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Development of Pec Based Electrical Load Schedule Software

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ABSTRACTS

This paper presents the development of PEC-based electrical load schedule software for residential electrical services design. All the sources that will be used for the computation and data will be based on PEC. The testing of the project will be carried out in accordance with PEC as well as other approved codes. Calculating tools to help you understand the process of accurately sizing a commercial electrical panel based on proposed loads. To emphasize, accurate load sizing is best performed by an electrical engineer, which is reviewed by the building department in your jurisdiction. The software was developed using Visual Basic (VB. net) programming language. Vb.net, or Visual Basic, is a development of the BASIC programming language. It is intended to be used in conjunction with an Integrated Development Environment (IDE). Prior to the development of IDEs, programming languages like BASIC relied significantly on the DOS command-line. A load schedule for different operating scenarios will show when peak consumption occurs and provide an opportunity to find out if all the high loads must operate at this time. It serves as a valuable calculation tool for electrical engineers, students, and technicians by providing a faster, easier, and more accurate means of carrying out some basic calculations, such as determination of the size of wire; conduit sizes; circuit breaker ratings; the main feeder size of wires; main circuit breaker ratings; voltage drop; and riser diagram using Philippine Electrical Code Tables. The results of these calculations help the designer to make vital decisions such as cable sizing and nominal ratings of protective devices required by each circuit and by the entire installation, in line with appropriate standards and regulations.

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1. INTRODUCTION

The electrical load schedule computation is a summary of the data that helps electrical installers to know the equipment ratings and their contribution to the overall power consumption in an installation. The data in the electrical load schedules is usually backed by calculations which are based on standard electrical codes (PEC) Philippine Electrical Code. Some of the Electrical engineers compute their electrical load schedule manually and there are a portion who use Microsoft Excel and create a sheet for their computation. Nowadays with the help of a fast phase advancement of technology many develop software with the means of improving their efficiency and accuracy. There are books to read where we can learn and understand the Electrical load Schedule, also known as PEC or Philippine Electrical Code, which is done by an Electrical Engineer. To have a precise and acceptable result, the purpose of this study is to create software that electrical engineers may use to identify everything they need to do and put everything in place. Application of electrical products and equipment for additional installation or replacement is suggested to be consulted with a licensed electrical practitioner before installation for safety. Failure to do so may result in fire, serious injury, or death.

The Electrical Load Schedule Software will aid Professional Electrical Engineer and Electrical Engineering in analysing load schedules. This program can compute the size of wire, conduit sizes, circuit breaker rating, the main feeder size of wires, main circuit breaker ratings, voltage drop and riser diagram using Philippine Electrical Code Tables. The software can be used for calculation and

estimation for electrical engineers and master electricians in the project that has been professionally prepared and printed

The Electrical load schedule software combines a graphical user interface and the intelligence of software electrical load schedule for (Bungalow/family home, offices, and administration building). To easily design, calculate and analyse low and medium voltage panel load schedules and distribution of panel boards.

The Electrical Load Schedule Software is done by using a program that will calculate electrical loads to be used in an electrical calculation. This program will be using Visual Basic (VB.net), there are many programs language readily available in the market like C++, C#, Java, and others. Since the group's knowledge in programming is limited, Visual Basic (VB.net) is another option (Morrison & Cornell, 2008). It is easier to use and you can develop something fairly fast. VB may also be used for web and application development, similar to java but with a different approach.

The Philippine Electrical Code (PEC) is used nationally as the basis for safeguarding people, buildings, and contents from hazards that may arise from the use of electricity. This code contains provisions that are necessary for safety and thus is used as a basis for the legal enforcement in the installation of electrical system design and PEC calculations are based on a 120-230 V ac source and an operating frequency of 60Hz and the wiring sizes exist from each other's table.

This study aims to develop software for electrical engineers. The Electrical load schedule software combines a graphical

user interface and the data intellect of PEC to lighten, calculate, design, and analyse electrical load schedules and distributions of panel boards. The Philippine Electrical Code (PEC) is the basis of making sure the electrical service is sized properly and computed correctly.

- To provide these calculating tools as a guide to assist you to understand the process of accurately sizing a residential unit electrical panel based on proposed loads.
- To enlighten the results of the calculations are based upon the accuracy of the information that users provide.
- To emphasise the accurate load sizing is best performed by an electrical engineer which is reviewed by the building department in your jurisdiction.

