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# A Simple and Generalized Model to Compute LT Distribution Loss and Testing of its Applicability

By

**Deepak Adhikari**

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The undersigned certify that they have read, and recommended to the Institute of Engineering for acceptance, a thesis entitled **"A simple and generalized model to compute LT distribution loss and testing of its applicability"** submitted by Deepak Adhikari in partial fulfilment of the requirements for the degree of Master of Science in Power System Engineering.

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# ABSTRACT

The loss is the major problem for all electric utilities worldwide. Power loss occurs in all parts of the power system that include generation, transmission, and distribution loss. Most of the losses occur in the electricity distribution system. For the economic operation of the power system, these losses should be minimized by formulating and implementing proper loss reduction strategies and techniques. The electric utility can segregate losses, identify their priority, and may launch effective loss reduction strategies and techniques. Distribution feeder losses are grouped as technical loss (TL) and non-technical losses (NTL). The total loss of a LT feeder can be determined by knowing the total energy supplied by a transformer and the energy consumed by all consumers connected to that transformer. The difference between the total loss and technical loss is the non-technical loss and without knowing the TL NTL cannot be determined. But the determination of the TL of a LT feeder by simulation is tedious and time-consuming as the network of the LT line is complex and irregular. Therefore, some mathematical model shall be formulated which can help to determine the TL of the LT line in an easier and faster way. This research intends to find a simple and generalized model to compute LT distribution loss and testing of its applicability.

This research is based on the real field data of certain parts of the Balaju Distribution Center, Nepal Electricity Authority (NEA). Five different distribution feeders of the urban area and five different distribution feeders of the rural area are taken for the analysis. Losses for those distribution feeders are found after load flow analysis on ETAP. Similarly, losses for the same distribution feeders are found using uniformly distributed load (UDL) and uniformly varying load (UVL) concepts and compared with ETAP simulation results. The study shows that, for the urban area, losses obtained from ETAP simulation and UDL concept are nearly equal with a maximum error of 3.86% while that of ETAP and UVL concept is not equal as there is a maximum variation of 51.32%. Similarly, for the rural areas, losses obtained from ETAP simulation and UDL concept are not equal with a maximum error of 26.83% and that of ETAP and UVL concept is also not equal as there is a maximum variation of 23.01%.

Thus, the study shows that the losses of rural area LT feeders cannot be computed using either UDL or UVL concept but the losses of urban area LT feeders can be computed using the UDL concept with a maximum error of 3.86 %.

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Deepak Adhikari

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## LIST OF ABBREVIATIONS

| Abbreviation | Full Form |
|---|---|
| IEEE | Institute of Electrical and Electronics Engineers |
| NEA | Nepal Electricity Authority |
| TOD | Time of Day |
| ETAP | Electrical Transient & Analysis Program |
| MATLAB | Matrix Laboratory |
| UDL | Uniformly Distributed Load |
| UVL | Uniformly Varying Load |
| kVA | kilo Volt Ampere |
| kV | kilo Volt |
| HT | High Tension |
| LT | Low Tension |
| DC | Distribution Center |
| NTL | Non-Technical Loss |
| TL | Technical Loss |
| Amp | Ampere |
| SLD | Single Line Diagram |
| pu | Per Unit |
| pf | Power Factor |
| LLF | Loss of Load Factor |
| LF | Load Factor |

# LIST OF APPENDICES

# CHAPTER ONE: INTRODUCTION

## 1.1 Background

The loss is the major problem for all electric utilities worldwide. Power loss occurs in all three parts which include generation, transmission, and distribution loss. Major portion of the losses occurs in distribution system. Electric utility should segregate losses at each stages before implementing loss reduction techniques. Then only utility can identify their priority, formulate and implement effective methods to reduce losses. Technical losses are due to internal properties of power system components that include losses of transmission lines and transformers. These losses are due to power dissipated in internal electrical resistance. These types of losses occurs due to core losses of the transformers, eddy current losses, hysteresis losses, dielectric losses, corona losses and copper losses. According to the parts of electric system, these losses can be subdivided into transmission losses, substation losses, primary distribution losses, secondary distribution losses, connection extension losses and measurement system losses [1]. The electricity which is consumed but not billed is known as Non-technical losses [2]. Energy theft, fraud by end customers, conveyance errors etc. are associated with NTL [3].

Power dissipated in power system components such as conductors of transmission and distribution systems, substations, bus bars, transformers, measurement systems and other electrical accessories due to internal electrical resistance causes technical losses. It is possible to compute and control the technical losses if the electric system has known quantity of loads. These types of losses occur during transmission and distribution and involve substation, transformer, and line related losses. For any distribution feeder technical losses occurs in conductors of HT line, core and windings of distribution transformers, conductors of LT line and consumer service connection wire [4]. The technical losses cannot be eliminated completely. Copper losses ($I^2R$ losses), dielectric losses, and induction and radiation losses are technical losses which are caused because of the flow of current in an electric circuit. Finite resistance of conductors of electrical network generates copper losses ($I^2R$ losses). Heating on the dielectric material between conductors results the dielectric losses. Electromagnetic fields around the conductors due to current results the induction and radiation losses. The main causes for technical losses are:

- Losses due to harmonics distortion,
- Losses due to overloading,
- Losses due to low voltage,
- Losses due to improper earthing at consumer end,
- Losses due to unbalanced loading,
- Losses due to long single-phase lines,
- Losses due to poor standard of equipment etc.

Non-technical losses are the electric energy consumed but not billed. These losses are caused by actions external to the power system. These are different than electricity which is billed but not paid. In these cases, the end user of electricity is unknown and the total unit of electricity consumed is not certain. Measurement of these losses is very difficult as there is no record for these types of losses. There are mainly three types of NTL. Those are electricity theft, conveyance errors and errors in unmetered supplies. Electricity theft is the energy which is consumed by hooking, tampering or bypassing the meters and so on. In such cases the amount of energy consumed cannot be recorded and measured. These types of energy are taken illegally without information to the electric utility which makes the difference between planned and consumed electricity amount. These theft increases the per unit rate of electricity and the per unit rate for electricity will be increased which increases bills of all consumers. Electricity theft can also be thought for un-metered supply. Conveyance error occurs due to situations where electricity is taken legally but not or measured and recorded properly in the reading and billing system of electricity utility. Errors in meter readings, errors in registration and faulty or damaged meters can lead to conveyance errors. These types of errors create the difference between real and recorded energy which results in the energy loss in electricity utility billing system. Unmetered supplies also create NTL. Street lights, bus stops, advertisement boards etc. may be supplied without meters. In those supplies consumptions are estimated in an average basis. But the actual consumption on those supplies are changing frequently and there might be variation between actual consumption and estimated consumption done on average basis. Those variations between actual consumption and estimated consumption generate non-technical loss.

## 1.2 Problem Statement

Losses in a distribution network are the major problem for an electric utility as the major portion of the losses occurs in the distribution network of the power system. Loss should be reduced by formulating and implementing proper loss-reduction strategies and techniques. But before formulating and implementing the loss reduction strategies and techniques it is necessary to know what is the total loss in a particular area. Furthermore, the amount of technical and non-technical losses should be known. The total loss of a LT feeder can be determined by knowing the energy supplied by a transformer and the energy consumed by all consumers connected to that transformer. Non-technical loss is the difference between total loss and technical loss. So, without knowing the technical loss non-technical loss cannot be determined. But the determination of the technical loss of a LT feeder by simulation is tedious and time-consuming as the network of the LT line is very complex and irregular. Therefore, some mathematical model should be formulated which can help to determine technical loss. And thereby, segregation of loss can be done easily. In order to mitigate the above problem, a new technique is required that can determine the technical loss in an easier and faster way. This research intends to find a simple and generalized model to compute LT distribution loss.

Loads in a power system distribution feeder may be uniformly distributed load or uniformly varying load. Uniformly distributed load in a feeder is the load in which loads are distributed uniformly along the length of feeder and each unit length is loaded to same rate. Similarly, uniformly varying load in a feeder is the load in which load is increasing continuously from one end to another end. There is zero load at beginning segment and increases at constant rate towards the ending segment. This research is aimed to model the technical loss using UDL and UVL concept and then to find a simple and generalized model to compute LT distribution Loss in terms of UDL and/or UVL loss and to test its applicability.

## 1.3 Objectives and Scopes

The main objective of this thesis work is to develop a simple and generalized model to compute LT distribution loss and testing of its applicability. In order to achieve the main objective, the following sub-objectives are set;

- To model distribution loss using UDL concept.
- To model distribution loss using UVL concept.
- To determine LF of distribution transformer of urban area.
- To determine LF of distribution transformer of rural area.

## 1.4 Outline of Thesis

This thesis has been organized into five chapters:

**Chapter 1** is an introductory chapter which includes general background, problem statement of the work, rationale of the study, objectives and scopes of the thesis and outline of thesis.

**Chapter 2** gives the overview of literature review for determining technical and non-technical loss and their computational complexity. This chapter also gives the relationship between load factor and loss of load factor. Concept of UDL and UVL are also described in this chapter. The motivations for requirement of new approach to find distribution loss are also described.

**Chapter 3** presents the methodology used for determining the loss using UDL and UVL concept. The tools and software used for this research are also described in this chapter. The generalized flowchart and algorithm to get objective is also described in this chapter.

**Chapter 4** describes ETAP and MATLAB simulation results of five urban and five rural LT feeders. This chapter also describes the Load curve and load factor of sample urban as well as sample rural distribution transformer. The outputs obtained from ETAP and MATLAB are analyzed, compared and discussed in this chapter.

**Chapter 5** summarizes the thesis and highlights the contributions of thesis, and proposes directions for further research.

Finally, the thesis ends with list of papers referred for this study.

# CHAPTER TWO: LITERATURE REVIEW

Load flow analysis can be used to calculate the Technical losses. Technical losses should be found before the segregation of losses because it is very hard to compute and measure non-technical losses directly. At first, technical losses are obtained from load flow analysis of the system and then technical losses are subtracted from the total losses of the system to get the non-technical losses. To find the technical losses load flow and simulation has to be done in an appropriate simulation software.

In Technical Loss Evaluation in Distribution Feeders, K. Seethalekshmi, U. C. Trivedi and M. Ramamoorty [5], the author deals with a representative methodology for computing the technical loss in the distribution system. The outcome of their research found the use in the system enhancement. The most important and initial step to be followed for reducing losses is to carry out an energy audit to recognize the various types of losses and their possible origins. Following the same methodology, the accurate estimate of technical losses of one urban and one rural feeder of Gujarat Electricity Board was computed and the losses of the complete distribution system has been computed from that estimation.

In Technical and Non-technical Losses in Power System and Its Economic Consequence in Indian Economy, J.P Navani, N.K Sharma, Sonal Sapra [4], the author analyze both types of losses by taking sample studies and simulating them in MATLAB. There are shortages of local and peak-time energy inside India which have had a negative impact on the overall economic growth. The lack of sufficient transmission and distribution capacity, a large number of transformation parts, unbalanced loading at the distribution end, and massive rural electric expansion, etc. are the causes of high losses. The author had taken two bus system where one is slack bus and another is load bus. The load pattern of sample domestic and industrial locations had been chosen and few portion of NTL had been added. The increased load and losses had been calculated using N-R load flow and MATLAB. Readings of a whole day had been recorded. Then a case study had been worked out in a village to know the extent of NTL of that part.

A book Electric Power Distribution Engineering [6] by Turan Gonen gives the detail information about electrical power distribution system. This book gives the information about uniformly distributed load, uniformly varying load, load factor, and loss factors and gives the relationship between the Load and Loss Factors.

The ratio of the average system load over a period to the maximum load occurring on that period is known as load factor as presented in [6] i.e.

$$\text{LF} = \frac{\text{Average Load}}{\text{Peak Load}}$$

Similarly, the ratio of the average power loss with the peak-load power loss over a certain duration is known as loss of load factor as presented in [7] i.e.

$$\text{LLF} = \frac{\text{Average Power Loss}}{\text{Power Loss at Peak Load}}$$

## 2.1 Relationship between the Load and Loss Factors

Generally, there is no direct relationship between the two factors. But, the equation can be found in their relationship with some limits [8]. Let us consider the sample feeder connected to a load of varying nature as shown in Figure 2.1. The arbitrary and ideal load curve is shown in Figure 2.2.

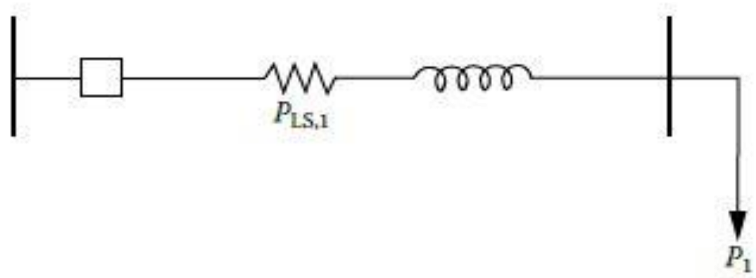


Figure 2-1 A typical line with fluctuating load

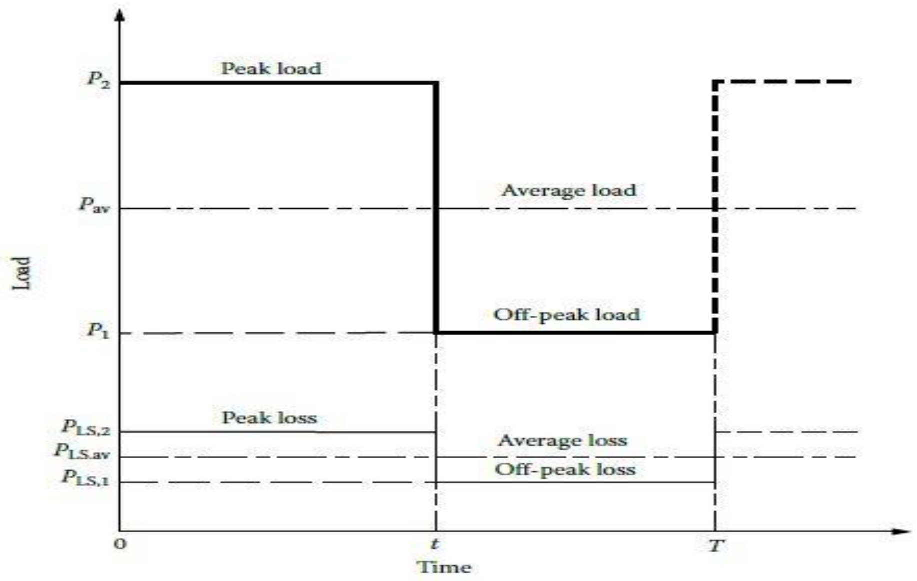


Figure 2-2 Arbitrary and ideal load curve

Let us suppose,

$P_{LS,1}$ - off peak loss.

$P_{LS,2}$ - peak loss

Now, LF is

$$LF = \frac{Pav}{Pmax} = \frac{Pav}{P2} \quad \text{……………………………………………} (2.1)$$

From Figure 2,

$$Pav = \frac{P2*t+P1(T-t)}{T} \quad \text{……………………………………………} (2.2)$$

Replacing equation 2.2 in 2.1,

$$LF = \frac{P2*t+P1(T-t)}{P2*T} = \frac{t}{T} + \frac{P1}{P2} * \frac{(T-t)}{T} \quad \text{…………………………} (2.3)$$

Now LLF is,

$$LLF = \frac{Pls,av}{Pls,max} = \frac{Pls,av}{Pls,2} \quad \text{……………………………………………} (2.4)$$

Here,

Pls,av is the average power loss

Pls,max is the maximum power loss

Pls,2 is the peak loss at peak load

From Figure 2,

$$Pls,av = \frac{Pls,2*t+Pls,1*(T\text{-}t)}{T} \quad \ldots\ldots\ldots\ldots\ldots\ldots(2.5)$$

Putting equation 2.5 into 2.4,

$$LLF = \frac{Pls,2*t+Pls,1*(T\text{-}t)}{Pls,2*T} \quad \ldots\ldots\ldots\ldots\ldots\ldots (2.6)$$

Here,

Pls,1 is the off-peak loss at off-peak load

t is the peak-load duration

T-t is the off-peak-load duration

The peak and off peak loads are represented as,

$$Pls,_1=k*P_1^2 \quad \ldots\ldots\ldots\ldots\ldots\ldots(2.7)$$

$$Pls,_2=k*P_2^2 \quad \ldots\ldots\ldots\ldots\ldots\ldots(2.8)$$

Here, Putting equations 2.7 and 2.8 into 2.6, the LLF will be,

$$LLF = \frac{t}{T} + \frac{P1*P1}{P2*P2} * \frac{T\text{-}t}{T} \quad \ldots\ldots\ldots\ldots\ldots\ldots(2.9)$$

From equations 2.3 and 2.9, the LF and LLF can be related with each other for various following cases.

Case I: When off-peak load is zero. i.e.

$$PLS,1 = 0$$

Since $P_1$ is zero. Thus, from 2.3 upto 2.9,

$$LF=LLF= t/T \quad \ldots\ldots\ldots\ldots\ldots\ldots (2.10)$$

This means, the load factor and loss factor are equal and constant, and their values are equal to the t/T constant.

Case II: Short-ending peak.

$$t \rightarrow 0$$

Thus from 2.3 and 2.9,

$$(T\text{-}t)/T \rightarrow 1$$

So,

$$LLF= (LF)^2 \quad \ldots\ldots\ldots\ldots\ldots\ldots (2.11)$$

This means, the LLF is equal to the square of the LF.

Case III: The load is steady. In this case,

$$t \rightarrow T$$

That means, peak and off-peak load can be ignored in this case. Therefore, from equations 2.3 upto 2.10,

$$LLF \rightarrow LF \quad (2.12)$$

That means, the LLF and the LF are equal.

So, we can write

$$LF < LLF < LF^2 \quad (2.13)$$

Thus, determination of loss factor from the load factor cannot be done directly because the loss factor is calculated from losses as a function of time, which is directly related to the square of load as a function of time.

But, according to Buller and Woodrow [9] approximate relation between LLF and LF is given as

$$LLF = 0.3*LF+0.7*LF^2 \quad (2.14)$$

$$LLF = k_1*LF+k_2*LF^2 \quad (2.15)$$

Here,

LLF is loss factor, pu

LF is load factor, pu

## 2.2 Uniformly Distributed Load (UDL) and Uniformly Varying Load (UVL)

Uniformly distributed load in a feeder is the load in which loads are distributed uniformly along the length of feeder and each unit length is loaded to same rate. Similarly, uniformly varying (increasing) load in a feeder is the load in which load is increasing continuously from one end to another end. Load is zero at one segment and increases at same rate towards another segment. Such load is also called triangular load. We can assume loads to be lumped at half of the feeder length for UDL and (2/3) rd of the feeder length for UVL for voltage drop calculation. Similarly, we can assume loads to be lumped at (1/3) rd of the feeder length for UDL and (8/15) th of the feeder length for UVL for Loss calculation [10]. And the formulas for power loss and voltage drop calculation are as follows:

For UDL case the power loss and voltage drop can be calculated as:

$$\text{Power loss} = \frac{1}{3} * I^2rL$$

$$\text{Voltage drop} = \frac{1}{2} * IzL$$

For UVL case the power loss and voltage drop can be calculated as:

$$\text{Power loss} = \frac{8}{15} * I^2 rL$$

$$\text{Voltage drop} = \frac{2}{3} * IzL$$

Where,

I is the current flowing through line.

r is the resistance of line per unit length.

z is the impedance of line per unit length.

