings, can increase interoperability, improve cross-discipline communication, help resolve design/coordination clashes and help accurately estimate project cost estimates, leading to effective project planning. These BIM models can be developed using BIM-enabled software, such as Revit for Revit 3D modelling.

Any drawing, both on paper or digital, requires some amount of revisions or modifications. In manual drafting, modifications are made by erasing and re-drawing. Using CAD enables revision easily with a range of editing tools. A few clicks of the mouse can undo, redo or delete previous actions. Re-drawing is virtually eliminated at any time, as existing objects can be modified by mirroring, stretching, rotating, scaling, etc.

AutoCAD is significantly faster than manual drafting. It prepares bill of materials, reports, scaling, etc. quickly. The tedious task of drawing each line on paper can be completed in a few clicks. As CAD software eliminates repetitive iterations, a substantial amount of time is saved. In AutoCAD, data describing a component or its family is associative, and hence, revisions are automatically translated everywhere the data is used. Modifying, editing and checking drawings is faster than creating drawings from the beginning for every change.
In manual drafting, all drawn objects must be of the correct size and alignment. Each object and its dimensions needs to be manually verified, as the slightest error could be catastrophic for the entire project. Using CAD drawings, numerous tools and techniques can help obtain the exact dimensions and other information about an object, leading to improved accuracy.

Auto Cad is very valuable tool in the field of mechanical as well as electrical. Auto-Cad designing is useful in panel designing wiring diagram design breaker design etc. you can easily get post of a draftsman in any of the electrical companies research and development department. So you have a scope of better future when you apply for companies of designing.

# References


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- https://www.udemy.com/course/draft/2816633/learn/lecture/18077773?start=7#overview

# Appendix-1

RI table

| Reflectances | | | Room Index | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| C | W | F | 0.75 | 1.0 | 1.25 | 1.5 | 2.0 | 2.5 | 3.0 | 4.0 | 5.0 |
| 70 | 50 | 20 | 58 | 66 | 73 | 78 | 85 | 90 | 93 | 98 | 101 |
| 70 | 30 | 20 | 50 | 58 | 66 | 71 | 79 | 84 | 88 | 93 | 97 |
| 70 | 10 | 20 | 45 | 53 | 60 | 66 | 74 | 79 | 83 | 89 | 93 |
| 50 | 50 | 20 | 56 | 63 | 70 | 75 | 81 | 86 | 89 | 93 | 95 |
| 50 | 30 | 20 | 49 | 57 | 64 | 69 | 76 | 81 | 84 | 89 | 92 |
| 50 | 10 | 20 | 44 | 52 | 59 | 64 | 71 | 77 | 81 | 86 | 90 |
| 30 | 50 | 20 | 54 | 61 | 67 | 72 | 78 | 82 | 84 | 88 | 91 |
| 30 | 30 | 20 | 48 | 55 | 62 | 67 | 73 | 78 | 81 | 85 | 88 |
| 30 | 10 | 20 | 44 | 51 | 57 | 62 | 69 | 74 | 78 | 83 | 86 |
| 0 | 0 | 0 | 41 | 48 | 54 | 59 | 65 | 70 | 73 | 77 | 80 |
| BZ-class | | | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |

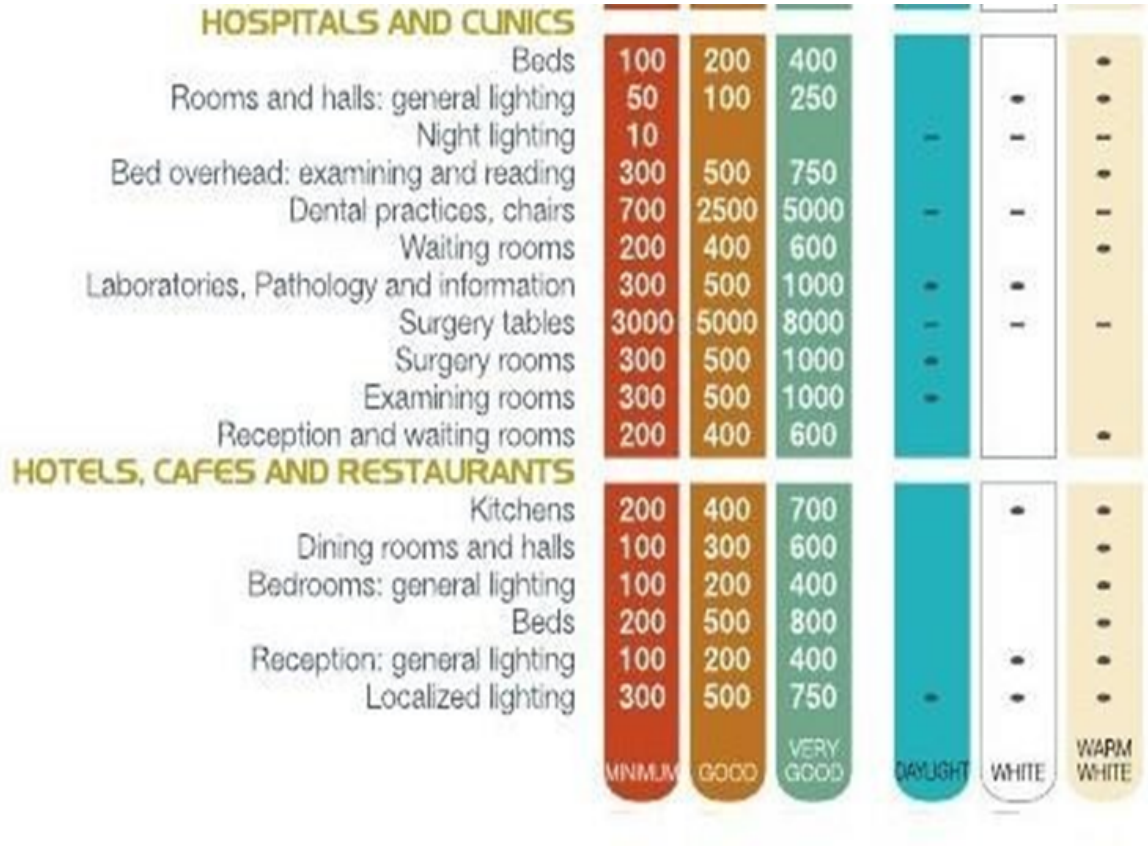
AC Wattage Taable

| Split A/C | Window A/C |
|---|---|
| **0.75 TR – 1050 W** | 0.75 TR – 1200 W |
| **1.0 TR – 1400 W** | 1.0 TR – 1600 W |
| **1.5 TR – 2100 W** | 1.5 TR – 2400 W |
| **2.0 TR – 2800 W** | 2.0 TR – 3200 W |

# Appendix-2

Room wise lumen and lux chart

| ACTIVITY | LIGHTING LEVELS (LUX) | | | SUGGEST LIGHT TONES | | |
|---|---|---|---|---|---|---|
| | MINIMUM | GOOD | VERY GOOD | DAYLIGHT | WHITE | WARM WHITE |
| **ELEVATORS** | | | | | | |
| Inside | 300 | 500 | 700 | | • | • |
| Hallway | 50 | 100 | 200 | | • | • |
| **FARMING BUILDINGS** | | | | | | |
| Garages, parking, general lighting | 50 | 100 | 200 | • | • | |
| Repairs | 200 | 300 | 500 | • | • | |
| Feed stock rooms, general lighting | 50 | 150 | 300 | | • | |
| Chicken coops, pork sties, rabbit hutches | 50 | 150 | 300 | | • | |
| Animal food preparation | 100 | 200 | 400 | | • | |
| **EDUCATION** | | | | | | |
| Art and industrial drawing and sawing | 500 | 700 | 1000 | | • | • |
| Gymnasiums | 150 | 300 | 500 | | • | |
| Blackboards | 300 | 500 | 700 | | • | • |
| Classrooms and laboratories | 200 | 500 | 1000 | | • | • |
| Conference rooms | 200 | 500 | 1000 | | • | • |
| Hallways , pass through rooms | 150 | 500 | 700 | | • | • |
| Locker rooms, dressers, washbasins | 50 | 100 | 250 | | • | • |
| **GARAGES** | | | | | | |
| Parking Structures | 100 | 150 | 300 | • | • | |
| Repair shops | 200 | 300 | 500 | • | • | |
| **ROOMS** | | | | | | |
| Bathrooms: general lighting | 50 | 100 | 250 | | • | • |
| Mirrors | 200 | 500 | 1000 | | | • |
| Kitchens | 150 | 300 | 600 | | • | • |
| Family rooms: general lighting | 70 | 200 | 400 | | | • |
| Reading | 200 | 500 | 700 | | • | • |
| Children¥s rooms | 70 | 200 | 400 | | | • |
| Bedrooms: general lighting | 50 | 100 | 250 | | | • |
| Beds | 200 | 500 | 800 | | | • |
| Staircases | 100 | 150 | 300 | | • | • |
| Homework areas | 300 | 500 | 750 | | • | • |


HOSPITALS AND CLINICS
Beds 100 200 400
Rooms and halls: general lighting 50 100 250
Night lighting 10
Bed overhead: examining and reading 300 500 750
Dental practices, chairs 700 2500 5000
Waiting rooms 200 400 600
Laboratories, Pathology and information 300 500 1000
Surgery tables 3000 5000 8000
Surgery rooms 300 500 1000
Examining rooms 300 500 1000
Reception and waiting rooms 200 400 600
HOTELS, CAFES AND RESTAURANTS
Kitchens 200 400 700
Dining rooms and halls 100 300 600
Bedrooms: general lighting 100 200 400
Beds 200 500 800
Reception: general lighting 100 200 400
Localized lighting 300 500 750
MINIMUM
GOOD
VERY GOOD
DAYLIGHT
WHITE
WARM WHITE