According to [Olatmiwa 2012](#), the software was found to be reasonably effective and efficient in carrying out the required electrical design calculations at computer speed and accuracy. The software serves as a valuable design tool for electrical engineers, students, and technicians by providing a faster, easier, and more accurate means of carrying out some basic calculations. The calculator software was created utilizing the Java programming dialect and it serves as an important planning device for electrical engineers, students, and professionals by giving a speedier, less demanding, and more precise means of carrying out a few essential calculations, such as; assurance of the number of lighting installations required in a room; the plan current and control required per last sub-circuit; the whole associated load; voltage drop over chosen cables; and load adjusting over the three stages of a three-phase provided building. The results of these calculations offer assistance to the architect in forming crucial choices such as sorts of lights,

sizes of cables, and nominal appraisals of defensive gadgets required by each circuit and by the whole establishment in line with fitting measures and directions. The software is called Calculation for Home Electrical Services.

Residential electrical services design calculator software. The software was created using the Java programming language and serves as a useful design tool for electrical engineers, students, and technicians by making basic calculations such as determining the number of lighting fixtures required in a room, the design current and power required per final sub-circuit, the total connected load, voltage drop across chosen cables, and load balancing across the three axes faster, easier, and more accurate. The results of these calculations assist the designer in making critical decisions such as the types of luminaires, cable diameters, and notional protective device ratings required by each circuit and by the total system in accordance with acceptable standards.

The few calculators software that provide residential design calculations utilise an approach that presume the home's load need is based on its area. This study, on the other hand, proposes a model that allows the designer to deal with precise loads predicted or needed by the customer while taking into account unusual load characteristics such as power factor. This program estimates apparent power, which is the amount of power required from the supply to the end user, while also accounting for variations in real load utilisation. The designer may enter all quantitative design elements utilised in the computations (diversity factor, utility factor, maintenance factor, and power factor), improving design flexibility ([Parmar et al., 2012](#)).

Calculating electrical loads needs to be improved to improve the accuracy of the data that affect the technical and economic indicators of the overall corporate complex. (Khomiakov & Ustinov, 2019). To reduce the inaccuracy in predicting electrical loads to acceptable levels in engineering calculations, the effect of energy-saving measures made on each electric receiver independently, particularly from the frequency converter installation, must be considered. The experiments undertaken confirm the necessity to alter the coefficients used in the calculations using the existing method.

The analysis of the electrical load schedule takes far too long. There are steps to take, preparations to make, and requirements to meet. C.A. Cole claims that while there are many various ways to construct an electrical design, there is only one item that cannot be changed (Khomiakov & Ustinov, 2019). The requirements of the code must be observed.

According to Polydorides & Lionheart, (2002), Microsoft's VB.NET is a programming language that runs on the .NET framework. Visual basic may be readily developed by any programmer that is familiar with vb.net. The Common Language runtime environment for Microsoft's Visual Studio program is used by VB.NET (Polydorides & Lionheart, 2002).

The cost of a schedule is determined by the total energy consumption of the equipment, which is calculated on a regular basis. Every 15 minutes, the power provider and the plant owner agree a target usage. Any deviation from the contractual usage is punished, and

the goal is to keep the total of these fines as low as possible (Hait & Artigues, 2011)

According to Khuntia & Van der Meijden, (2018), For utilities and planners, long-term electrical load forecasting is critical. The use of a multiplicative error model (MEM) to anticipate long-term demand is proposed in this work. The advantages of taking volatility into account is demonstrated by out-of-sample forecast outcomes and directional accuracy during the Great Recession.

For the distribution system planning problem, a novel technique based on the seeker optimization algorithm (SOA) is given. SOA entails the simultaneous installation of automatic reclosers (RAs) to prevent brief failures. It may be utilized effectively to optimize the design of an advanced power distribution system (Kumar & Samantaray, 2014)

According to Karabulut et al. (2008), Load management is a capacity that load distribution centers and electric companies demand. Long-term load forecasting provides direction for installation maintenance and construction planning. Power companies have been more interested in new forecasting approaches for more trustworthy and accurate estimates. Short-term, mid-term, and long-term load forecasting assessments are available.