L is the length of line.

# CHAPTER THREE: METHODOLOGY

## 3.1 Methodological Approach

As losses in the distribution system are major problem for electric utility, these should be minimized by implementing proper loss minimization strategies and techniques. Formulation of strategies and techniques for loss reduction can be done only after knowing total losses of that part and the proportion of technical and nontechnical losses. The difference between energy supplied by the utility and the energy received by all end users is the total losses. There are mainly two sources of losses: those are technical losses and non-technical losses. The heating effect of conductors of lines, excitation system of the transformer windings and other electrical accessories generate technical losses, and inadequate metering, error in metering system, error in billing systems, error in collection systems, and/or electricity theft by end users generate non-technical losses [11]. The flow of electric current in the electric system causes technical losses and develops the dielectric losses, copper or $I^2R$ losses and induction and radiation losses. These can further be grouped into constant losses and variable losses. The energy dissipated in the system in the form of $I^2R$ is the varying losses and approximately seventy five percentages of the technical losses are $I^2R$ losses only [12]. In a distribution feeder copper losses ($I^2R$ losses) are due to the internal resistance of conductors.
Total losses can be found by knowing the energy supplied by a distribution transformer and energy consumed by all consumers connected to that transformer. Determination of technical losses in a distribution feeder can be done by simulation but that process is tedious and time consuming. Furthermore, without knowing technical losses nontechnical losses cannot be determined. This research intends to find a simple and generalized model to compute LT distribution loss and to test its applicability.

This research is based on the data collected from real field. Certain parts of Balaju Distribution Center, NEA have been selected for the study. Balaju DC is selected for the study purpose because the service area of Balaju DC is located at urban as well as rural locations. About sixty percentage of its area lies in urban area and about forty percentage area lies in rural area. Balaju DC distributes electricity to areas of Kathmandu Metropolitan, Nagarjun Municipality, Tarkeshwor Municipality and Dhunibesi Municipality. There are about 250 number of distribution transformers within the DC. Among them five different distribution transformers of urban area and five different distribution transformers of rural area are taken for the research.

The selected transformer locations of urban areas are Baisdhara, Buddhamall, Water boring, Machhapokhari1 and Machhapokhari2. Similarly, the selected transformer locations of rural areas are Pusal, Mahankal, Bihani chowk, Chilaune Gau and Simkhada Gau. The data such as line length, number of phases of each line segments, type of conductors, size of conductors, consumer's connection point, consumer connection phase, consumer number/ID, number of phase of each consumers etc. of each distribution transformers are collected from field. Energy consumed by each consumers are taken from m-power database system of Balaju distribution center. The single line diagram of each distribution transformers are drawn from the collected information.

Load pattern of one urban area distribution transformer and one rural area distribution transformer only are recorded using TOD meter. Rest of distribution transformers are assumed to follow same load pattern due to lack of sufficient number of TOD meters to be installed to all distribution transformers. Distribution transformer of Baisdhara is taken as sample distribution transformer for determination of load pattern of urban area. Distribution transformer of Pusal is taken as sample distribution transformer for determination of load pattern of rural area. The peak power of each consumer is obtained from energy consumed in a month, load factor and total time duration of a month. These peak power of each consumer is converted to peak current by dividing peak power by voltage and pf. Line and load data sheets for ETAP and MATLAB are prepared from SLD and collected data for each distribution transformers.

## 3.2 Project Implementation

- TOD meter installed at transformers of Baisdhara and Pusal.
- TOD data downloaded to get recorded data of current, voltage, pf and energy.
- Drawn Load curve for each distribution transformer.
- Calculated LF of Baisdhara and Pusal distribution transformers.
- Selected five different distribution transformers of urban area and five different distribution transformers of rural area.

- Collected information and data such as line length, number of phases of each line segments, type of conductors, size of conductors, consumer's connection point, consumer connection phase, consumer number/ID, number of phase of each consumers, energy consumed by each consumer in a month etc. of all ten distribution transformers from field and drawn SLD.
- Prepared Line and load datasheets of all ten distribution transformers from collected data.
- SLD drawn on ETAP 12.6.0 and performed load flow analysis to find loss of each LT feeders (all ten distribution feeders).
- MATLAB program written to find loss of each LT feeders for both UDL and UVL cases.
- Losses obtained from ETAP simulation and MATLAB program are compared.

## 3.3 Project Layout

The research covers the urban load centers and rural load centers overseen by Balaju Distribution Center. Five distribution transformers from urban load centers and five from rural load centers are taken for this research.

i) Details of LT line of transformers were taken from the field.

ii) Energy consumption of consumers in the project area was taken from the M-Power software database.

iii) Load curve of urban areas and rural areas were obtained by installing TOD meters in distribution transformer.

iv) LF of urban and rural areas were determined from the corresponding load curve.

v) Average power factor was obtained from TOD meter data.

vi) Peak power of each consumers were obtained from monthly energy consumption, LF and time.

vii) Peak power are converted to peak current by dividing peak power by voltage and pf.

viii) Line and load datasheets for all distribution transformers were prepared with the help of collected information, SLD and peak current.

### 3.4 Generalized Flowchart

The generalized flowchart to get the objective of this study is given in fig 3-1.

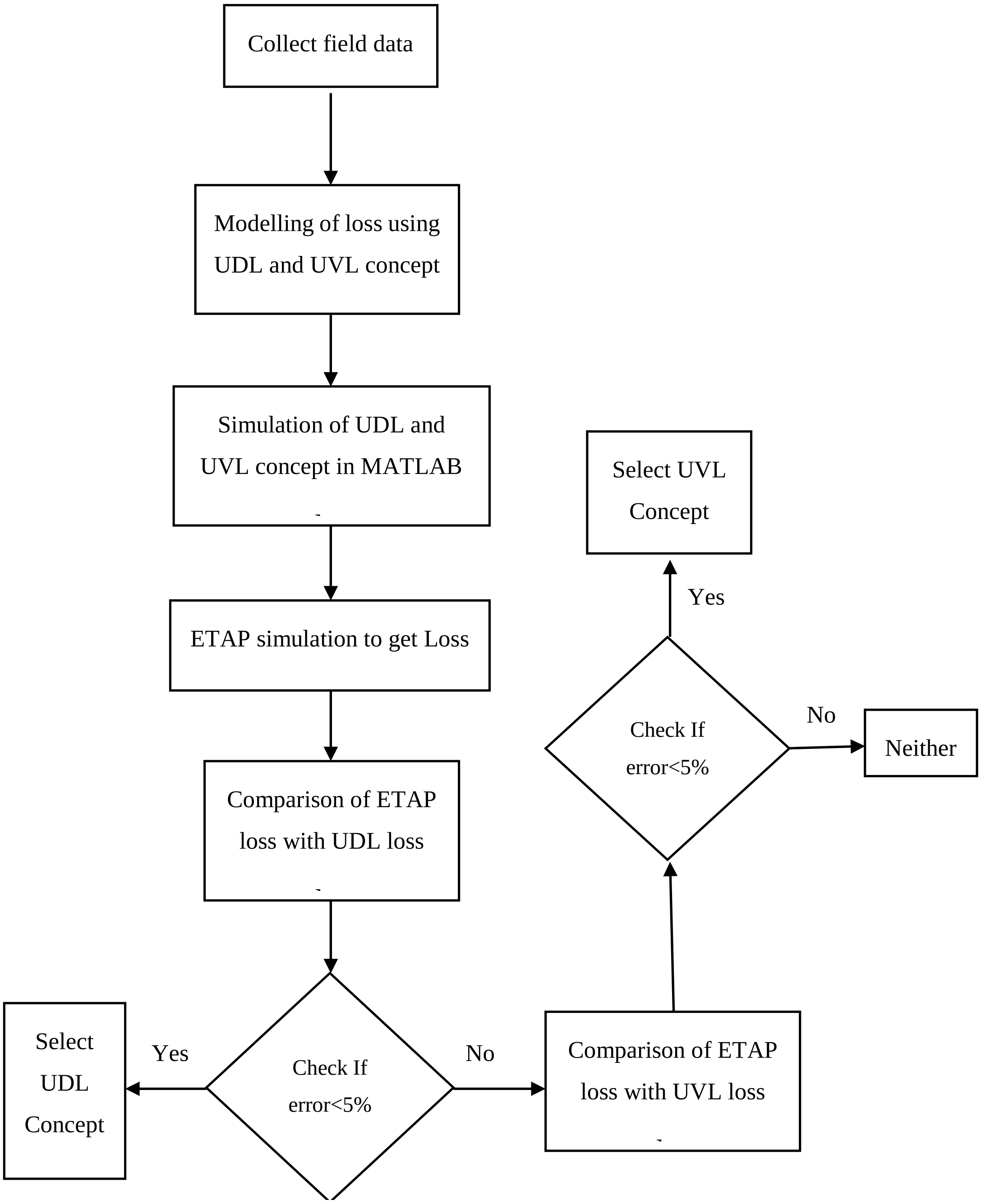


Figure 3-1 Generalized Flowchart

### 3.5 Methodological Steps

Following are the methodological steps to carry out this thesis project:

1. Data Collection.
2. Modelling of loss using UDL concept (In matrix form).
    a. Draw single line diagram.
    b. Use formula to calculate loss assuming load are UDL.
    c. Simplify the equation and convert into matrix form.
3. Modelling of loss using UVL concept (In matrix form).
    a. Draw sample single line diagrams.
    b. Use formula to calculate loss assuming load are UVL.
    c. Simplify the equation convert into matrix form.
4. Develop MATLAB program to find loss using UDL and UVL concept using model developed in steps 2 and 3.
5. Determination of LT technical loss by simulation on ETAP, UDL and UVL for LT lines.
    a. Collect all information of LT line and draw Single line diagram. (Data: length, type of conductor, load connection point, consumer details of each connection points, number of phases, energy consumed etc.).
    b. Find load curve using TOD meter.
    c. Calculate LF from load curve.
    d. Find peak load of each consumer, Peak load = (Energy consumed in a month) / (LF * 24 * 30).
    e. Find peak current of each consumer, Peak current = Peak load / (Voltage*pf).
    f. Model LT line in ETAP.
    g. Simulate and find peak power loss. This loss is the technical loss.
    h. Calculate loss by UDL and UVL concept using code developed in step 4.
    i. Find energy loss using, Energy loss = Peak power loss * LLF * 24 * 30.
6. Comparison of losses obtained from ETAP simulation with UDL and UVL losses obtained from MATLAB coding.
7. Result Analysis.
8. Conclusion.

## 3.6 UDL and UVL Modeling

Let us consider a radial distribution feeder having seven load points namely point A, point B, point C, point D, point E, point F, and point G as shown in figure 3.1.

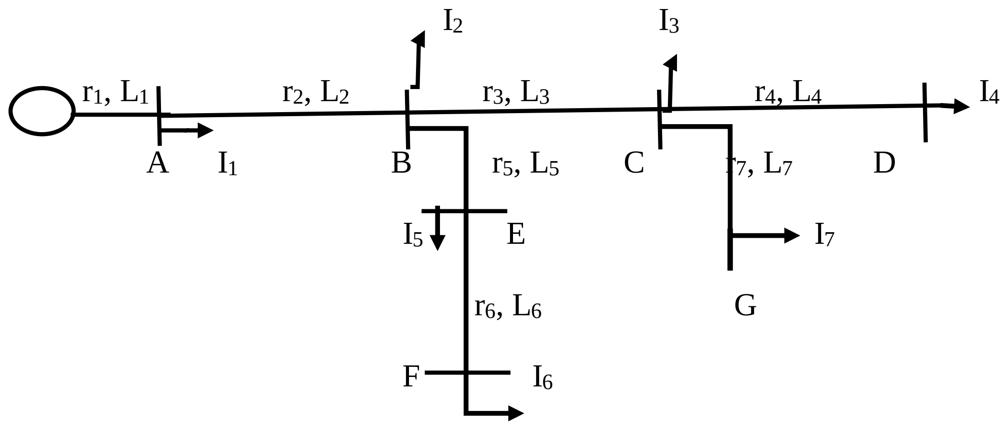


Figure 3-2 Typical LT distribution feeder

Where,

$r_1, r_2, \ldots\ldots\ldots.. r_7$ are resistances per unit length,

$L_1, L_2, \ldots\ldots\ldots.. L_7$ are lengths of each segment and

$I_1, I_2, \ldots\ldots\ldots\ldots I_7$ are currents of each load points of LT feeder respectively.

**CASE I: UDL**

Losses in each branch of LT feeder consists of two types of losses. One is uniformly distributed load loss which is the loss due to current of that node. Second loss is constant current loss which is due to currents of all nodes behind that node. For the sample circuit above total loss assuming load as UDL is as follows,

Total loss= loss due to constant current + loss due to uniformly distributed load

$$Loss=[(0*I_1+I_2+I_3+\ldots\ldots I_7)^2*r_1*L_1+\frac{1}{3}*I_1{}^2*r_1*L_1]+[(0*I_1+0*I_2+I_3+\ldots\ldots I_7)^2*r_2*L_2+\frac{1}{3}*I_2{}^2*r_2*L_2]+\ldots\ldots..+[(0*I_1+0*I_2+0I_3+\ldots 0I_7)^2*r_7*L_7+\frac{1}{3}*I_7{}^2*r_7*L_7]$$

Now writing in matrix form,

$$\text{Loss} = [r1 \quad r2 \ldots\ldots \quad r7] \begin{bmatrix} (0*I_1+I_2+I_3+\ldots\ldots\ldots\ldots I_7)^2 L_1 \\ (0*I_1+0*I_2+I_3+\ldots\ldots\ldots I_7)^2 L_2 \\ \ldots. \\ \ldots. \\ (0I_1+0I_2+\ldots\ldots\ldots\ldots\ldots I_7)^2 L_7 \end{bmatrix}$$

$$+\frac{1}{3}[r1 \quad r2 \ldots\ldots \quad r7] \begin{bmatrix} I_1^2 L_1 \\ I_2^2 L_2 \\ \ldots. \\ \ldots. \\ I_7^2 L_7 \end{bmatrix}$$

$$=[r1 \quad r2 \ldots \quad r7] \begin{bmatrix} L1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & L2 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & L3 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & L4 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & L5 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & L6 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & L7 \end{bmatrix} \begin{bmatrix} square(0I1 + I2 + \cdots I7) \\ square(0I1 + 0I2 + \cdots I7) \\ \ldots. \\ \ldots.. \\ \ldots. \\ \ldots.. \\ square(0I1 + 0I2 + \cdots 0I7) \end{bmatrix}$$

$$+\frac{1}{3} * [r1 \quad r2 \ldots\ldots \quad r7] \begin{bmatrix} L1 & 0 & 0 & 0 & 0 \\ 0 & L2 & 0 & 0 & 0 \\ \ldots & \ldots. & \ldots. & \ldots & 0 \\ 0 & 0 & 0 & 0 & L7 \end{bmatrix} * \left[ \begin{bmatrix} square(I1) \\ square(I2) \\ \ldots.. \\ square(I7) \end{bmatrix} \right]$$

$$=[R]*[L]* \left\{ \begin{matrix} square\ of\ each\ element\ of \left( \begin{bmatrix} 0 & 1 & 1 & \ldots & 1 \\ 0 & 0 & 1 & \ldots. & 1 \\ \ldots & \ldots & .. & \ldots & \ldots \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix} * \begin{bmatrix} I1 \\ I2 \\ \ldots \\ I7 \end{bmatrix} \right) \\ + \frac{1}{3} * \begin{bmatrix} square(I1) \\ square(I2) \\ \ldots.. \\ square(I7) \end{bmatrix} \end{matrix} \right\}$$

$$=[R]*[L]* \left\{ square\ of\ each\ element\ of\ ([U1] * [In]) + \frac{1}{3} * [I] \right\}$$

Here, U1 = $\begin{bmatrix} u11 & u12 & u13 & \dots & u1n \\ u21 & u22 & u23 & \dots. & u2n \\ \dots & \dots & .. & \dots & \dots \\ un1 & un2 & un3 & \dots & unn \end{bmatrix}$

For U1: Uij=1 if jth node current possesses through ith branch

Uij=0 if jth node current does not possess the ith branch

[In] = $\begin{bmatrix} I1 \\ I2 \\ \dots \\ In \end{bmatrix}$ ; [I]= $\begin{bmatrix} square(I1) \\ square(I2) \\ \dots.. \\ square(I7) \end{bmatrix}$

Hence, Total Loss =[R]*[L]*[M1]

Where,

[M1] = $\left\{square\ of\ each\ element\ of\ ([U1] * [In]) + \frac{1}{3} * [I]\right\}$

**Case II: UVL**, for the sample circuit above total loss assuming load as UVL,

Total loss= loss due to constant current + loss due to uniformly varying load

Loss=$[(0*I_1+I_2+I_3+\dots\dots I_7)^2*r_1*L_1+\frac{8}{15}*I_1^2*r_1*L_1]+[(0*I_1+0*I_2+I_3+\dots\dots I_7)^2*r_2*L_2+\frac{8}{15}*I_2^2*r_2*L_2]+\dots\dots..+[(0*I_1+0*I_2+0I_3+\dots 0I_7)^2*r_7*L_7+\frac{8}{15}*I_7^2*r_7*L_7]$

Now writing in matrix form,

$$\text{Loss} = [r1 \quad r2 \dots\dots \quad r7] \begin{bmatrix} (0*I_1+I_2+I_3+\dots\dots\dots\dots I_7)^2L_1 \\ (0*I_1+0*I_2+I_3+\dots\dots\dots I_7)^2L_2 \\ \dots. \\ \dots. \\ (0I_1+0I_2+\dots\dots\dots\dots I_7)^2L_7 \end{bmatrix}$$

$$+\frac{8}{15}[r1 \quad r2 \dots \quad r7] \begin{bmatrix} I_1^2L_1 \\ I_2^2L_2 \\ \dots. \\ I_7^2L_7 \end{bmatrix}$$

$$=[r1 \quad r2 \ldots \quad r7]\begin{bmatrix} L1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & L2 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & L3 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & L4 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & L5 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & L6 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & L7 \end{bmatrix}\begin{bmatrix} square(0I1 + I2 + \cdots I7) \\ square(0I1 + 0I2 + \cdots I7) \\ \ldots. \\ \ldots.. \\ \ldots. \\ \ldots.. \\ square(0I1 + 0I2 + \cdots 0I7) \end{bmatrix}$$

$$+\frac{8}{15} * [r1 \quad r2 \ldots\ldots \quad r7]\begin{bmatrix} L1 & 0 & 0 & 0 & 0 \\ 0 & L2 & 0 & 0 & 0 \\ \ldots & \ldots. & \ldots. & \ldots & 0 \\ 0 & 0 & 0 & 0 & L7 \end{bmatrix}\left[\begin{bmatrix} square(I1) \\ square(I2) \\ \ldots.. \\ square(I7) \end{bmatrix}\right]$$

$$=[R]*[L]*\left\{\begin{matrix} square\ of\ each\ element\ of\ \left(\begin{bmatrix} 0 & 1 & 1 & \ldots & 1 \\ 0 & 0 & 1 & \ldots. & 1 \\ \ldots & \ldots & .. & \ldots & \ldots \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix} * \begin{bmatrix} I1 \\ I2 \\ \ldots \\ I7 \end{bmatrix}\right) \\ + \frac{8}{15} * \begin{bmatrix} square(I1) \\ square(I2) \\ \ldots.. \\ square(I7) \end{bmatrix} \end{matrix}\right\}$$

$$=[R]*[L]*\left\{square\ of\ each\ element\ of\ ([U1] * [In]) + \frac{8}{15} * [I]\right\}$$

Here, $U1 = \begin{bmatrix} u11 & u12 & u13 & \ldots & u1n \\ u21 & u22 & u23 & \ldots. & u2n \\ \ldots & \ldots & .. & \ldots & \ldots \\ un1 & un2 & un3 & \ldots & unn \end{bmatrix}$

For U1: Uij=1 if jth node current possesses through ith branch

Uij=0 if jth node current does not possess the ith branch

$[In] = \begin{bmatrix} I1 \\ I2 \\ \ldots \\ In \end{bmatrix}$ ; $[I] = \begin{bmatrix} square(I1) \\ square(I2) \\ \ldots.. \\ square(I7) \end{bmatrix}$

Hence, Total Loss =[R]*[L]*[$M_2$]

Where,

$$[M_2]= \left\{square\ of\ each\ element\ of\ ([U1] * [In]) + \frac{8}{15} * [I]\right\}$$

### 3.7 Tools and Software

Load flow analysis of any network can be done using various software such as ETAP, MATLAB/Simulink, Power Factory from Dig SILENT, ERAC, NEPLAN, Power-World, and so on.