What VB developers can achieve with Visual Basic.NET is limitless, and books for Visual Basic.NET must be created from the bottom up. VB developers are continuously seeking for publications that are clear and effective in communicating these new issues (Barnaby, 2002).

1.1 Power load calculator

This software will help you calculate the load on a circuit to see if it is excessive. You may also determine the size of circuit breaker required for the load. This is especially useful during pre-production since it allows you to quickly assess whether or not you'll require an external generator and how many you'll require. Calculating the minimum required load for your power supply is a straightforward task. By glancing up a few ratings from the datasheet, you can immediately apply the proper load size ([Power Load Calculator, 2007-2022](#)).

1.2 Design master electrical

It enables the user to design quality schedules with different electrical characteristics that are simple to manage and read. It enhances electrical calculations with new features. This application's design is simple and straightforward. It responds quickly when doing its role. The main part of designing electrical services is the user-friendly interface. Design master electrical is a full electrical drawing and model solution that works directly in AutoCAD, requiring no other software ([Design Master Software, 2001-2022](#)).

1.3 Wiresizecalculator.net

The wire size calculator makes estimating the size of wires and cables for pump applications very simple and quick. This site has a number of complex calculators to help you size wire securely and accurately. It has calculators, tables, and tools to help you size wire and conduit correctly ([WireSizeCalculator.net, 2021](#)).

1.4 NECDESIGN.COM

NEC Calculator is a set of calculators that will correctly, efficiently, and consistently handle all of your basic electrical design jobs. Wire size, conduit fill, fault current,

power factor, transformer, underground cover, lighting design, motors, voltage drop, and more are all done in accordance with current National Electrical Code regulations. The reports are thorough, succinct, and well-written ([NEC Design Software, 2014](#)).

2. METHOD

The Research Methodologies used for the study are described with specific objectives to achieve the design conditions of the project. The projects start with the definition and function of the components based on the Philippine Electrical Code (PEC) ([PEC, 2017](#)). All the sources that will be used for the computation and data will be based on Philippine Electrical Code. Then, testing of the project will be done (Fig. 1).

The program language used was VB.net. The Vb.net or Visual Basic is a development of the BASIC programming language that is intended to be used in conjunction with an Integrated Development Environment (IDE). Programming languages like BASIC relied significantly on the DOS command-line prior to the development of IDEs. Programmers had to write their code by hand and use DOS to convert it into executable files, which was a time-consuming procedure with a lot of chance for error. An IDE, on the other hand, streamlines the process by offering a single interface that makes coding easier and allows for one-click compilation into an executable file. We think Visual Basic is a very approachable programming language for beginners who want to write basic applications because of its simplicity. Visual Basic is a Microsoft-developed programming language that is primarily used to create method programs in the Windows system. In the mathematical modelling of the software, all the data of the electrical design were

based on Philippine Electrical Code (PEC). This includes all the necessary computation in the load schedule, voltage drop and the riser diagram of the software such as ground wire of the main circuit breaker, size of wire, ground wire for the size of the wire, horsepower (Air Conditioning unit), ampere ratings for the circuit breakers, and ampere rating

(Conduit). All of this will be included in the mathematical modelling of the software.

The following procedures were employed in the development of P.E.C. based electrical load schedule software as shown in Fig. 1.

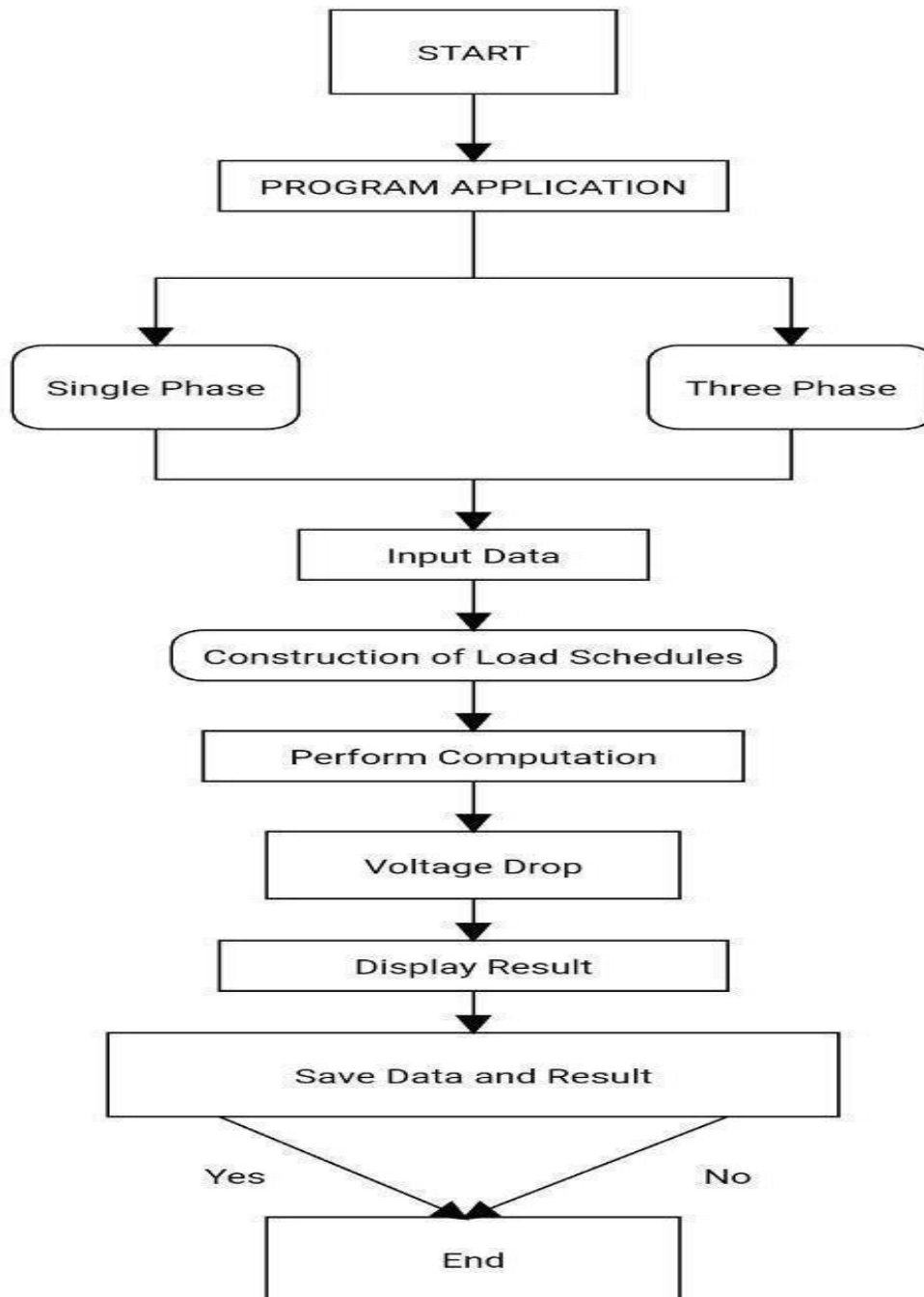


Fig. 1. Program Development

2.1. Methods of Program Development

2.1.1. Program Application

This program application you will choose or select of what type of load schedule you will create. There are two option calculations, the single phase and the three phase.

2.1.2. Input Data

The user will select the type of Loads and input all the required data in creating a load schedule table. The data entry operator may be required to verify or edit data as it is entered. There will be a dropdown option when you insert your quantities.

2.1.3. Construction of Load Schedule Table

Loads that are inputted by the user are now then put in the load schedule. It includes a circuit number, types of loads, rating rated current, circuit breaker ratings, sizes of wires, conduit sizes, voltage drop and riser diagram. This will help designers to properly size the power backup generators or other alternative power sources.

2.1.4. Perform Computation

The program performs two different types of computation: load schedule and riser diagram. For the load schedule table, the program computes the rated current and gives the sizes of wire, conduit size, voltage drop, circuit breaker ratings for each load. The load schedule table, computes the overall current and gives the main feeder sizes of the wires, conduit size, and circuit breaker rating. For the design of the riser diagram, the program only computes the circuit number of the breaker and the size of the wire grounding electrode.

2.1.5. Voltage Drop

It will automatically show you the voltage drop. If volts drop, amps drop too. That is why when you find a voltage drop in a connection or cable, you know the connection or cable is restricted.