#### 3.7.1 ETAP 12.6.0

Electrical Transient and Analysis Program (ETAP) 12.6.0, is used as key tool in this study. ETAP is one of the most effective, generalized and reliable analysis tool which is widely used in power system generation, transmission, and distribution. This tool is basically used in the design process, simulation, operation and control, optimization, and automation of power system.

Within ETAP simulator, we have various simulators. Those are Load Flow Analysis, Contingency Analysis, Transient Stability Analysis, Optimal Power Flow Analysis, Optimal Capacitor Placement, Reliability Analysis, and Short Circuit Analysis.

Among the above, Load Flow Analysis will be used for determining losses of LT feeders of practical system.

#### 3.7.2 MATLAB R2014a

MATLAB is called as matrix laboratory. This tool was developed by MathWorks. It is the numeric computational environmental and proprietary programming language tool. This tool is widely used for manipulations of matrices, developments of algorithms, plotting of graphs, formation of interfaces, and interfacing with written programs. Primary aim of MATLAB is for complex numeric computation. But there are some optional toolbox and package which adds the MATLAB functions. To access symbolic computational capability MuPAD can be used. To enhance graphical multiple analysis and model based design, the Simulink can be added.

In this thesis MATLABR2014a will be used to develop an algorithm which can give the values of losses of various LT distribution feeders for both UDL and UVL cases.

# CHAPTER FOUR: SIMULATION RESULTS AND DISCUSSION

This chapter deals with the load flow analysis and the simulation results obtained from ETAP 12.6.0 and MATLAB. Load flow analysis was done in ETAP 12.6.0 for LT feeders of ten distribution transformers to get the loss for each LT feeder. Programming was done in MATLAB to obtain the loss of all ten distribution transformers for both UDL and UVL cases. Recorded TOD meter data of one sample urban area distribution transformer and one sample rural area distribution transformer were downloaded and analyzed to find LF.

## 4.1 LF calculation

### 4.1.1 LF of urban area Distribution Transformer

TOD meter was installed at Baisdhara transformer which is in urban area. TOD meter download data of Baisdhara transformer for one day (2019-03-11) is presented in Appendix A. The load curve for three phases are shown below.

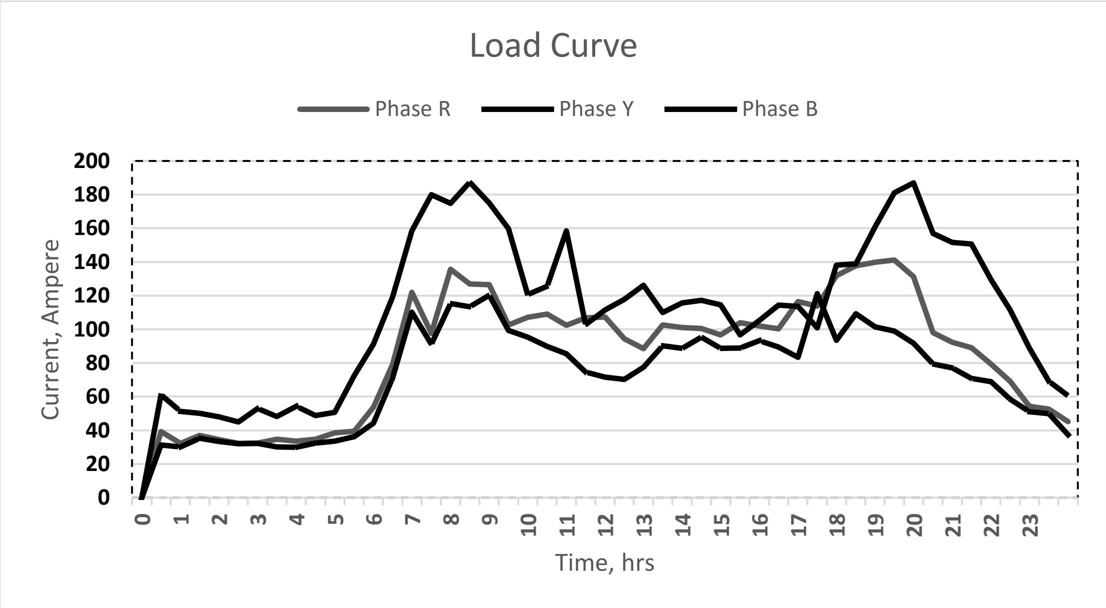


Figure 4-1 Load curve for Baisdhara transformer

LF for all three phases of Baisdhara distribution transformer is calculated in table 4.1.

Table 4-1 LF of Baisdhara distribution transformer

| Parameter | Phases | | |
|---|---|---|---|
| | R | Y | B |
| Maximum current, A | 141.080 | 121.210 | 187.320 |
| Total current of a day, A | 4147.040 | 3513.290 | 5404.640 |
| Average current, A | 86.397 | 73.194 | 112.597 |
| LF | 0.612 | 0.604 | 0.601 |

From the table 4-1, it is seen that the value of LF of R, Y and B phases of urban area distribution transformer is 0.612, 0.604 and 0.601 respectively.

### 4.1.2 LF of rural area Distribution Transformer

TOD meter was installed at Pusal transformer which is in rural area. TOD meter download data of Pusal transformer for one day is presented in Appendix B. The load curve for three phases are shown below.

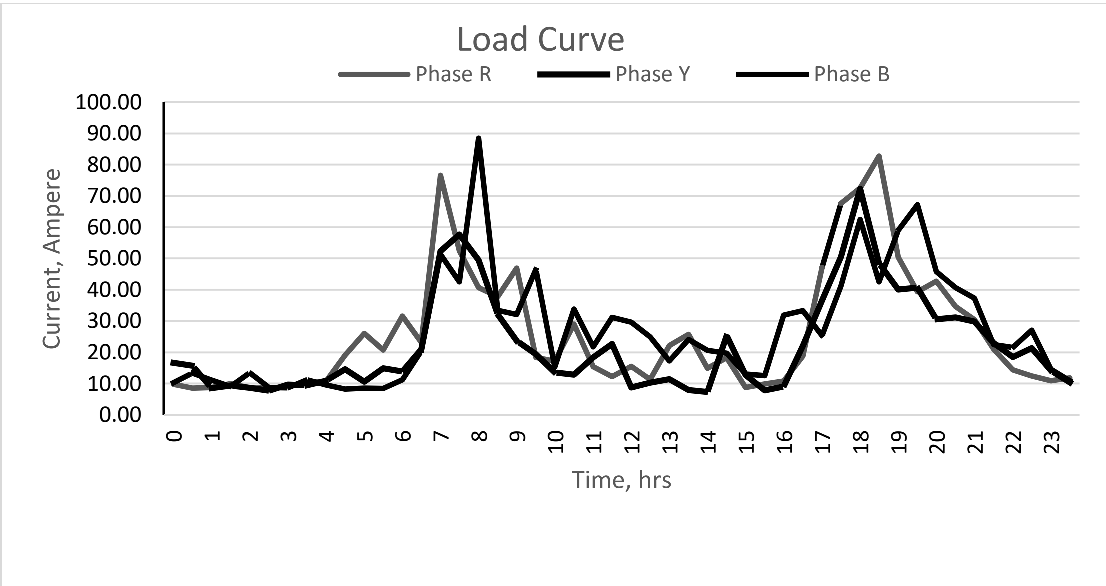


Figure 4-2 Load curve for Pusal transformer

LF for all three phases of Pusal distribution transformer is calculated as follows:

Table 4-2 LF of Pusal distribution transformer

| Parameter | Phases | | |
|---|---|---|---|
| | R | Y | B |
| Maximum current, A | 82.760 | 72.300 | 88.500 |
| Total current of a day, A | 1245.940 | 1064.090 | 1293.810 |
| Average current, A | 25.957 | 22.169 | 26.954 |
| LF | 0.314 | 0.307 | 0.305 |

From the table 4-2, it is seen that the value of LF of R, Y and B phases of rural area distribution transformer is 0.314, 0.307 and 0.305 respectively.

## 4.2 MATLAB program to find UDL and UVL loss

This research uses the MATLAB tool for developing program for determining loss using UDL and UVL concept. The MATLAB program is presented in Appendix-C. This program takes the input of length, resistance and current of each phases from the excel datasheets and then calculate UDL and UVL losses using model developed and record the UDL and UVL loss values in excel sheet.

UDL and UVL losses are calculated for Baisdhara, Pusal and Mahankal LT feeders in excel sheets. These loss values are used to check correctness of MATLAB program. The value of UDL and UVL losses found from MATLAB program and manual calculation are equal for Baisdhara, Pusal and Mahankal LT feeders. The UDL and UVL losses for other LT feeders are also found using the MATLAB program.

## 4.3 ETAP model development and simulation of urban area transformers

Baisdhara, Buddhamall, Water boring, Machhapokhari1 and Machhapokhari2 are the five selected LT distribution feeders of urban area. These distribution transformers supplies the electricity to consumers of urban area. Consumers of these area consumes more energy than that consumed by consumers of rural area. Consumers of these area are mainly of commercial type. ETAP model for each LT feeder were developed from the corresponding SLD and data were entered from line and load datasheets of corresponding LT feeders. Loss of each LT feeder was obtained after load flow analysis.

### 4.3.1 Simulation of Baisdhara transformer

The single line diagram of Baisdhara distribution transformer and its LT line is shown in figure 4-3. The capacity of transformer of Baisdhara is 200 kVA. This transformer serves the area around Baisdhara.

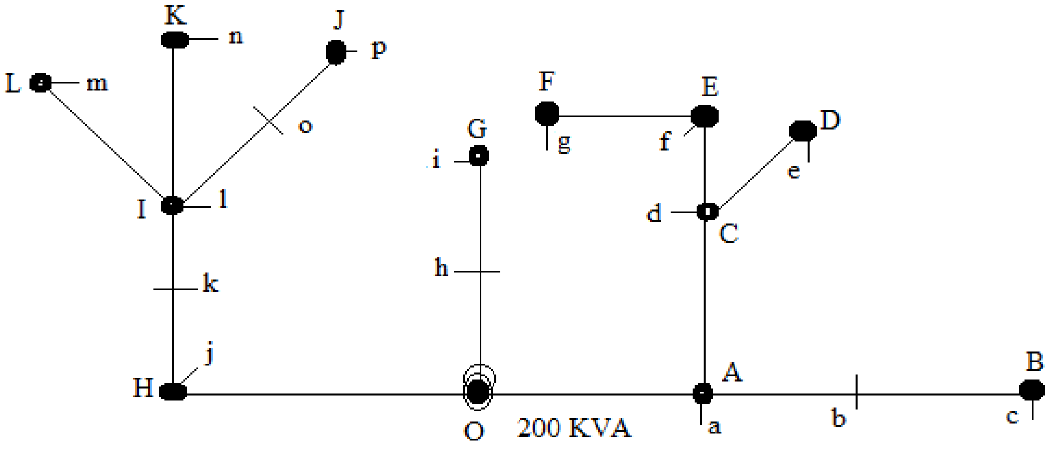


Figure 4-3 Single line diagram of Baisdhara transformer

Here, A, B, C ….are branching points and a, b, c….are load points. Line and load data for above SLD are presented in Appendix-D. The modeling of above LT line in ETAP 12.6.0 is shown below.

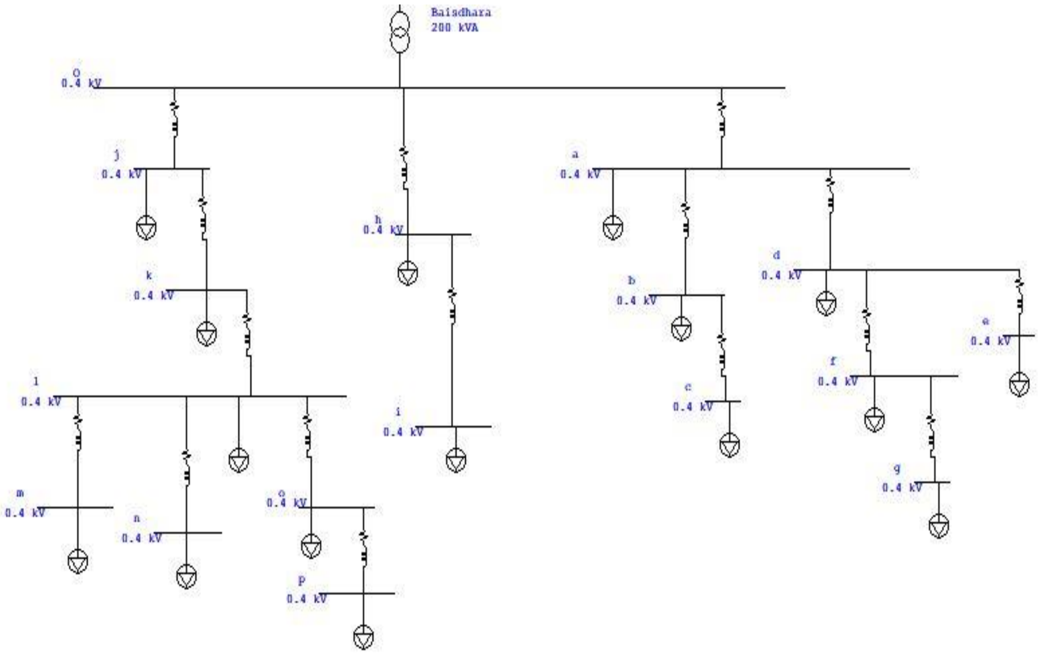


Figure 4-4 ETAP model for Baisdhara LT feeder

### 4.3.2 Simulation of Buddhamall transformer

The single line diagram of Buddhamall distribution transformer and its LT line is shown in figure below. The capacity of transformer of Baisdhara is 100 kVA. This transformer serves the area around Buddhamall.

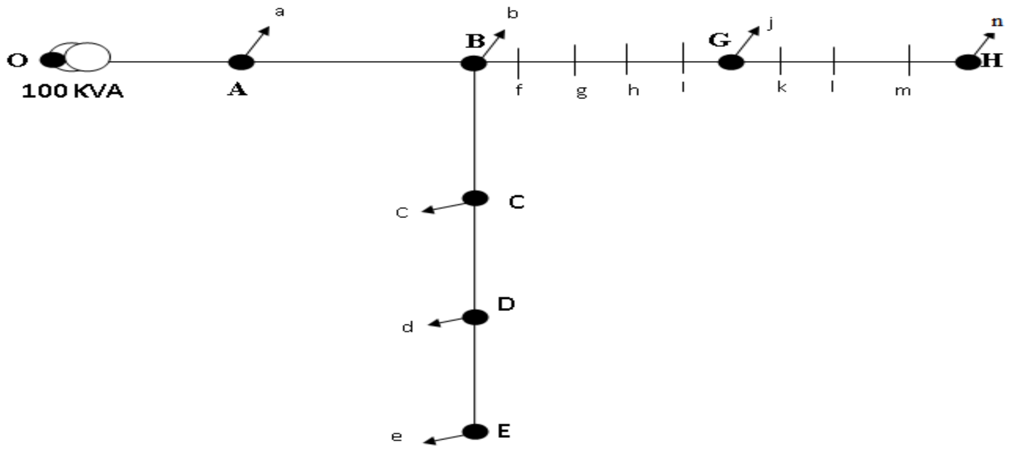


Figure 4-5 Single line diagram of Buddhamall transformer

Notes:-

Here A, B, C… are Branching Points and a, b, c …………are Load points. Line and load data for above SLD are presented in Appendix-E. The modeling of above LT line in ETAP 12.6.0 is given below;

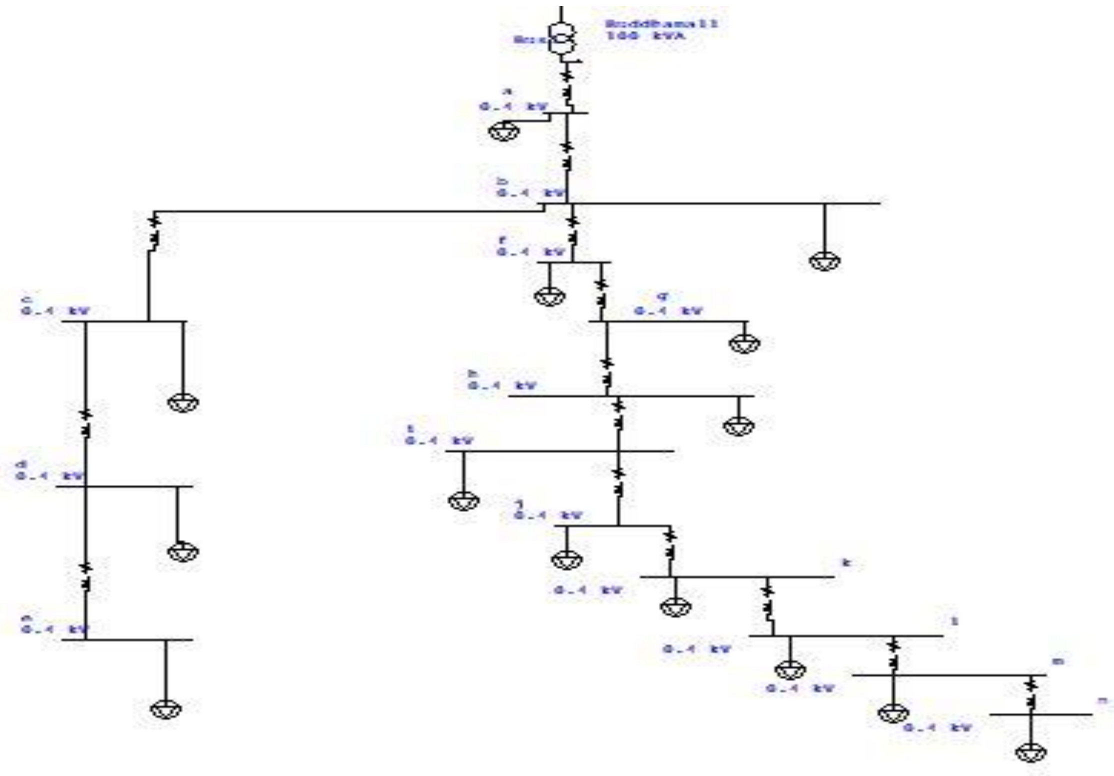

Figure 4-6 ETAP model for Buddhamall LT feeder

### 4.3.3 Simulation of Water boring transformer

The single line diagram of water boring distribution transformer and its LT line is shown in figure below. The capacity of transformer of water boring is 300 kVA.