2.1.6. Display Results

The program displays the computed results in the load schedule table and the riser diagram in its dedicated platform. The load schedule table shows the sizes of wires, conduit size, and circuit breaker rating of each load and also the main feeder sizes of wires and main circuit breaker ratings and Voltage drop. While the riser diagram only displayed the circuit breaker number and grounding electrode. The process will handle the recommended inputs and it will be shown downwards while you put the necessary details in your computation such as the proper wire size and number of circuits to be used, types of loads, rating rated current, circuit breaker ratings, size of wires and conduits to be used in the project.

2.1.7. Save

If the user is finished with the design, the user can choose to save it or discard it. If the user chose to save the file, the program produces a text file for the riser diagram with load schedule computation. The software can provide printed output when you finish the design.

2.2. Software Formulas

In the Single-Phase System this is the simplest. The kVA may be calculated easily using the kW and power factor. The current is calculated by dividing the kVA by the voltage. While in the Three Phase System the voltage is the major

difference between a three phase and a single-phase system. In a three-phase system we have the line-to-line voltage (VLL) and the phase voltage (VLN).

2.2.1. Conductor sizing

Branch Circuit (Lighting and Appliance Load)

QTY. X 100 (if lighting) = WATTS (as per PEC standard)

QTY. X 180 (if con. outlet) = WATTS (as per PEC standard)

TV, Refrigerator, Water pump and Range etc. as per owner choice of wattage (VA)

VA/V = A (AMPERES)

WATTS /VOLTS = AMP. LOAD

2.2.2. Motor Load

The current on the branch circuit feeding a single motor is taken as 125% the full load rated current of the motor.

$$I_c = I_{fL} \times 1.25$$

The current on the branch circuit feeding two or more is taken as not less than 125% of the full load current rating of the highest rated motor in the group plus the sum of the full load current rating of the remainder of the motors in the group.

2.2.3. Overcurrent Protection Rating

Branch Circuit (Lighting and Appliance loads) The rating of the overcurrent protection should be capable of carrying the computed line current. It should be the nearest higher commercially available overcurrent protection/circuit breaker. The ampere trip of the overcurrent protection should not be higher than the ampacity of the conductor that is being protected.

Motor Load

The overcurrent device protecting the individual motor branch circuit must be able to carry the motor starting current. It must have a time delay to allow the motor to start and come up to speed.

For single phase (all types no code letter)

I_{cb} = 250% I_{fL} - Inverse time breaker

I_{cb} = 700% I_{fL} - Instantaneous trip breaker

I_{ss} = 300% I_{fL} - Non time delay fuse

I_{ss} = 175% I_{fL} - Dual Element

For other types of motor with code letters. (PEC, 2017)

Feeder Circuit (Lighting and Appliance loads)

Single or Three phase loads

The rating of overcurrent protection shall be capable of carrying the computed line current. It should be the nearest higher commercially available overcurrent protection should not be higher than the capacity of the feeder conductor protected. Minimum ampacity of the conductor required (I_c), Full load current of the motor (I_{fL}).= Full load current of the highest rated motor (I_{fLhrm}).

$$I_c = 1.25\% I_{fL} \text{ hrm} + I_{fL}$$

Single Phase System

Service Entrance Conductors (size of wire)

The service entrance is where the wires connected to the load side of the meter enter the house or building. The service entrance in a home is typically called to as a breaker or power supply.

$$IF = (IFL \times D.F) + 25\% (HML)$$

Service Equipment (size of breaker)

This required equipment, which typically consists of circuit breakers, switches, and fuses, as well as their equipment, is connected to the load end of service conductors that serve a structure and serves as the main control and cut off of the supply.

IMCB = (IFL x D.F) + 150% (HML)
(size of breaker) (Section 4.30.2.4 PEC 2017, pg. 349,350)

Three Phase System

Delta Connected System

A delta connection is a three-phase system connection in which three elements in series form a triangle, with the supply being input and output at the three junctions. Minimum ampacity of the feeder conductor (IF), Summation of line currents (IL), Current of the highest rated motor in the group/panel (ihrm), Summation of 3phase line current ($\sqrt{3}I_{\phi}$), Summation of the single-phase line current ($\sqrt{3}I_{\phi H}$). The service entrance (size of wire) and service equipment (size of breaker) equation is shown respectively as follows:

Service Entrance (size of wire)

$$I_F = [\sqrt{3} I_{3\phi} + I_{1\phi H} + .25 I_{hrm}] [Demand Factor]$$

Service Equipment (size of breaker)

$$I_{cb} = [\sqrt{3} I_{3\phi} + I_{1\phi H} + 1.5 I_{hrm}] [Demand Factor]$$

Voltage drop is calculated using the most universal of all electrical laws: Ohm's Law. This states that the voltage potential across the conductor is equal to the

current flowing through the conductor multiplied by the total resistance of the conductor. In other words, $V_d = I \times R$. A simple formula was derived from Ohm's law to calculate the voltage drop across a conductor. This formula can help you determine voltage drop across a circuit, as well as the size wire gauge you will need for your circuit based on the maximum desired voltage drop. The Philippine Electrical Code states that the voltage drop of a feeder circuit must not exceed 5%, and the voltage drop of a branch circuit must not exceed 3%.

The voltage drop formula illustrates whether the power given by the voltage source is condensed as electric current runs through the parts of the electrical circuit that do not supply the voltage. Furthermore, voltage drops between the source's internal resistances and connections are undesirable since supply energy is wasted. Furthermore, voltage drop across active circuit parts and loads is preferable since provided power performs a competent task.

Voltage Drop Formula

General Formula

$$VD = I_{Load} Z_{wire}$$

Where:

$$Z = \sqrt{R^2 + X^2}$$

Single- Phase Circuits

$$VD = 2IZ \left(\frac{L}{305} \right) \left(\frac{1}{N} \right)$$

Three- Phase Circuits

$$VD = I \sqrt{3} Z \left(\frac{L}{305} \right) \left(\frac{1}{N} \right)$$

Where:

Z is the wire impedance, Ω

L is the total Length of wire, m

N is the number of sets

Conductors for feeders, as sized to prevent a voltage drop exceeding 3 percent at the farthest outlet of power, heating, and lighting loads, or combination of such loads, and where the maximum total voltage drop on both feeders and branch circuits to the farthest outlet does not exceed 5 percent, will provide reasonable efficiency of operation. 2.15.1.2 Minimum Rating and Size (Feeders), 2.10.2.2 Minimum Ampacity and Size (Branch Circuit) PEC.

2.3. Research tool

Evaluation form. An instrument is used to assess the operational feasibility of the system. The following criteria were provided in order to evaluate the developed application. During the evaluation of the developed system, the researchers distributed questionnaires and feedback forms through an online form to the respondents of the system and they were evaluated by a licensed electrical practitioner. The developed application was evaluated by the target users. In addition, computed means are interpreted in the five-point Likert Scale, which uses a rating scale ranging from not at all satisfied (1) to very satisfied (5) and the conversion of the qualified weighted mean into a descriptive rating.

The researchers used the product quality model defined in ISO/IEC 25010 for the study. The researcher went through eight primary phases in order to execute this model: functional suitability, performance efficiency, compatibility, usability, reliability, security, maintainability and portability. Functional suitability is when

used in certain conditions, this characteristic demonstrates the extent to which a product or system provides functions that meet stated and implied expectations of the Electrical Load Schedule software while also adhering to the Philippine Electrical Code's standards. Later, the requirements of the Electrical load schedule software and the PEC standards guided the creation of the template and layouts. This feature indicates performance in relation to the quantity of resources consumed under specified conditions. Then the compatibility, the extent to which a product, system, or component may share information with other products, systems, or components while sharing the same software environment. For usability, the degrees to which a product or system may be utilised by specific users to accomplish specific goals with effectiveness, efficiency, and satisfaction in a specific context of usage. Then reliability, the degree to which a system, product, or component fulfils defined functions under given conditions during a specific time period. Security is the degree to which a product or system safeguards information and data so that people or other goods or systems have the proper level of data access for their kinds and degrees of permission. The degree of efficacy and efficiency with which a product or system may be adjusted to enhance, rectify, or adapt to changes in the environment and needs is represented by the maintainability characteristic. Finally, portability describes the ability with which a system, product, or component may be transferred from one software or other operational or consumption environment to another

3. RESULTS AND DISCUSSION

This chapter presents the major findings of the study.

3.1. Software Homepage

Fig. 2 shows the electrical load scheduling program. The software's logo will be shown on the welcome page.

As for the image shown you can also see the username and password wherein the user will put its own username and password then click the login button to continue if not the user can just click the exit button, then the software will continue to exit.