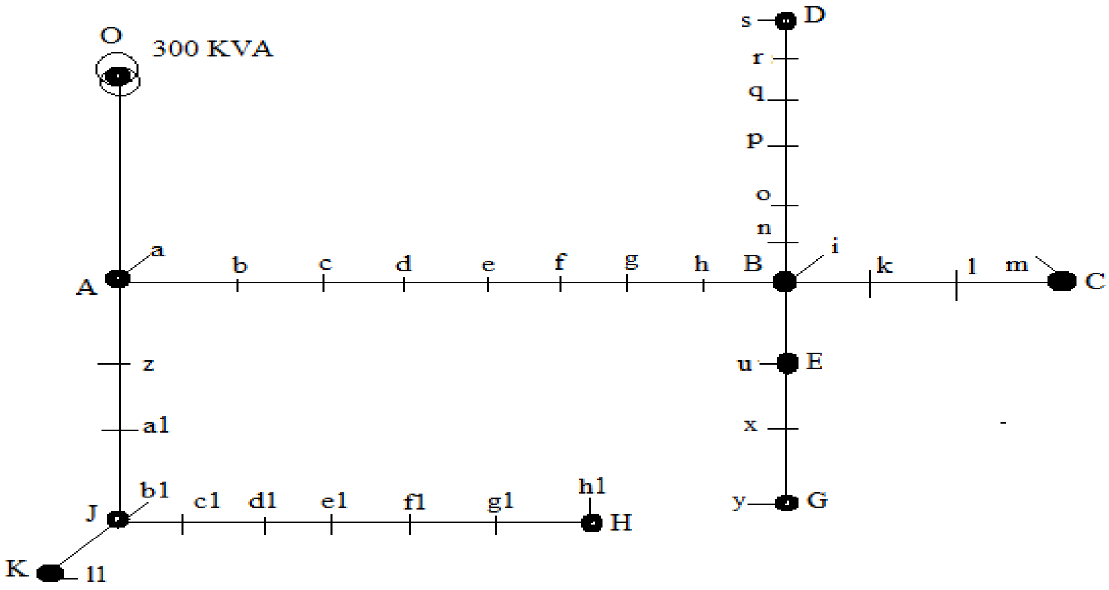


Figure 4-7 Single line diagram of water boring transformer

Here A, B, C… are Branching Points and a, b, c …………are Load points. Line and load data for above SLD are presented in Appendix-F. The modeling of above LT line in ETAP 12.6.0 is given in figure 4-8.

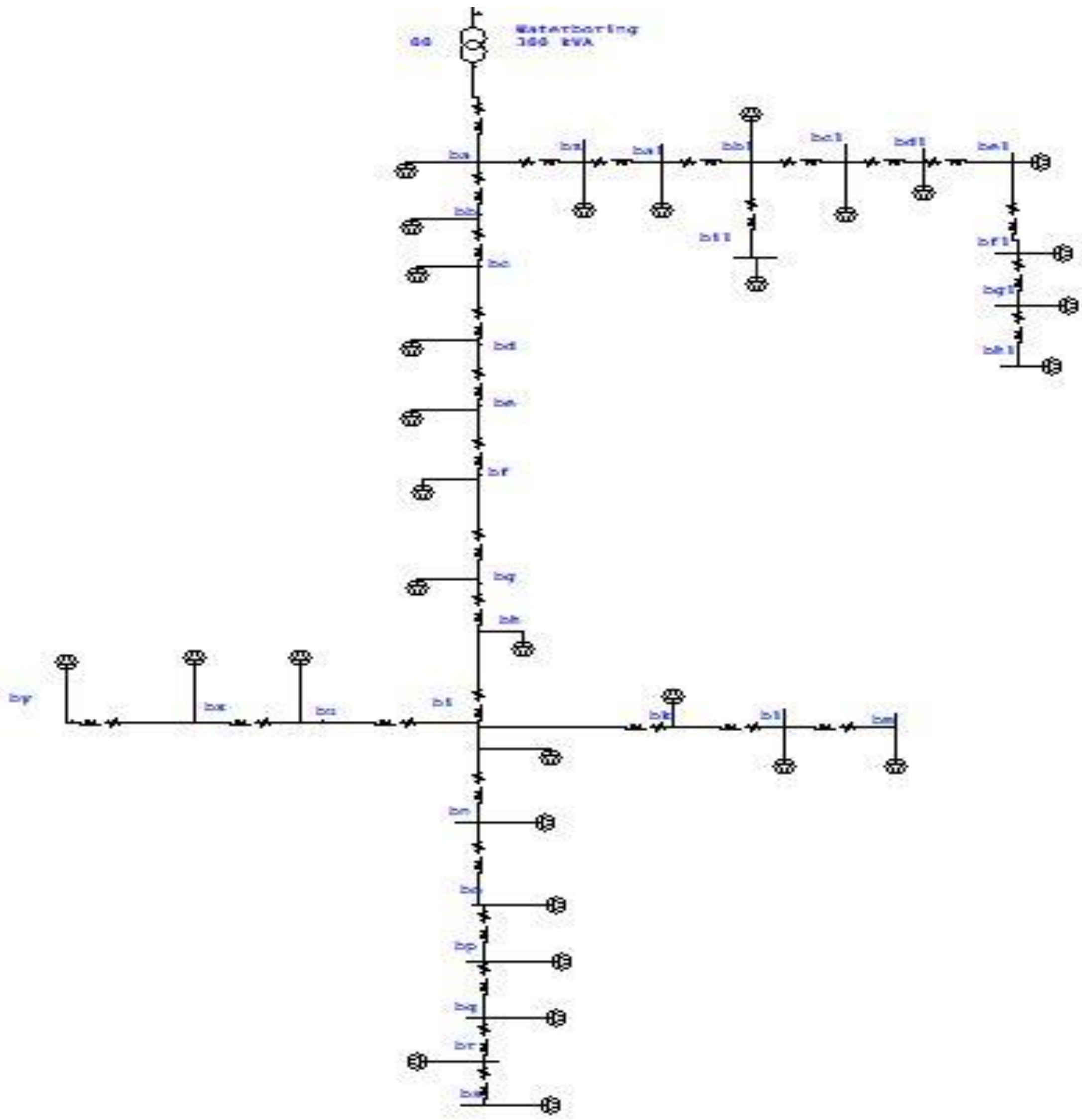

Figure 4-8 ETAP model for Water boring LT feeder

### 4.3.4 Simulation of Machhapokhari1 transformer

The single line diagram of Machhapokhari1 distribution transformer and its LT line is shown in figure 4-9. The capacity of transformer of Machhapokhari1 is 250 kVA. Line and load data for above SLD are presented in Appendix-G.

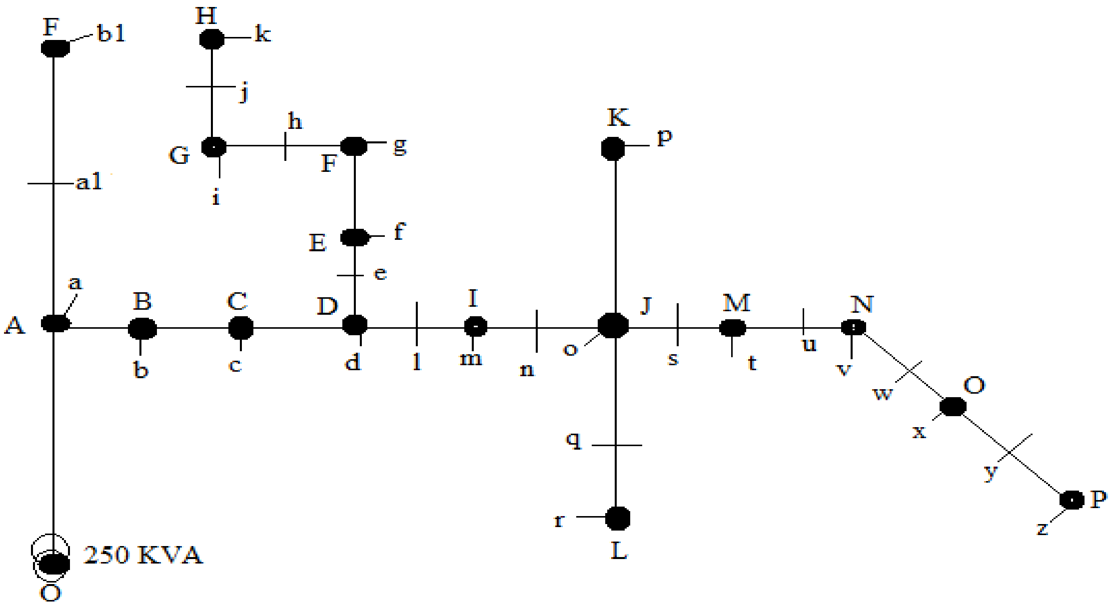


Figure 4-9 Single line diagram of Machhapokhari1 transformer

Here A, B, C… are Branching Points and a, b, c ………..are Load points. The modeling of above LT line in ETAP 12.6.0 is given below.

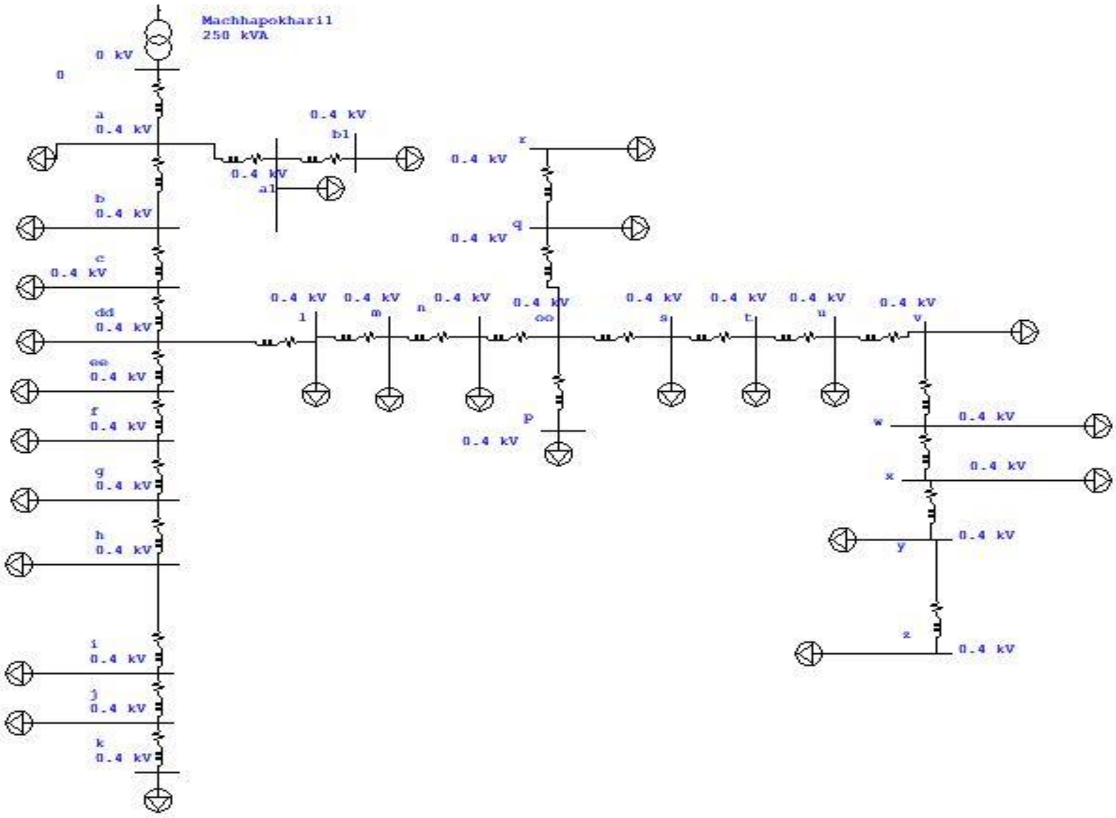


Figure 4-10 ETAP model for Machhapokhari1 LT feeder

### 4.3.5 Simulation of Machhapokhari2 transformer

The single line diagram of Machhapokhari2 distribution transformer and its LT line is shown in figure below. The capacity of transformer of Machhapokhari2 is 300 kVA.

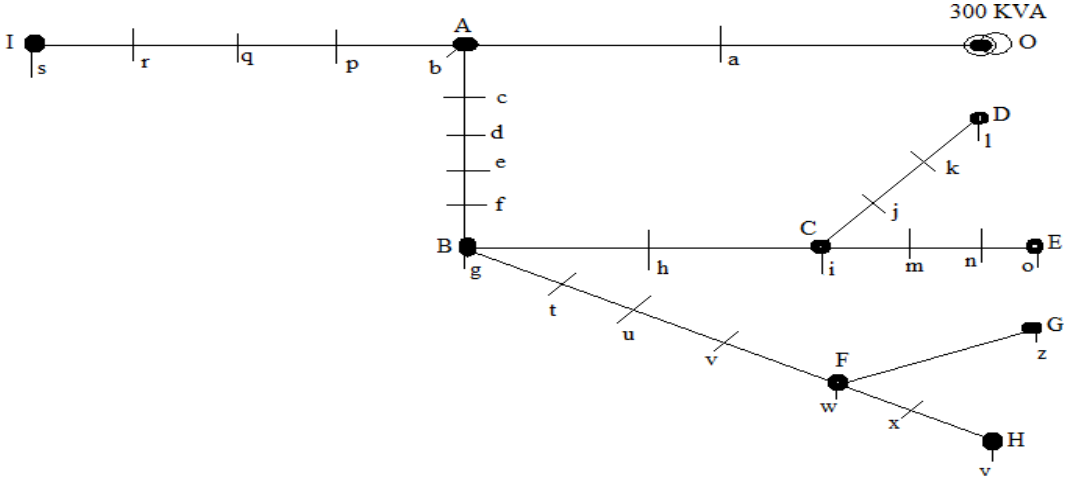


Figure 4-11 Single line diagram of Machhapokhari2 transformer

Here A, B, C… are Branching Points and a, b, c …………are Load points. Line and load data for above SLD are presented in Appendix-H. The modeling of above LT line in ETAP 12.6.0 is given below.

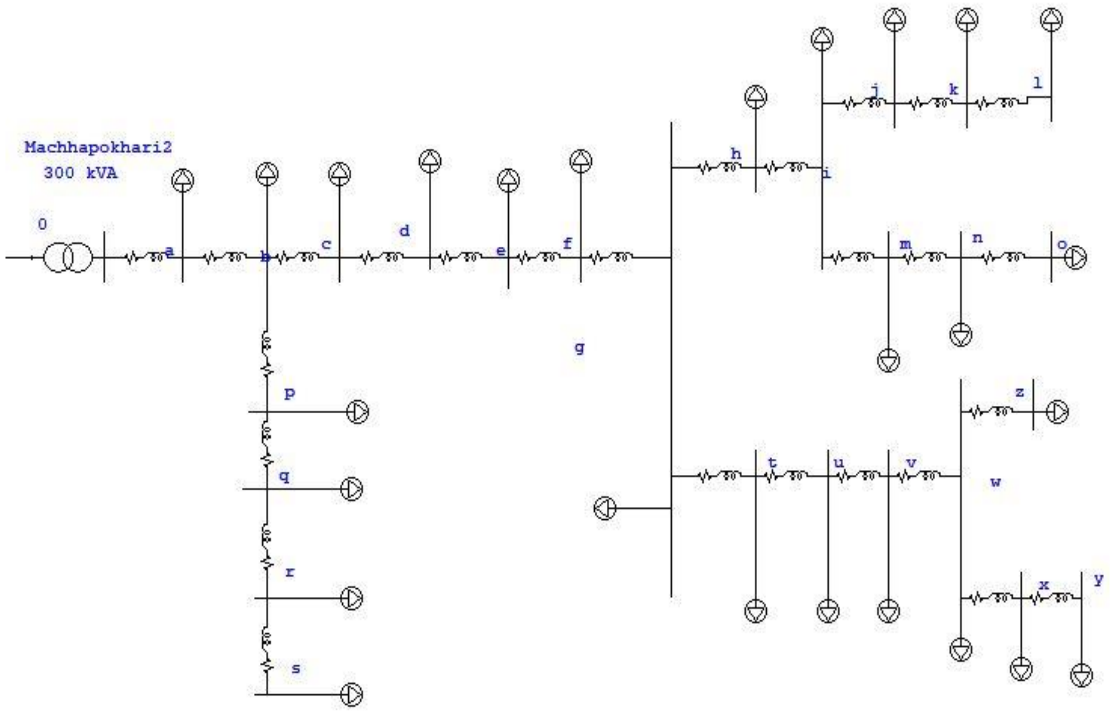


Figure 4-12 ETAP model for Machhapokhari2 LT feeder

### 4.4 ETAP model development and simulation of rural area transformers

Pusal, Mahankal, Bihani Chowk, Chilaune Gau and Simkhada Gau are the five selected LT distribution feeders of rural area. These distribution transformers supplies the electricity to consumers of rural area. Consumers of these area consumes less energy than that consumed by consumers of urban area. Consumers of these area are mainly of domestic type. ETAP model for each LT feeder was developed from the corresponding SLD and data were entered from line and load datasheets of corresponding LT feeders. Loss of each LT feeder was obtained after load flow analysis.