3.2. Calculation Option Page

The single-phase and three-phase calculations are the two possibilities for computation on this menu. The table will now be displayed, where you may make

a list of all the scheduled loads in the installation.

We get the electrical characteristics for each load in a single phase, such as wire size, conduit size, circuit breaker ratings, main feeder wire size, main circuit breaker ratings, voltage drop, and riser diagram. In all three phases, the procedure is the same, but the computations are different. When everything is finished, the riser diagram will be shown (Fig. 3).

3.3. Load Description

An outlet is a place on the wire system that supplies power to electrical equipment. A lighting outlet is one designed for electrical use. On household general-purpose branch circuits, there is no limit to the number of light or receptacle outlets.

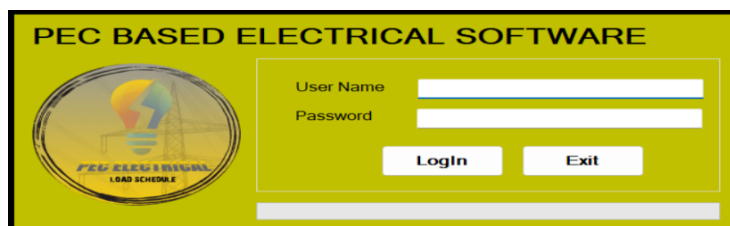


Fig. 2. Welcome page of the program

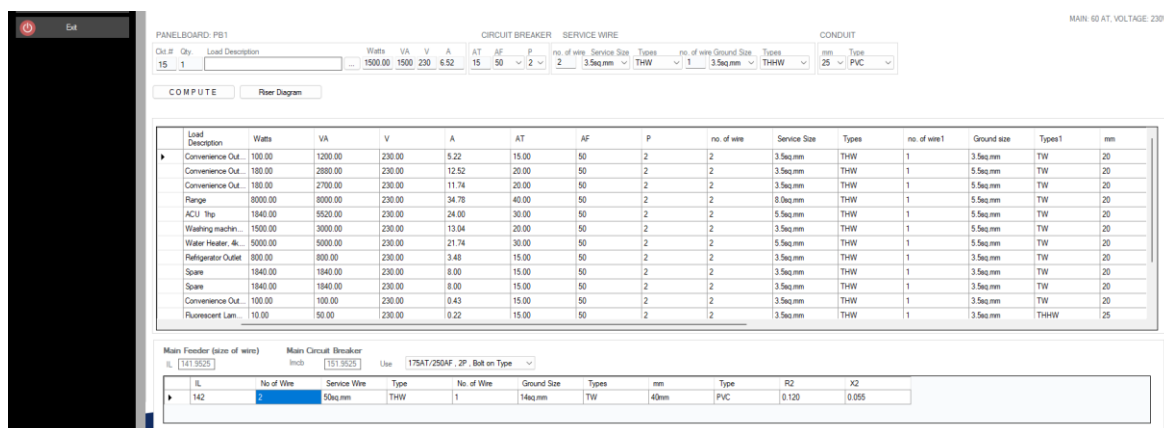


Fig. 3. Calculation Option Page

On the software, the following lights will be visible; Halogen Lamp, LED Dual Floodlight, Fluorescent Lamp, Incandescent Lamp, Mercury Lamp, LED Emergency Light, HPS Lamp, LED Lamp, Spot Light, LED Linear Lamp, Compact Fluorescent, LED High Bay Lamp, Incandescent Lamp, LED Outdoor Light, Pin Light, and Smart Bulbs. This is due to their high-power consumption or other fundamental properties such as high initial current and frequency of use. Appliances are typically seen as a single piece of equipment used to perform household tasks in the home. The following appliances will be shown in our program; Exhaust Fan, Hand Dryer, Freezer, Fan Coil Unit, Ceiling Fan, Television, Heater Machine, LED TV, Water Heater, Washing Machine, Water Pump, Air conditioner unit, Dryer, and Refrigerator.

A convenience outlet is a type of outlet that is mounted on a room's wall and is used to power electrical appliances. The electricity from the incoming source is connected to the line side of an outlet. Power exits the device and continues down the load side of the circuit. The predicted load for a single 230-volt outlet. Here is the following; Convenience

Outlet, Range, Duplex Convenience Outlet, Spare, and SPO (Fig. 4).