#### 4.4.1 Simulation of Pusal transformer

The single line diagram of Pusal distribution transformer and its LT line is shown in figure below. The capacity of transformer of Pusal is 50 kVA.

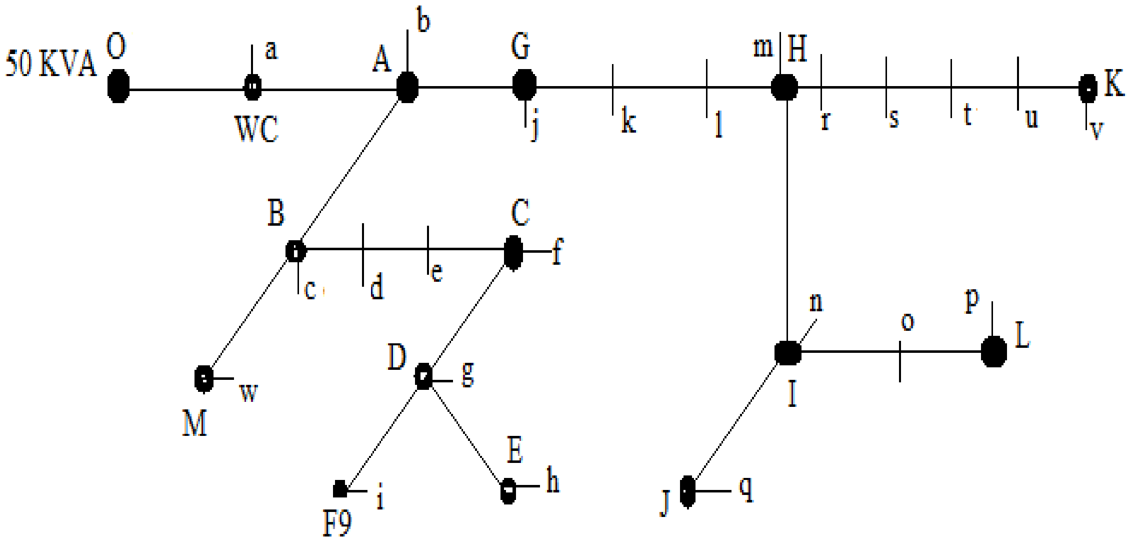


Figure 4-13 Single line diagram of Pusal transformer

Here A, B, C… are Branching Points and a, b, c …………are Load points. Line and load data for above SLD are presented in Appendix-I.

The modeling of above LT line in ETAP 12.6.0 is given below;

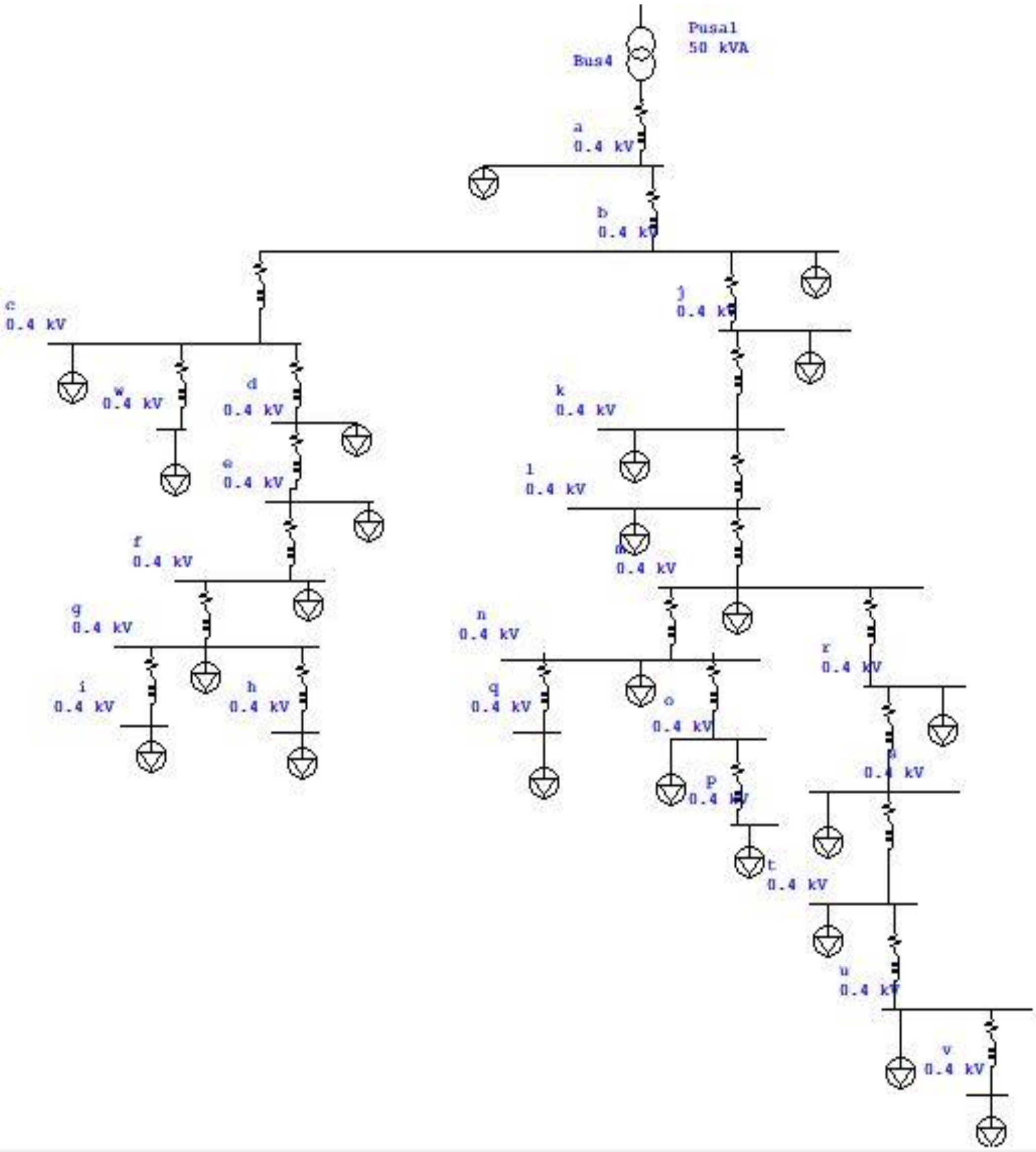


Figure 4-14 ETAP model for Pusal LT feeder

### 4.4.2 Simulation of Mahankal transformer

The single line diagram of Mahankal distribution transformer and its LT line is shown in figure 4-15. The capacity of transformer of Mahankal is 50 kVA. Line and load data for above SLD are presented in Appendix-J.

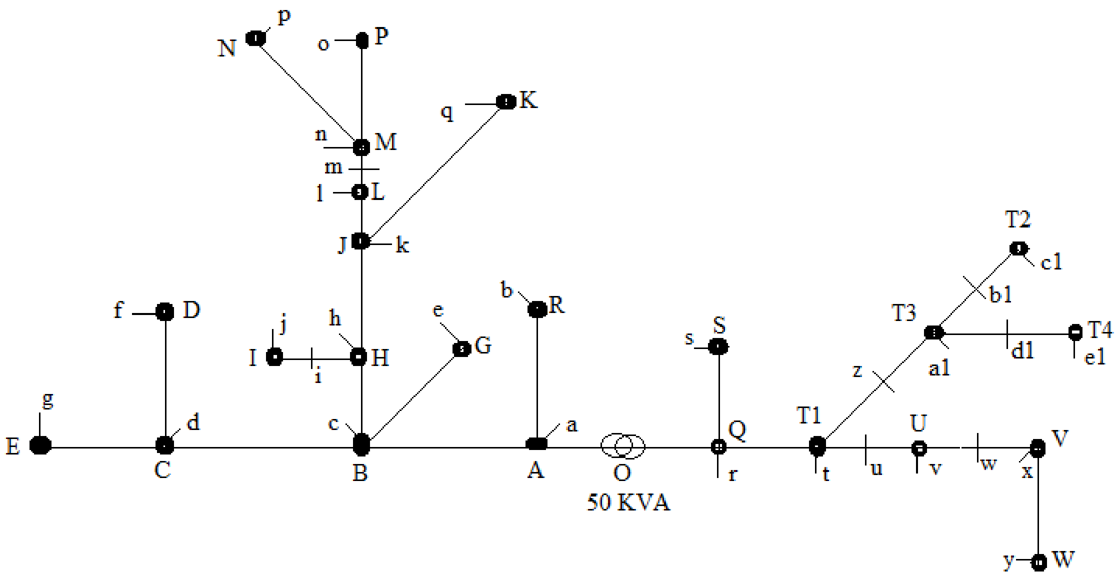


Figure 4-15 single line diagram of Mahankal transformer

Here A, B, C… are Branching Points and a, b, c …………are Load points. The modeling of above LT line in ETAP 12.6.0 is given below;

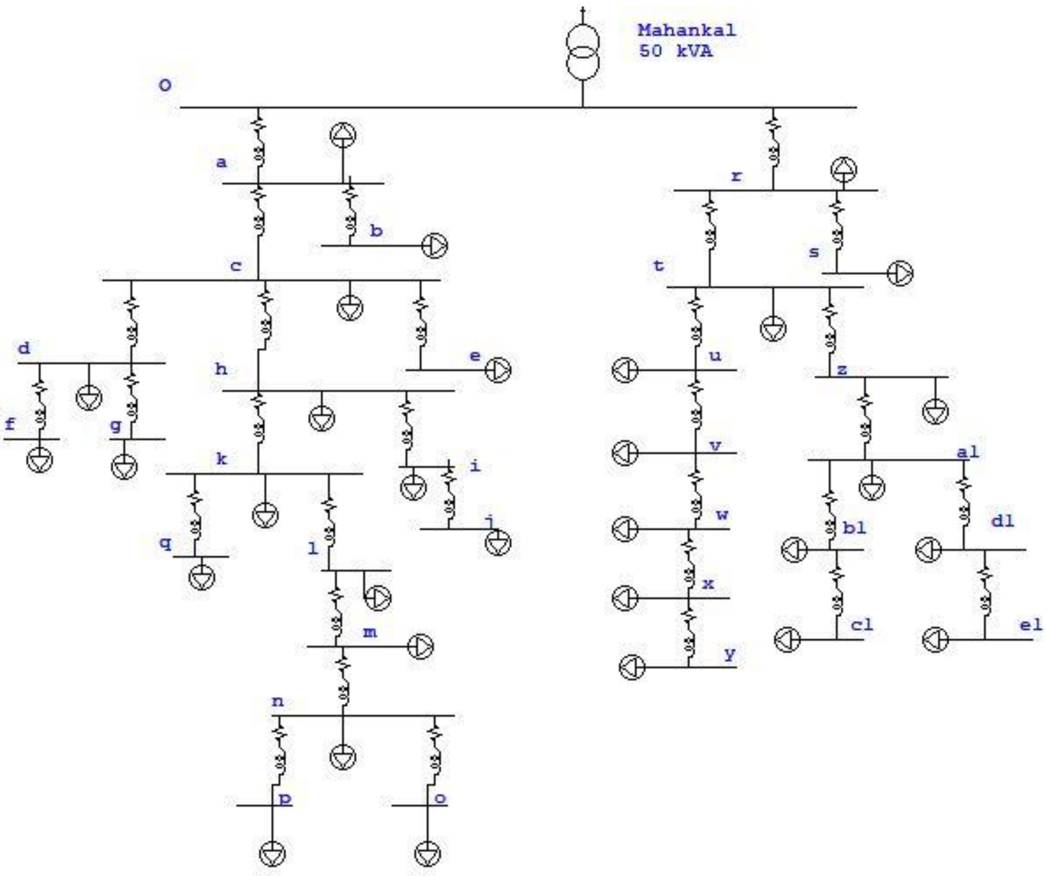


Figure 4-16 ETAP model for Mahankal LT feeder

### 4.4.3 Simulation of Bihani Chowk transformer

The single line diagram of Bihani chowk distribution transformer and its LT line is shown in figure below. The capacity of transformer of Bihani chowk is 200 kVA.

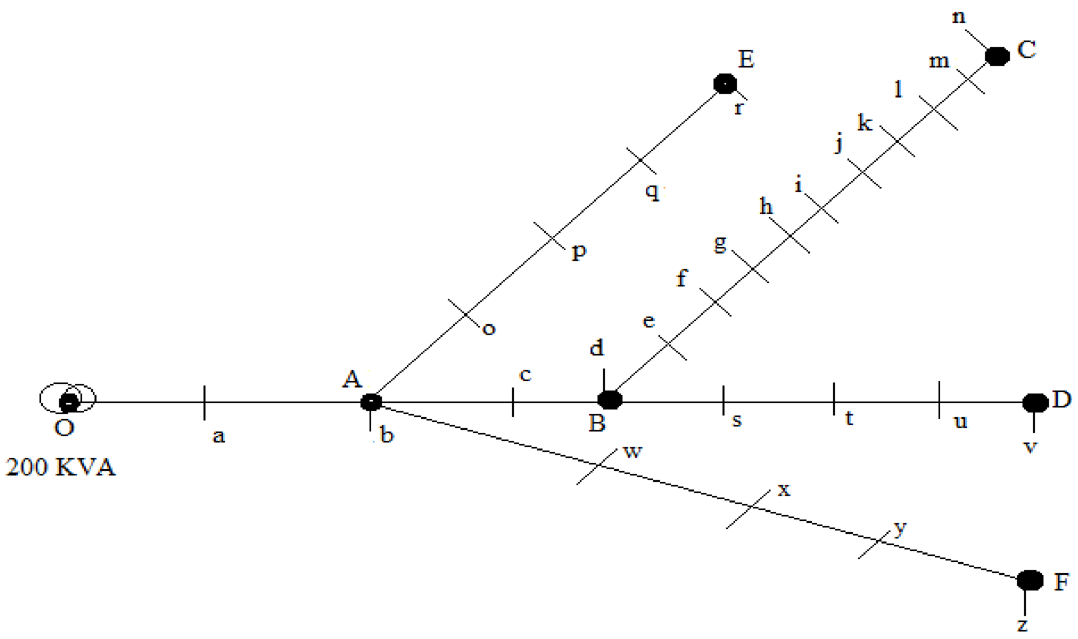


Figure 4-17 Single line diagram of Bihani Chowk transformer

Notes:-

A, B, C ……………………….. : - Branching Points

a, b, c ……………………….... : - Load points

Line and load data for above SLD are presented in Appendix-K.

The modeling of above LT line in ETAP 12.6.0 is given below;

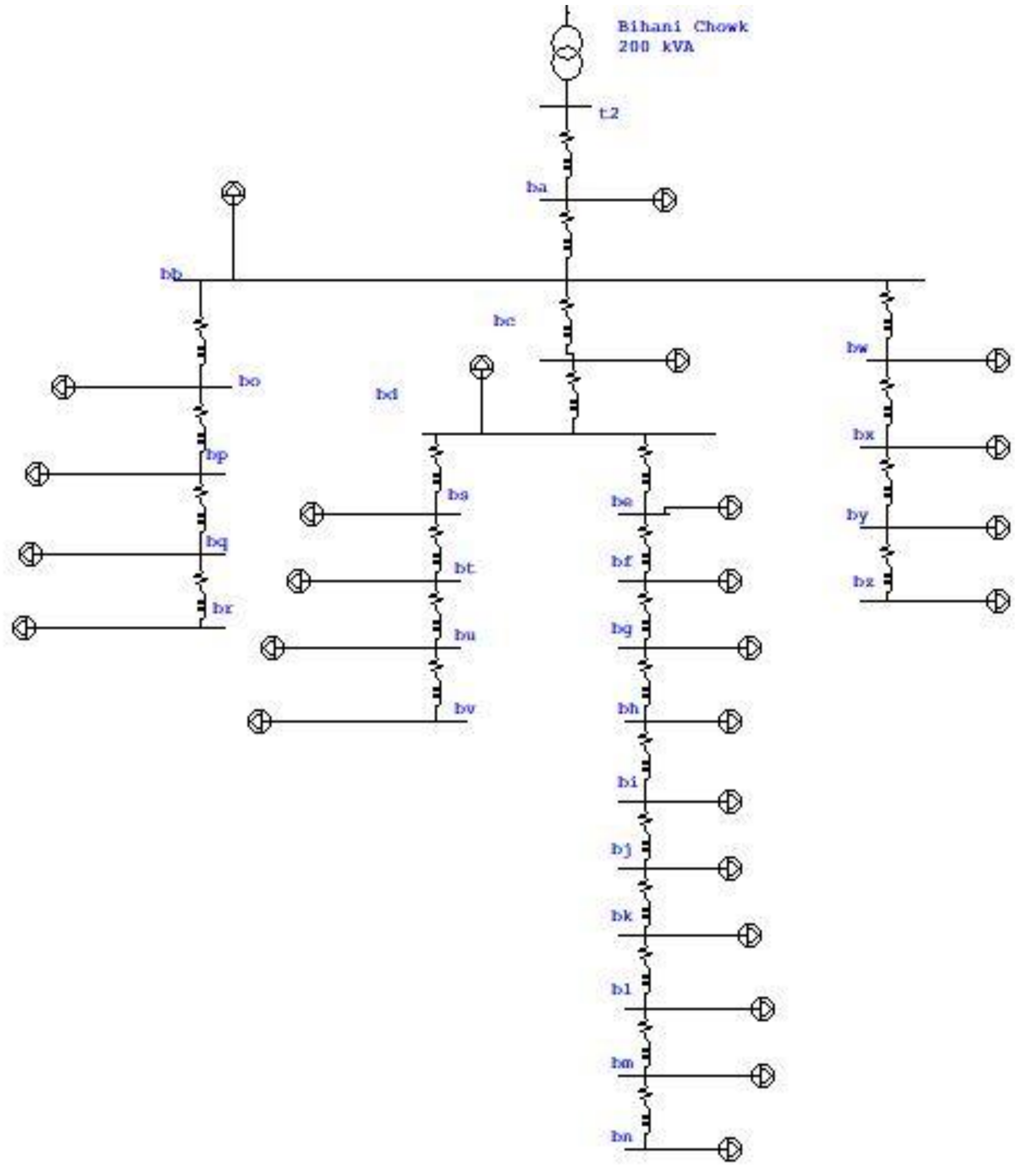


Figure 4-18 ETAP model for Bihani Chowk LT feeder

### 4.4.4 Simulation of Chilaune Gau transformer

The single line diagram of Chilaune Gau distribution transformer and its LT line is shown in figure 4-19. The capacity of transformer of Chilaune Gau is 50 kVA. Line and load data for above SLD are presented in Appendix-L.

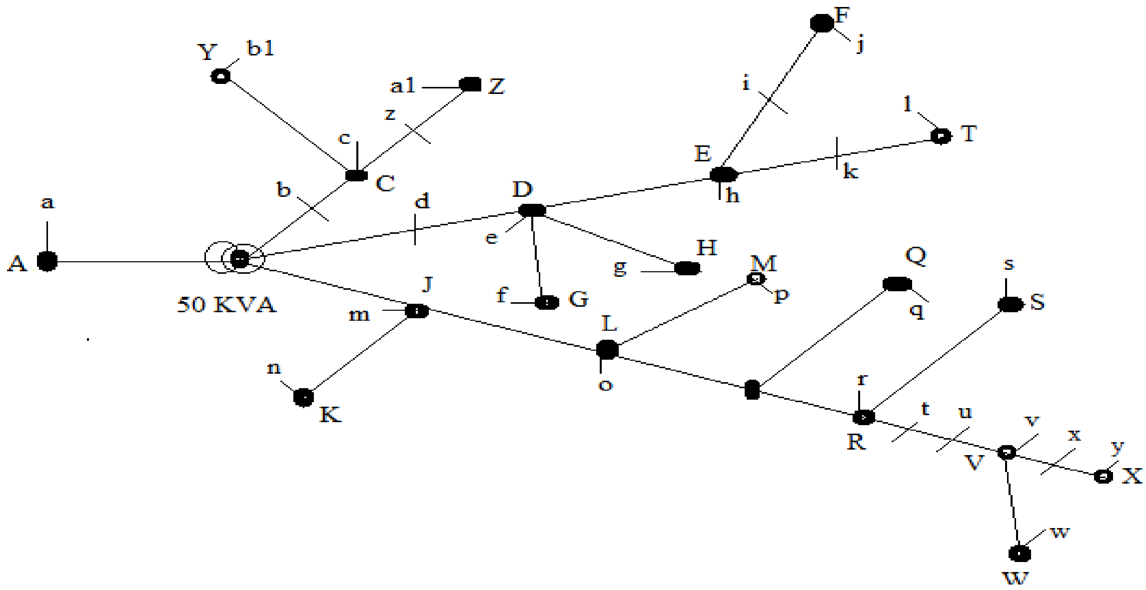


Figure 4-19 Single line diagram of Chilaune Gau transformer

Here A, B, C… are Branching Points and a, b, c …………are Load points. The modeling of above LT line in ETAP 12.6.0 is given below;

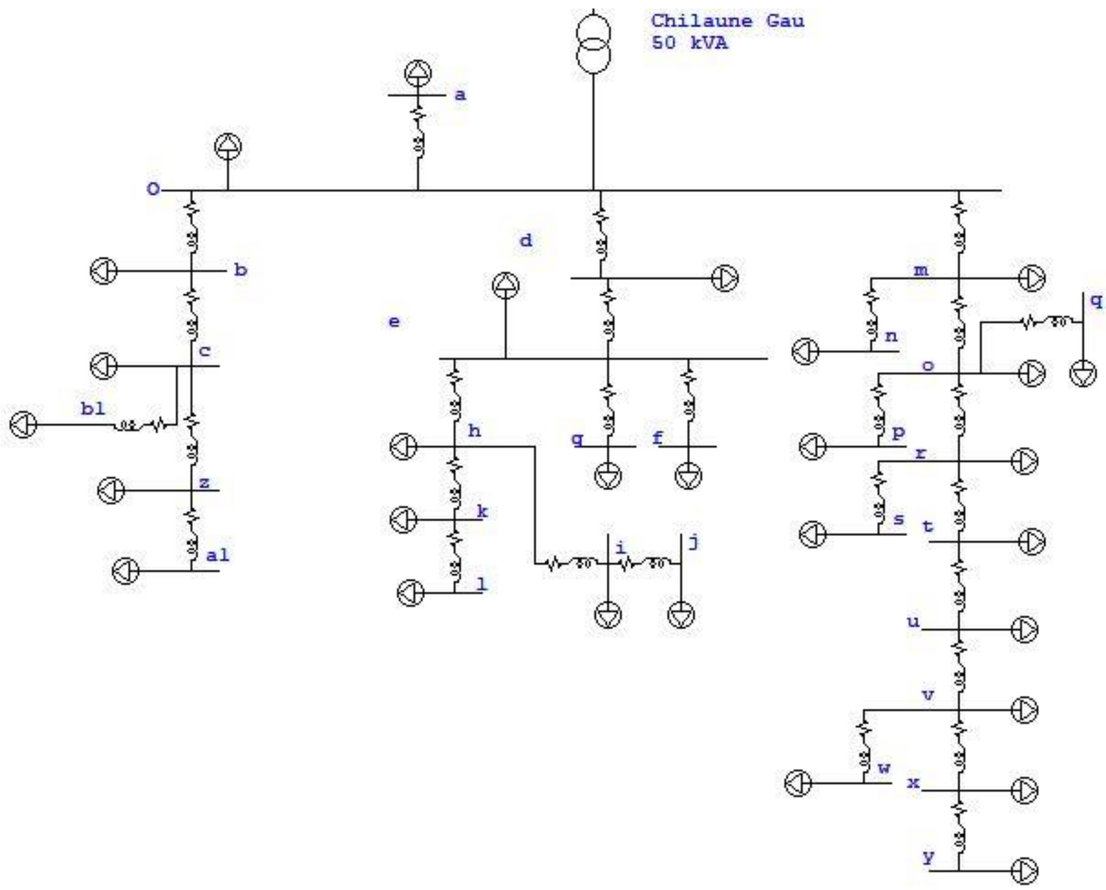


Figure 4-20 ETAP model for Chilaune gau LT feeder

### 4.4.5 Simulation of Simkhada Gau transformer

The single line diagram of Simkhada Gau distribution transformer and its LT line is shown in figure below. The capacity of transformer of Simkhada Gau is 50 kVA.

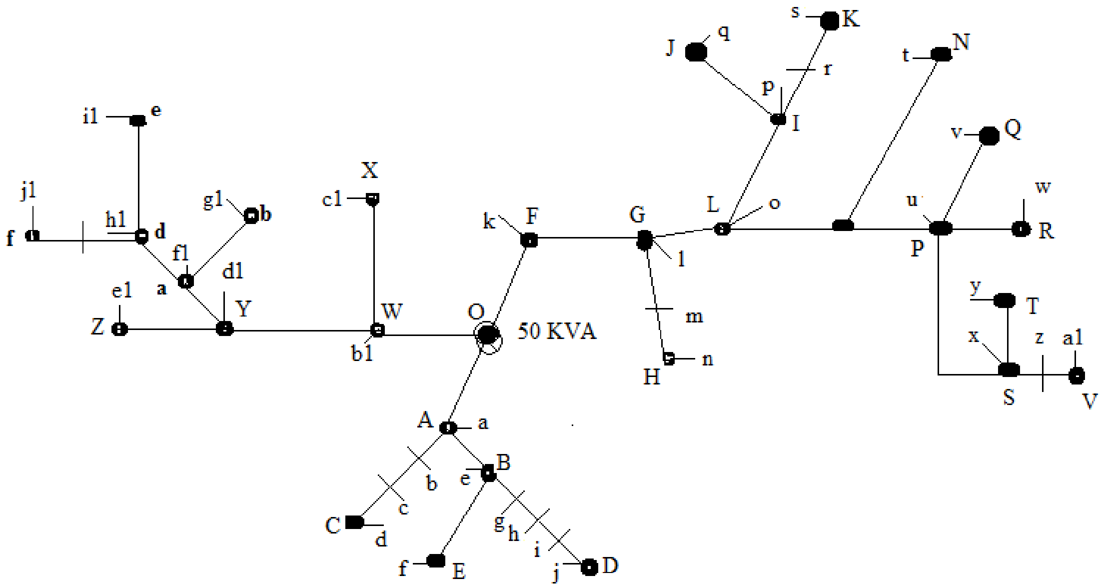


Figure 4-21 Single line diagram of Simkhada Gau transformer

Here A, B, C… are Branching Points and a, b, c …………are Load points. Line and load data for above SLD are presented in Appendix-M. The modeling of above LT line in ETAP 12.6.0 is given below;

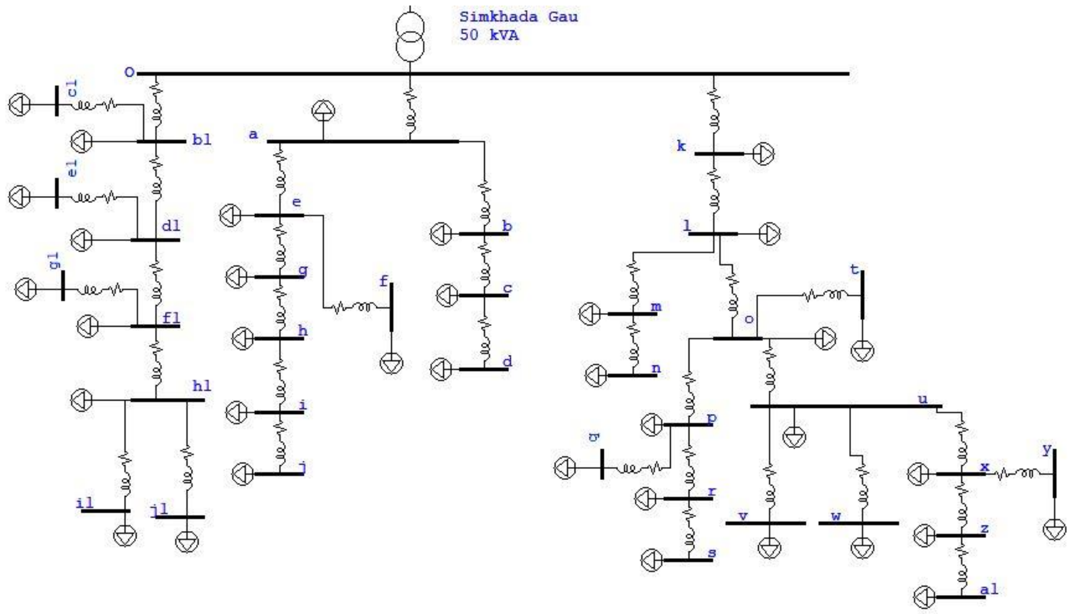


Figure 4-22 ETAP model for Simkhada gau LT feeder

### 4.5 Results obtained from MATLAB

The UDL and UVL power loss and monthly energy loss for all ten LT lines are obtained from MATLAB.

#### 4.5.1 Results obtained from MATLAB for urban area LT feeders

The UDL and UVL power loss and monthly energy loss for urban areas LT lines are given in table below.

Table 4-3 UDL and UVL losses of urban area LT feeders

| S.N. | Urban areas | | | | | |
|---|---|---|---|---|---|---|
| | **Location** | **UDL Power Loss, W** | **UDL Energy loss, kWh** | **UVL Power Loss, W** | **UVL Energy loss, kWh** | **Remarks** |
| 1 | Baisdhara | 10939.93 | 3402.76 | 12157.73 | 3781.54 | |
| 2 | Buddhamall | 11152.04 | 3468.73 | 14224.55 | 4424.40 | |
| 3 | Water Boring | 18459.57 | 5741.66 | 29053.10 | 9036.68 | |
| 4 | Machapokhari1 | 19509.55 | 6068.25 | 19774.07 | 6150.53 | |
| 5 | Machapokhari2 | 18641.68 | 5798.31 | 19374.37 | 6026.21 | |

#### 4.5.2 Results obtained from MATLAB for rural area LT feeders

The UDL and UVL power loss and monthly energy loss for rural areas LT lines are given in table below.

Table 4-4 UDL and UVL losses of rural area LT feeders

| S.N. | Rural Areas | | | | | |
|---|---|---|---|---|---|---|
| | **Location** | **UDL Power Loss, W** | **UDL Energy loss, kWh** | **UVL Power Loss, W** | **UVL Energy loss, kWh** | **Remarks** |
| 1 | Pusal | 12007.28 | 1322.72 | 13458.22 | 1482.56 | |
| 2 | Mahankal | 12172.73 | 1340.95 | 12318.48 | 1357.00 | |
| 3 | Bihani chowk | 20268.63 | 2232.79 | 23680.81 | 2608.68 | |
| 4 | Chilaune Gau | 6463.46 | 712.01 | 6596.46 | 726.67 | |
| 5 | Simkhada Gau | 2788.26 | 307.15 | 2897.42 | 319.18 | |

### 4.6 Results obtained from ETAP simulation

The power loss and monthly energy loss for all ten LT feeders are obtained from ETAP simulation.

#### 4.6.1 Results obtained from ETAP simulation for urban area LT feeders

The power loss and monthly energy loss for urban areas LT lines obtained from ETAP simulation are given in table below.

Table 4-5 losses of urban area LT feeders obtained from ETAP simulation

| S.N. | Urban areas | | | | | |
|---|---|---|---|---|---|---|
| | **Location** | **Total Power Loss, kW** | **Transformer loss, kW** | **Loss in LT feeder, kW** | **Energy loss, kWh** | **Remarks** |
| 1 | Baisdhara | 11.90 | 1.10 | 10.80 | 3359.23 | |
| 2 | Buddhamall | 12.20 | 0.80 | 11.40 | 3545.86 | |
| 3 | Water Boring | 19.70 | 0.50 | 19.20 | 5971.97 | |
| 4 | Machapokhari1 | 19.90 | 1.00 | 18.90 | 5878.66 | |
| 5 | Machapokhari2 | 21.30 | 3.20 | 18.10 | 5629.82 | |

#### 4.6.2 Results obtained from ETAP simulation for rural area LT feeders

The power loss and monthly energy loss for rural areas LT lines obtained from ETAP simulation are given in table below.

Table 4-6 losses of rural area LT feeders obtained from ETAP simulation

| S.N. | Rural areas | | | | | |
|---|---|---|---|---|---|---|
| | **Location** | **Total Power Loss, kW** | **Transformer loss, kW** | **Loss in LT feeder, kW** | **Energy loss, kWh** | **Remarks** |
| 1 | Pusal | 16.10 | 1.60 | 14.50 | 1597.32 | |
| 2 | Mahankal | 17.10 | 1.10 | 16.00 | 1762.56 | |
| 3 | Bihani chowk | 28.30 | 0.60 | 27.70 | 3051.43 | |
| 4 | Chilaune Gau | 8.30 | 0.70 | 7.60 | 837.22 | |
| 5 | Simkhada Gau | 3.90 | 0.20 | 3.70 | 407.59 | |

## 4.7 Comparison of ETAP results with MATLAB results

Energy losses of LT feeders obtained from ETAP simulation are compared with UDL energy losses and UVL energy losses for both urban and rural areas. Difference/Variation of energy losses obtained from ETAP simulation and UDL energy losses has been calculated in kWh and in percentage. Similarly, difference/variation of energy losses obtained from ETAP simulation and UVL energy losses has been calculated in kWh and in percentage.

### 4.7.1 Comparison of ETAP results with UDL losses of urban area

The comparison of energy losses obtained from ETAP simulation with UDL losses for urban areas LT feeders are given in table below.

Table 4-7 Comparison of ETAP results with UDL losses of urban area

| S.N. | Urban areas | | | | | |
|---|---|---|---|---|---|---|
| | Location | UDL Energy loss, kWh | Energy loss from etap, kWh | Difference between UDL loss and loss obtained from etap | | Remarks |
| | | | | In kWh | In % | |
| 1 | Baisdhara | 3402.76 | 3359.23 | -43.52 | -1.30 | |
| 2 | Buddhamall | 3468.73 | 3545.86 | 77.13 | 2.18 | |
| 3 | Water Boring | 5741.66 | 5971.97 | 230.30 | 3.86 | |
| 4 | Machapokhari1 | 6068.25 | 5878.66 | -189.60 | -3.23 | |
| 5 | Machapokhari2 | 5798.31 | 5629.82 | -168.49 | -2.99 | |

The value of losses obtained from ETAP simulation are compared with UDL losses for urban area LT feeders. The variation of losses obtained from ETAP simulation and UDL losses for Baisdhara, Buddhamall, Water Boring, Machapokhari1 and Machapokhari2 are -43.52 kWh, 77.13 kWh, 230.30 kWh, -189.60 kWh and -168.49 kWh respectively. The percentage variation of losses obtained from ETAP simulation and UDL losses for Baisdhara, Buddhamall, Water Boring, Machapokhari1 and Machapokhari2 are -1.30 %, 2.18 %, 3.86 %, -3.23 % and -2.99 % respectively.

### 4.7.2 Comparison of ETAP results with UVL losses of urban area

The comparison of energy losses obtained from ETAP simulation with UVL losses for urban area LT feeders are given in table below.

Table 4-8 Comparison of ETAP results with UVL losses of urban area

| S.N. | Urban areas | | | | | |
|---|---|---|---|---|---|---|
| | Location | UVL Energy loss, kWh | Energy loss from etap, kWh | Difference between UVL loss and loss obtained from etap | | Remarks |
| | | | | In kWh | In % | |
| 1 | Baisdhara | 3781.54 | 3359.23 | -422.31 | -12.57 | |
| 2 | Buddhamall | 4424.40 | 3545.86 | -878.55 | -24.78 | |
| 3 | Water Boring | 9036.68 | 5971.97 | -3064.71 | -51.32 | |
| 4 | Machapokhari1 | 6150.53 | 5878.66 | -271.87 | -4.62 | |
| 5 | Machapokhari2 | 6026.21 | 5629.82 | -396.38 | -7.04 | |

The value of losses obtained from ETAP simulation are compared with UVL losses for urban area LT feeders. The variation of losses obtained from ETAP simulation and UVL losses for Baisdhara, Buddhamall, Water Boring, Machapokhari1 and Machapokhari2 are -422.31 kWh, -878.55 kWh, -3064.71 kWh, -271.87 kWh and -396.38 kWh respectively. The percentage variation of losses obtained from ETAP simulation and UVL losses for Baisdhara, Buddhamall, Water Boring, Machapokhari1 and Machapokhari2 are -12.57%, -24.78%, -51.32%, -4.62% and -7.04% respectively.