3.4. Respondents of the Evaluation

Table 1 presents the respondents of the study. The following are the results taken from the evaluation of 7 Registered Electrical Engineers (REE) and 1 Professional Electrical Engineer. Product quality defined in ISO/IEC 25010 with results of the evaluators.

Table 2 shows the Overall result of the ISO/IEC 25010. From the data that the researchers collected and after analysing and reviewing the respondents' answers, it shows that from 8 respondents who participated in answering the survey questions, 35.89% answered more than satisfied to use the PEC based Electrical load schedule software for their design and to be further enhanced. Moreover, 34.68% are satisfied and agree to use the software. Meanwhile, 18.55% answered that they are fine with whether the system will be built or not. Furthermore, 10.48% answered that they were very satisfied and wanted the software to be further enhanced to give more pleasing satisfaction to the user. And last 0.40% who are not at all satisfied.

Load Description	HP	Watts	A	Load Type	scot
Compact FL, 100W	0.00	100.00	0.00	Appliances	3
Compact FL, 105W	0.00	105.00	0.00	Appliances	3
Compact FL, 10W	0.00	10.00	0.00	Appliances	3
Compact FL, 12W	0.00	12.00	0.00	Appliances	3
Compact FL, 13W	0.00	13.00	0.00	Appliances	3
Compact FL, 150W	0.00	150.00	0.00	Appliances	3
Compact FL, 15W	0.00	15.00	0.00	Appliances	3
Compact FL, 180W	0.00	180.00	0.00	Appliances	3
Compact FL, 200W	0.00	200.00	0.00	Appliances	3
Compact FL, 20W	0.00	20.00	0.00	Appliances	3
Compact FL, 23W	0.00	23.00	0.00	Appliances	3
Compact FL, 25W	0.00	25.00	0.00	Appliances	3
Compact FL, 26W	0.00	26.00	0.00	Appliances	3
Compact FL, 40W	0.00	40.00	0.00	Appliances	3
Compact FL, 42W	0.00	42.00	0.00	Appliances	3
Compact FL, 55W	0.00	55.00	0.00	Appliances	3
Compact FL, 5W	0.00	5.00	0.00	Appliances	3
Compact FL, 85W	0.00	85.00	0.00	Appliances	3

Fig. 4. Load Description

Table 1. Respondents of the Study

Respondents	Frequency	Percentage
Professional Electrical Engineer (PEE)	1	12.5%
Registered Electrical Engineer (REE)	7	87.5%
Total	8	100%

Table 2. Overall result of the ISO/IEC 25010

INDICATORS	Respondents					Mean	Median	Mode	Standard deviation	Response description
	1	2	3	4	5					
Functional suitability	0	5	10	8	1	3.21	3	3	0.83	Satisfied
Performance Efficiency	0	6	10	5	3	3.21	3	3	0.98	Satisfied
Compatibility	0	3	6	7	0	3.25	3	4	0.77	Satisfied
Usability	0	10	13	19	6	3.44	4	4	0.97	Satisfied
Reliability	0	6	9	11	6	3.53	4	4	1.02	More Than Satisfied
Security	0	7	14	16	3	3.36	3	4	0.87	Satisfied
Maintainability	1	7	14	14	4	3.33	3	3.4	0.97	Satisfied
Portability	0	2	10	9	3	3.38	3	3	0.82	Satisfied
total	1	46	86	89	26	3.32	3	3	0.93	Satisfied
	1	2	3	4	5					
INDICATORS	Respondents					Mean	Median	Mode	Standard deviation	Response description
	1	2	3	4	5					
	1	46	86	89	26	3.38	3	4	0.92	Satisfied

4. CONCLUSION

The program was found to be relatively effective and efficient when it came to doing the needed electrical design calculations at computer speed and accuracy. The program is a helpful design tool for electrical engineers since it allows them to perform certain fundamental calculations faster, easier, and more accurately for home electrical design work. We should refer the program to AutoCAD. The

computation of the electrical load schedule, as illustration, is direct to convert to AutoCAD. We would want to use our software to build it, but we wouldn't have enough time. Since the group was mainly focused on bungalows or family homes, offices, and administrative buildings, this subject suggests that it contains more industrial structures where suitable demand variables for various industrial buildings must be addressed.

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