### 4.7.3 Comparison of ETAP results with UDL losses of rural area

The comparison of energy losses obtained from ETAP simulation with UDL losses for rural area LT feeders are given in table below.

Table 4-9 Comparison of ETAP results with UDL losses for rural area

| S.N. | Rural areas | | | | | |
|---|---|---|---|---|---|---|
| | Location | UDL Energy loss, kWh | Energy loss from etap, kWh | Difference between UDL loss and loss obtained from etap | | Remarks |
| | | | | In kWh | In % | |
| 1 | Pusal | 1322.72 | 1597.32 | 274.60 | 17.19 | |
| 2 | Mahankal | 1340.95 | 1762.56 | 421.61 | 23.92 | |
| 3 | Bihani chowk | 2232.79 | 3051.43 | 818.64 | 26.83 | |
| 4 | Chilaune Gau | 712.01 | 837.22 | 125.20 | 14.95 | |
| 5 | Simkhada Gau | 307.15 | 407.59 | 100.44 | 24.64 | |

The value of losses obtained from ETAP simulation are compared with UDL losses for rural area LT feeders. The variation of losses obtained from ETAP simulation and UDL losses for Pusal, Mahankal, Bihani Chowk, Chilaune Gau and Simkhada Gau are 274.60 kWh, 421.61 kWh, 818.64 kWh, 125.20 kWh and 100.44 kWh respectively. The percentage variation of losses obtained from ETAP simulation and UDL losses for Pusal, Mahankal, Bihani Chowk, Chilaune Gau and Simkhada Gau are 17.19 %, 23.92 %, 26.83 %, 14.95 % and 24.64 % respectively.

### 4.7.4 Comparison of ETAP results with UVL losses of rural area

The comparison of energy losses obtained from ETAP simulation with UVL losses for rural area LT feeders are tabulated in table below.

Table 4-10 Comparison of ETAP results with UVL losses for rural area

| S.N. | Rural areas | | | | | |
|---|---|---|---|---|---|---|
| | Location | UVL Energy loss, kWh | Energy loss from etap, kWh | Difference between UVL loss and loss obtained from etap | | Remarks |
| | | | | In kWh | In % | |
| 1 | Pusal | 1482.56 | 1597.32 | 114.76 | 7.18 | |
| 2 | Mahankal | 1357.00 | 1762.56 | 405.56 | 23.01 | |
| 3 | Bihani chowk | 2608.68 | 3051.43 | 442.75 | 14.51 | |
| 4 | Chilaune Gau | 726.67 | 837.22 | 110.55 | 13.20 | |
| 5 | Simkhada Gau | 319.18 | 407.59 | 88.41 | 21.69 | |

The value of losses obtained from ETAP simulation are compared with UVL losses for rural area LT feeders. The variation of losses obtained from ETAP simulation and UVL losses for Pusal, Mahankal, Bihani Chowk, Chilaune Gau and Simkhada Gau are 114.76 kWh, 405.56 kWh, 442.75 kWh, 110.55 kWh and 88.41 kWh respectively. The percentage variation of losses obtained from ETAP simulation and UVL losses for Pusal, Mahankal, Bihani Chowk, Chilaune Gau and Simkhada Gau are 7.18 %, 23.01 %, 14.51 %, 13.20 % and 21.69 % respectively.

# CHAPTER FIVE: CONCLUSIONS AND FUTURE WORKS

## 5.1 Conclusions

This thesis provides a new methodology to find LT distribution loss. LT loss has been modeled using the concept of UDL and UVL and program code was written to find UDL and UVL losses. Correctness of program output has been checked for three different LT lines (Baisdhara, Pusal and Mahankal LT lines). The UDL and UVL losses for five urban and five rural LT lines has been calculated. Also, the losses of those five urban area LT lines and five rural area LT lines has been obtained after modeling and simulation on ETAP.

The following conclusion can be drawn from this study:

1. As seen from derivation done in chapter 3.5, LT distribution loss can be modeled using UDL concept i.e. assuming loads as UDL. The simplified model to calculate loss for UDL case (in matrix form) is given by:

   UDL Loss =[R]*[L]*[M1]

2. Similarly, LT distribution loss can be modeled using UVL concept i.e. assuming loads as UVL. The simplified model to calculate loss for UVL case (in matrix form) is given by:

   UVL Loss =[R]*[L]*[M2]

3. From the results presented in chapter 4.1, it is seen that the value of LF of urban area distribution transformer is nearly equal to 0.6 and that of rural area distribution transformer is nearly equal to 0.3. These values shows that the LF of urban area distribution transformer is higher than the LF of rural area distribution transformer.

4. In chapter 4.7.1 and chapter 4.7.2, the value of losses obtained from ETAP simulation are compared with UDL and UVL losses for urban area LT feeders. Table 4-7 shows that losses of LT feeders obtained from ETAP simulation are nearly equal to UDL losses for all five LT feeders of urban area with maximum error of 3.86%. But as seen from table 4-8, there is too much variation between losses obtained from ETAP simulation and UVL losses for all five LT feeders

of urban area with maximum variation of 51.32%. Thus, losses of urban area LT feeders can be computed using UDL concept with minor errors.

5. In chapter 4.7.3 and chapter 4.7.4, the value of losses obtained from ETAP simulation are compared with UDL and UVL losses for rural area LT feeders. As seen from table 4-10, there is too much variation between losses obtained from ETAP simulation and UDL losses for all five LT feeders of rural area with maximum variation of 26.83%. Similarly, as seen from table 4-10, there is too much variation between losses obtained from ETAP simulation and UVL losses for all five LT feeders of rural area with maximum variation of 23.01%. Thus, it is seen that losses of rural area LT feeders cannot be computed using either UDL or UVL concept.

Thus, from this study it can be concluded that the losses of rural area LT feeder cannot be computed using either UDL or UVL concept but the losses of urban area LT feeders can be computed using UDL concept with minor errors. Moreover, the simple model to compute LT loss of urban area LT feeder is equal to [R]*[L]*[M1] as derived in chapter 3.5.

## 5.2 Future works

This research can be further extended to meet the limitations that are realized while carrying out this thesis. Due to lack of sufficient number of TOD meters to be installed to all distribution transformers, load pattern of only one urban area distribution transformer and only one rural area distribution transformer are recorded and rest of distribution transformers are assumed to follow same load pattern. So this can be extended by installing TOD meters to all distribution transformers and determining load pattern and load factor of all distribution transformers.

## REFERENCES


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# APPENDIX A: TOD METER DATA FOR ONE DAY OF BAISDHARA TRANSFORMER

Nepal Electricity Authority

Download Date: 2019-10-17 16:48:53
Consumer Name: Thesis Meter
Consumer Address: Balaju
Consumer No: 000-00-000
MeterNo: 201803001341
Programmed PT ratio: 400/400
Programmed CT ratio: 200/5
Load Profile (interval 15/30/60 mins): Max XXXXX nos

| No. | Date And Time | Voltage v1(V) | Voltage v2(V) | Voltage v3(V) | Current i1(A) | Current i2(A) | Current i3(A) | Power Factor 1 | Power Factor 2 | Power Factor 3 | Import Active Energy (kW h) (Total) | Import Active Energy (kW h) (T1) | Import Active Energy (kW h) (T2) | Import Active Energy (kW h) (T3) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 03-11-2019 00:00:00 | 236.27 | 238.43 | 235.71 | 39.36 | 31.3 | 61.12 | 0.9305 | 0.9939 | 0.9954 | 35758.6 | 13399.8 | 18788.8 | 3570 |
| 2 | 03-11-2019 00:30:00 | 234.94 | 236.74 | 234.3 | 32.16 | 30.1 | 51.2 | 0.9475 | 0.9836 | 0.9932 | 35771.3 | 13399.8 | 18788.8 | 3582.6 |
| 3 | 03-11-2019 01:00:00 | 234.93 | 236.8 | 234.35 | 36.96 | 35.2 | 50.12 | 0.9578 | 0.9845 | 0.9882 | 35782.8 | 13399.8 | 18788.8 | 3594.2 |
| 4 | 03-11-2019 01:30:00 | 234.79 | 236.67 | 234.36 | 34.48 | 33.3 | 48.08 | 0.9276 | 0.9949 | 0.9931 | 35794 | 13399.8 | 18788.8 | 3605.4 |
| 5 | 03-11-2019 02:00:00 | 236.87 | 238.65 | 236.35 | 32.2 | 32.1 | 45.04 | 0.9325 | 0.992 | 0.9944 | 35805.1 | 13399.8 | 18788.8 | 3616.5 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | 03-11-2019 02:30:00 | 234.39 | 236.25 | 233.74 | 32.52 | 32.2 | 52.88 | 0.9336 | 0.9886 | 0.9949 | 35816.4 | 13399.8 | 18788.8 | 3627.8 |
| 7 | 03-11-2019 03:00:00 | 237.27 | 238.9 | 236.59 | 34.8 | 30.1 | 48.24 | 0.9225 | 0.9864 | 0.9938 | 35827.9 | 13399.8 | 18788.8 | 3639.2 |
| 8 | 03-11-2019 03:30:00 | 236.87 | 238.63 | 236.21 | 33.56 | 29.9 | 54.24 | 0.9453 | 0.9904 | 0.9964 | 35839.7 | 13399.8 | 18788.8 | 3651 |
| 9 | 03-11-2019 04:00:00 | 236.11 | 237.91 | 235.74 | 34.64 | 32.4 | 48.8 | 0.9446 | 0.9829 | 0.9989 | 35851.9 | 13399.8 | 18788.8 | 3663.2 |
| 10 | 03-11-2019 04:30:00 | 237.26 | 238.88 | 236.57 | 38.48 | 33.5 | 50.72 | 0.9552 | 0.9788 | 0.9936 | 35864 | 13399.8 | 18788.8 | 3675.4 |
| 11 | 03-11-2019 05:00:00 | 232.46 | 234.17 | 231.61 | 39.52 | 36.2 | 72.56 | 0.9404 | 0.9446 | 0.9859 | 35877.4 | 13399.8 | 18788.8 | 3688.7 |
| 12 | 03-11-2019 05:30:00 | 230.05 | 232.14 | 229.47 | 53.64 | 44.3 | 91.12 | 0.9158 | 0.9792 | 0.9935 | 35895 | 13399.8 | 18806.4 | 3688.7 |
| 13 | 03-11-2019 06:00:00 | 228.46 | 230.75 | 227.47 | 79.12 | 71.2 | 119.32 | 0.9493 | 0.9424 | 0.9851 | 35918.2 | 13399.8 | 18829.6 | 3688.7 |
| 14 | 03-11-2019 06:30:00 | 220.65 | 223.17 | 219.95 | 121.96 | 110.13 | 158.56 | 0.9769 | 0.9313 | 0.9928 | 35950.2 | 13399.8 | 18861.6 | 3688.7 |
| 15 | 03-11-2019 07:00:00 | 230.74 | 232.79 | 228.84 | 97.68 | 91.1 | 180 | 0.9433 | 0.9125 | 0.9902 | 35986.7 | 13399.8 | 18898.1 | 3688.7 |
| 16 | 03-11-2019 07:30:00 | 224.86 | 227.74 | 224.07 | 135.72 | 115.34 | 174.88 | 0.9608 | 0.9613 | 0.9946 | 36029.4 | 13399.8 | 18940.8 | 3688.7 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 | 03-11-2019 08:00:00 | 223.87 | 226.17 | 222.24 | 126.96 | 113.39 | 187.32 | 0.9729 | 0.9638 | 0.9936 | 36068.7 | 13399.8 | 18980.1 | 3688.7 |
| 18 | 03-11-2019 08:30:00 | 222.74 | 224.69 | 221.26 | 126.56 | 120.2 | 175 | 0.9425 | 0.9426 | 0.9781 | 36110.1 | 13399.8 | 19021.5 | 3688.7 |
| 19 | 03-11-2019 09:00:00 | 222.36 | 224.38 | 221.01 | 102.48 | 99.4 | 159.8 | 0.9328 | 0.9316 | 0.9826 | 36149 | 13399.8 | 19060.4 | 3688.7 |
| 20 | 03-11-2019 09:30:00 | 222.25 | 224.42 | 221.2 | 107.08 | 95.42 | 120.6 | 0.9643 | 0.958 | 0.9805 | 36177.5 | 13399.8 | 19088.9 | 3688.7 |
| 21 | 03-11-2019 10:00:00 | 220.61 | 222.94 | 219.62 | 109.08 | 89.89 | 125.56 | 0.945 | 0.9615 | 0.968 | 36192.5 | 13399.8 | 19103.9 | 3688.7 |
| 22 | 03-11-2019 10:30:00 | 226.11 | 227.99 | 224.47 | 102.44 | 85.43 | 158.48 | 0.9466 | 0.9391 | 0.9893 | 36226.3 | 13399.8 | 19137.7 | 3688.7 |
| 23 | 03-11-2019 11:00:00 | 225.44 | 227.33 | 224.68 | 106.76 | 74.65 | 102.68 | 0.9608 | 0.9353 | 0.9825 | 36256.4 | 13399.8 | 19167.8 | 3688.7 |
| 24 | 03-11-2019 11:30:00 | 222.82 | 224.64 | 222.11 | 107.28 | 71.6 | 111.44 | 0.9501 | 0.9165 | 0.9796 | 36287.4 | 13399.8 | 19198.8 | 3688.7 |
| 25 | 03-11-2019 12:00:00 | 223 | 224.72 | 221.95 | 94.48 | 70.17 | 117.84 | 0.94 | 0.942 | 0.9835 | 36317.2 | 13399.8 | 19228.6 | 3688.7 |
| 26 | 03-11-2019 12:30:00 | 224.5 | 225.97 | 223.17 | 88.6 | 77.43 | 126.12 | 0.9187 | 0.9122 | 0.9831 | 36345.5 | 13399.8 | 19256.9 | 3688.7 |
| 27 | 03-11-2019 13:00:00 | 226.2 | 227.91 | 225.47 | 102.6 | 90.3 | 109.96 | 0.9415 | 0.9129 | 0.9738 | 36374.4 | 13399.8 | 19285.8 | 3688.7 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 28 | 03-11-2019 13:30:00 | 226.55 | 228.36 | 225.77 | 100.96 | 88.61 | 115.76 | 0.9383 | 0.9045 | 0.9733 | 36404.5 | 13399.8 | 19315.9 | 3688.7 |
| 29 | 03-11-2019 14:00:00 | 226.3 | 227.84 | 225.53 | 100.44 | 95.42 | 117.12 | 0.9228 | 0.9073 | 0.9805 | 36435.4 | 13399.8 | 19346.8 | 3688.7 |
| 30 | 03-11-2019 14:30:00 | 225.32 | 227.08 | 224.74 | 96.6 | 88.67 | 114.56 | 0.8983 | 0.9402 | 0.9805 | 36465.9 | 13399.8 | 19377.3 | 3688.7 |
| 31 | 03-11-2019 15:00:00 | 227.05 | 228.83 | 226.68 | 103.84 | 88.93 | 96.64 | 0.9306 | 0.927 | 0.9687 | 36495.4 | 13399.8 | 19406.8 | 3688.7 |
| 32 | 03-11-2019 15:30:00 | 225.15 | 226.52 | 224.29 | 102 | 93.28 | 105.24 | 0.915 | 0.9263 | 0.9641 | 36523.9 | 13399.8 | 19435.3 | 3688.7 |
| 33 | 03-11-2019 16:00:00 | 225.16 | 226.62 | 224.11 | 100.24 | 89.51 | 114.4 | 0.9507 | 0.9135 | 0.9734 | 36553.2 | 13399.8 | 19464.6 | 3688.7 |
| 34 | 03-11-2019 16:30:00 | 225.6 | 227.32 | 224.81 | 116.48 | 83.32 | 113.56 | 0.9631 | 0.9271 | 0.976 | 36584.9 | 13399.8 | 19496.3 | 3688.7 |
| 35 | 03-11-2019 17:00:00 | 226.79 | 226.97 | 226.01 | 113.72 | 121.21 | 100.8 | 0.9566 | 0.8756 | 0.9679 | 36615.7 | 13399.8 | 19527.1 | 3688.7 |
| 36 | 03-11-2019 17:30:00 | 227.52 | 229.62 | 226.54 | 131.84 | 93.45 | 138.12 | 0.9679 | 0.9534 | 0.9817 | 36650.7 | 13434.8 | 19527.1 | 3688.7 |
| 37 | 03-11-2019 18:00:00 | 229.2 | 231.12 | 228.23 | 137.68 | 109.32 | 138.8 | 0.9562 | 0.94 | 0.973 | 36688.4 | 13472.6 | 19527.1 | 3688.7 |
| 38 | 03-11-2019 18:30:00 | 226.05 | 228.92 | 225.24 | 139.8 | 101.34 | 160.96 | 0.9837 | 0.9775 | 0.9955 | 36729.7 | 13513.8 | 19527.1 | 3688.7 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 39 | 03-11-2019 19:00:00 | 227.58 | 230.65 | 226.48 | 141.08 | 98.99 | 181.16 | 0.9905 | 0.9826 | 0.9972 | 36773.3 | 13557.5 | 19527.1 | 3688.7 |
| 40 | 03-11-2019 19:30:00 | 228.01 | 230.7 | 226.75 | 131.36 | 91.8 | 186.92 | 0.9925 | 0.9798 | 0.9987 | 36819.5 | 13603.7 | 19527.1 | 3688.7 |
| 41 | 03-11-2019 20:00:00 | 230.74 | 233.21 | 229.06 | 98 | 79.32 | 157 | 0.992 | 0.9832 | 0.9979 | 36858.2 | 13642.4 | 19527.1 | 3688.7 |
| 42 | 03-11-2019 20:30:00 | 233.58 | 235.89 | 231.91 | 92.36 | 77.05 | 151.68 | 0.983 | 0.9867 | 0.9988 | 36895.2 | 13679.4 | 19527.1 | 3688.7 |
| 43 | 03-11-2019 21:00:00 | 231.05 | 233.95 | 230.01 | 89.04 | 70.84 | 150.76 | 0.9824 | 0.9751 | 0.9954 | 36930.6 | 13714.7 | 19527.1 | 3688.7 |
| 44 | 03-11-2019 21:30:00 | 231.09 | 233.88 | 230.15 | 79.36 | 68.99 | 129.52 | 0.9844 | 0.9849 | 0.9965 | 36961.7 | 13745.8 | 19527.1 | 3688.7 |
| 45 | 03-11-2019 22:00:00 | 232.21 | 234.96 | 231.46 | 69.08 | 58.54 | 111.44 | 0.9642 | 0.9882 | 0.995 | 36989.1 | 13773.3 | 19527.1 | 3688.7 |
| 46 | 03-11-2019 22:30:00 | 234.31 | 236.62 | 233.51 | 54.28 | 51.12 | 88.84 | 0.9595 | 0.9735 | 0.9915 | 37010.9 | 13795 | 19527.1 | 3688.7 |
| 47 | 03-11-2019 23:00:00 | 231.51 | 233.95 | 231.24 | 52.6 | 49.89 | 69.08 | 0.9472 | 0.9792 | 0.989 | 37030.2 | 13814.3 | 19527.1 | 3688.7 |
| 48 | 03-11-2019 23:30:00 | 232.7 | 234.74 | 232.11 | 45.16 | 37.44 | 60.6 | 0.9497 | 0.9824 | 0.989 | 37047.5 | 13814.3 | 19527.1 | 3706.1 |

## APPENDIX B: TOD METER DATA FOR ONE DAY OF PUSAL TRANSFORMER

Nepal Electricity Authority

Download Date: 2019-02-18 16:46:12

Consumer Name: Thesis Meter

Consumer Address: Balaju

Consumer No: 000-00-000

MeterNo: 201803001341

Programmed PT ratio: 400/400

Programmed CT ratio: 200/5

Load Profile (interval 15/30/60 mins): Max XXXXX nos

| No. | Date And Time | Voltage v1(V) | Voltage v2(V) | Voltage v3(V) | Current i1(A) | Current i2(A) | Current i3(A) | Power Factor 1 | Power Factor 2 | Power Factor 3 | Import Active Energy (kW h) (Total) | Import Active Energy (kWh) (T1) | Import Active Energy (kW h) (T2) | Import Active Energy (kW h) (T3) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 12-19-2018 00:00:00 | 234.54 | 227.8 | 229.85 | 9.76 | 16.64 | 10.24 | 0.9993 | 0.9991 | 0.9962 | 10532.2 | 3992.6 | 5391.3 | 1148.3 |
| 2 | 12-19-2018 00:30:00 | 240.04 | 233.2 | 234.71 | 8.52 | 15.76 | 13.4 | 0.9966 | 0.9991 | 0.9858 | 10536.2 | 3992.6 | 5391.3 | 1152.2 |
| 3 | 12-19-2018 01:00:00 | 238.9 | 232.63 | 233.75 | 8.76 | 8.52 | 11.08 | 0.9972 | 0.9997 | 0.9798 | 10539.9 | 3992.6 | 5391.3 | 1155.9 |
| 4 | 12-19-2018 01:30:00 | 234.32 | 228.03 | 229.76 | 10 | 9.32 | 9.08 | 0.9962 | 0.9999 | 0.9969 | 10543.1 | 3992.6 | 5391.3 | 1159.1 |
| 5 | 12-19-2018 02:00:00 | 234.94 | 228.38 | 229.69 | 8.6 | 8.6 | 13.44 | 0.9999 | 0.9951 | 0.9623 | 10546.4 | 3992.6 | 5391.3 | 1162.4 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | 12-19-2018 02:30:00 | 236.06 | 229.69 | 231.2 | 8.52 | 7.76 | 8.8 | 0.9967 | 0.9982 | 0.9904 | 10549.4 | 3992.6 | 5391.3 | 1165.5 |
| 7 | 12-19-2018 03:00:00 | 234.94 | 228.35 | 230.3 | 9.04 | 9.72 | 8.68 | 0.9976 | 0.9987 | 0.9998 | 10552.5 | 3992.6 | 5391.3 | 1168.5 |
| 8 | 12-19-2018 03:30:00 | 236.05 | 229.62 | 230.84 | 10.36 | 9.44 | 11.2 | 0.9981 | 0.9998 | 0.9473 | 10555.8 | 3992.6 | 5391.3 | 1171.8 |
| 9 | 12-19-2018 04:00:00 | 238.39 | 232.32 | 233.56 | 10.68 | 10.92 | 9.56 | 0.9985 | 0.9991 | 0.9612 | 10559.2 | 3992.6 | 5391.3 | 1175.3 |
| 10 | 12-19-2018 04:30:00 | 237.61 | 231.83 | 233.69 | 19.08 | 14.56 | 8.24 | 0.9974 | 0.9983 | 0.9985 | 10563.4 | 3992.6 | 5391.3 | 1179.4 |
| 11 | 12-19-2018 05:00:00 | 234.74 | 229.29 | 230.33 | 26 | 10.6 | 8.5 | 0.9999 | 0.9966 | 0.9994 | 10567.8 | 3992.6 | 5391.3 | 1183.9 |
| 12 | 12-19-2018 05:30:00 | 226.8 | 221.24 | 222.56 | 20.76 | 14.92 | 8.4 | 0.9998 | 0.9959 | 0.9957 | 10573.6 | 3992.6 | 5397.1 | 1183.9 |
| 13 | 12-19-2018 06:00:00 | 226.47 | 221.93 | 223.1 | 31.53 | 13.92 | 11.2 | 0.9997 | 0.984 | 0.9997 | 10581.6 | 3992.6 | 5405.1 | 1183.9 |
| 14 | 12-19-2018 06:30:00 | 225.87 | 219.72 | 220.1 | 23.16 | 20.95 | 20.45 | 0.9997 | 0.9989 | 0.9998 | 10593.2 | 3992.6 | 5416.7 | 1183.9 |
| 15 | 12-19-2018 07:00:00 | 219.53 | 215.17 | 216.76 | 76.6 | 52.4 | 51.3 | 0.9999 | 0.9997 | 0.9999 | 10610.3 | 3992.6 | 5433.8 | 1183.9 |
| 16 | 12-19-2018 07:30:00 | 215.58 | 211.11 | 212.06 | 52.45 | 57.68 | 42.5 | 0.9999 | 0.9998 | 0.9999 | 10634.3 | 3992.6 | 5457.7 | 1183.9 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 | 12-19-2018 08:00:00 | 215.8 | 208.96 | 209.24 | 40.68 | 49.52 | 88.5 | 0.9814 | 0.993 | 0.9942 | 10654.6 | 3992.6 | 5478.1 | 1183.9 |
| 18 | 12-19-2018 08:30:00 | 224.12 | 218.77 | 218.6 | 37.84 | 32.12 | 33.4 | 0.9956 | 0.9877 | 0.998 | 10670.8 | 3992.6 | 5494.3 | 1183.9 |
| 19 | 12-19-2018 09:00:00 | 226.27 | 222.53 | 223.13 | 46.96 | 23.72 | 32.08 | 0.9999 | 0.9946 | 0.9968 | 10685.4 | 3992.6 | 5508.8 | 1183.9 |
| 20 | 12-19-2018 09:30:00 | 226.51 | 220.03 | 220.76 | 18.36 | 19.4 | 46.56 | 0.9994 | 0.9988 | 0.9999 | 10696 | 3992.6 | 5519.4 | 1183.9 |
| 21 | 12-19-2018 10:00:00 | 224.97 | 219.76 | 219.58 | 17.16 | 13.56 | 15.3 | 0.988 | 0.9936 | 0.9999 | 10704.6 | 3992.6 | 5528.1 | 1183.9 |
| 22 | 12-19-2018 10:30:00 | 223.88 | 219.91 | 219.68 | 29 | 12.8 | 33.8 | 0.9887 | 0.9974 | 0.9947 | 10713.9 | 3992.6 | 5537.3 | 1183.9 |
| 23 | 12-19-2018 11:00:00 | 227.66 | 221.91 | 222.9 | 15.36 | 18.36 | 21.72 | 0.9885 | 0.9951 | 0.9976 | 10719.7 | 3992.6 | 5543.1 | 1183.9 |
| 24 | 12-19-2018 11:30:00 | 231.14 | 224.79 | 225.18 | 12.28 | 22.72 | 31.16 | 0.999 | 0.9999 | 0.9984 | 10726.5 | 3992.6 | 5549.9 | 1183.9 |
| 25 | 12-19-2018 12:00:00 | 231.84 | 226.58 | 226.25 | 15.52 | 8.72 | 29.64 | 0.9908 | 0.9949 | 0.9998 | 10732.6 | 3992.6 | 5556.1 | 1183.9 |
| 26 | 12-19-2018 12:30:00 | 233.37 | 227.88 | 227.68 | 11.28 | 10.24 | 24.96 | 0.9716 | 0.9541 | 0.9973 | 10739.6 | 3992.6 | 5563 | 1183.9 |
| 27 | 12-19-2018 13:00:00 | 230.7 | 225.58 | 226.17 | 22.12 | 11.44 | 17.2 | 0.9838 | 0.9485 | 0.9959 | 10745.9 | 3992.6 | 5569.3 | 1183.9 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 28 | 12-19-2018 13:30:00 | 230.09 | 224.94 | 225.45 | 25.76 | 7.96 | 24.08 | 0.9941 | 0.9847 | 0.9962 | 10752 | 3992.6 | 5575.5 | 1183.9 |
| 29 | 12-19-2018 14:00:00 | 232.38 | 227.08 | 226.7 | 14.92 | 7.28 | 20.6 | 0.9874 | 0.9824 | 0.9845 | 10757.2 | 3992.6 | 5580.7 | 1183.9 |
| 30 | 12-19-2018 14:30:00 | 232.27 | 226.32 | 227.31 | 18.32 | 25.32 | 19.68 | 0.9784 | 0.9984 | 0.9869 | 10762.1 | 3992.6 | 5585.6 | 1183.9 |
| 31 | 12-19-2018 15:00:00 | 232.08 | 225.61 | 226.44 | 8.8 | 12.72 | 13.08 | 0.9982 | 0.9979 | 0.9526 | 10767.6 | 3992.6 | 5591 | 1183.9 |
| 32 | 12-19-2018 15:30:00 | 231.65 | 226.14 | 226.24 | 9.92 | 7.8 | 12.56 | 0.989 | 0.989 | 0.9812 | 10771.7 | 3992.6 | 5595.2 | 1183.9 |
| 33 | 12-19-2018 16:00:00 | 230.2 | 224.32 | 224.6 | 10.76 | 9.08 | 31.92 | 0.9907 | 0.993 | 0.9994 | 10775.5 | 3992.6 | 5599 | 1183.9 |
| 34 | 12-19-2018 16:30:00 | 227.79 | 221.99 | 222.02 | 18.8 | 22.08 | 33.36 | 0.9999 | 0.9984 | 0.9973 | 10781.8 | 3992.6 | 5605.2 | 1183.9 |
| 35 | 12-19-2018 17:00:00 | 223.73 | 219.27 | 219.21 | 47.12 | 36.56 | 25.3 | 0.9997 | 0.9999 | 0.9996 | 10791.8 | 3992.6 | 5615.3 | 1183.9 |
| 36 | 12-19-2018 17:30:00 | 217.2 | 212.85 | 213.29 | 67.6 | 50.56 | 41.2 | 0.9999 | 0.9999 | 0.9999 | 10808.5 | 4009.2 | 5615.3 | 1183.9 |
| 37 | 12-19-2018 18:00:00 | 215.11 | 209.95 | 211.04 | 72.56 | 72.3 | 62.5 | 0.9999 | 0.9999 | 0.9999 | 10831.4 | 4032.2 | 5615.3 | 1183.9 |
| 38 | 12-19-2018 18:30:00 | 215.2 | 212.69 | 213.41 | 82.76 | 48.44 | 42.53 | 0.9999 | 0.9999 | 0.9995 | 10853.5 | 4054.2 | 5615.3 | 1183.9 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 39 | 12-19-2018 19:00:00 | 222.06 | 216.86 | 218.06 | 50.4 | 40.08 | 59.05 | 0.9999 | 0.9969 | 0.9992 | 10873.5 | 4074.3 | 5615.3 | 1183.9 |
| 40 | 12-19-2018 19:30:00 | 225.42 | 219.53 | 220.54 | 39.36 | 40.72 | 67.24 | 0.9989 | 0.998 | 0.9991 | 10889.4 | 4090.1 | 5615.3 | 1183.9 |
| 41 | 12-19-2018 20:00:00 | 226.3 | 221.51 | 222.67 | 42.72 | 30.56 | 45.84 | 0.9999 | 0.9953 | 0.9996 | 10904.7 | 4105.4 | 5615.3 | 1183.9 |
| 42 | 12-19-2018 20:30:00 | 224.57 | 217.95 | 221.03 | 34.6 | 31.12 | 40.68 | 0.9999 | 0.9986 | 0.9995 | 10917.6 | 4118.3 | 5615.3 | 1183.9 |
| 43 | 12-19-2018 21:00:00 | 229.63 | 222.6 | 225.56 | 30.48 | 29.84 | 37.32 | 0.9999 | 0.9999 | 0.9989 | 10929.3 | 4130 | 5615.3 | 1183.9 |
| 44 | 12-19-2018 21:30:00 | 234.92 | 228.18 | 231 | 21.08 | 22.96 | 22.44 | 0.9997 | 0.9999 | 0.9996 | 10937.5 | 4138.3 | 5615.3 | 1183.9 |
| 45 | 12-19-2018 22:00:00 | 229.73 | 223.2 | 225.38 | 14.4 | 18.48 | 21.52 | 0.9999 | 0.9997 | 0.9991 | 10944 | 4144.7 | 5615.3 | 1183.9 |
| 46 | 12-19-2018 22:30:00 | 231.63 | 224.79 | 226.19 | 12.48 | 21.32 | 27.04 | 0.9999 | 0.9999 | 0.9957 | 10949.6 | 4150.3 | 5615.3 | 1183.9 |
| 47 | 12-19-2018 23:00:00 | 230.82 | 224.21 | 225.99 | 10.92 | 14.16 | 14.56 | 0.9994 | 0.9997 | 0.9969 | 10954.1 | 4154.9 | 5615.3 | 1183.9 |
| 48 | 12-19-2018 23:30:00 | 233.6 | 227.44 | 229.02 | 11.8 | 10.44 | 10.92 | 0.9894 | 0.9986 | 0.9957 | 10958 | 4154.9 | 5615.3 | 1187.7 |

# APPENDIX C: MATLAB PROGRAM TO FIND UDL & UVL LOSSES

Matlab Program:

```
function baisdhara

clear;
clc;

% Input of resistance vaLue of each branches
R(1,:)= xlsread('data_baisdhara.xlsx','R');
n= length(R);
fprintf('Importing the resistance of each branches from excel 
sheet.....\n...................Completed..................\n');

% Input of length of each branches
L0= zeros(1,n);

fprintf('Importing the length of each branches from excel 
sheet.......\n...................Completed..................\n');
L0(1,:)= xlsread('data_baisdhara.xlsx','L');
L0=L0/1000;%changed meter into kiLometer

L= zeros(n,n);
for i=1:n
    L(i,i)= L0(1,i); %insert length between nodes in the diagonaL 
eLement of diagonaL matrix
end

disp('L = ');
disp(L);

% Input of U matrix
U= xlsread('data_baisdhara.xlsx','U');

fprintf('Importing U matrix (matrix of 0 and 1) of the network from 
the excel 
sheet............\n...................Completed..................\n
');

disp('U = ');
disp(U);
```

```
 fprintf('Importing the vaLue of current of each branches of R-phase
from excel
sheet.........\n..................Completed..................\n')
;
In= xlsread('data_baisdhara.xlsx','IR');

disp('In = ');
disp(In);

I= In.*In;

disp('I = ');
disp(I);

 xUDL= U*In ; xUVL= U*In ;

M1= xUDL.*xUDL + I/3; M2= xUVL.*xUVL + 8*I/15;

L1= R*L;
LossUDLR= L1*M1;
disp('LossUDLR = ');
disp(LossUDLR);

LossUVLR= L1*M2;
disp('LossUVLR =');
disp(LossUDLR);

fprintf('Importing the vaLue of current of each branches of Y-phase
from excel
sheet.........\n..................Completed..................\n')
;
In= xlsread('data_baisdhara.xlsx','IY');

I= In.*In;
xUDL= U*In ; xUVL= U*In ;
M1= xUDL.*xUDL + I/3; M2= xUVL.*xUVL + 8*I/15;

L1= (R*L);
LossUDLY= L1*M1;
```

```
disp('LossUDLY =');
disp(LossUDLY);

LossUVLY= L1*M2;
disp('LossUVLY =');
disp(LossUVLY);

fprintf('Importing the vaLue of current of each branches of B-phase
from excel
sheet.........\n...................Completed..................\n')
;
In= xlsread('data_baisdhara.xlsx','IB');

I= In.*In;
xUDL= U*In ; xUVL= U*In ;
M1= xUDL.*xUDL + I/3; M2= xUVL.*xUVL + 8*I/15;

L1= (R*L);
LossUDLB= L1*M1;
disp('LossUDLB = ');
disp(LossUDLB);

LossUVLB= L1*M2;
disp('LossUVLB = ');
disp(LossUVLB);

% Calculate Total UDL Loss
LossUDL= LossUDLR + LossUDLY + LossUDLB;
fprintf('TotaL UDL Loss is: %.3f Watts \n',LossUDL);

% CaLcuLate Total UVL Loss
LossUVL= LossUVLR + LossUVLY + LossUVLB;
fprintf('TotaL UVL Loss is: %.3f Watts \n',LossUVL);

xlswrite('data_baisdhara.xlsx',LossUDL,'Result','A2:A2');
xlswrite('data_baisdhara.xlsx',LossUVL,'Result','B2:B2');
```

# APPENDIX D: LINE AND LOAD DATA FOR BAISDHARA DISTRIBUTION TRANSFORMER

**Location: Baisdhara**
**Capacity: 200 KVA**

| S.N | Specification | | | | | | | Consumers | | | Connected Phase | | | Billing, kWh | PEAK LOAD, kW | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | From | To | Total distance, m | size, sq. mm | Load point | Distance between Load point | No. of consumers at load point | consumers ID | phases | Approved Load | R | Y | B | One month | R | Y | B | |
| 1 | 0 | A | 150 | 50 | a | 150 | 11 | 215-09-035 | Single | 15 | 1 | 0 | 0 | 40 | 0.093 | 0.000 | 0.000 | |
| 2 | | | | | | | | 215-08-061 | Single | 5 | 0 | 1 | 0 | 90 | 0.000 | 0.208 | 0.000 | |
| 3 | | | | | | | | 215-03-39 | Single | 30 | 1 | 0 | 0 | 54 | 0.125 | 0.000 | 0.000 | |
| 4 | | | | | | | | 215-08-063 | Single | 5 | 1 | 0 | 0 | 55 | 0.127 | 0.000 | 0.000 | |
| 5 | | | | | | | | 215-08-064 | Single | 5 | 0 | 0 | 1 | 20 | 0.000 | 0.000 | 0.046 | |
| 6 | | | | | | | | 215-08-065 | Single | 5 | 0 | 0 | 1 | 25 | 0.000 | 0.000 | 0.058 | |
| 7 | | | | | | | | 215-08-066 | Single | 15 | 0 | 0 | 1 | 36 | 0.000 | 0.000 | 0.083 | |
| 8 | | | | | | | | 215-06-058 | Single | 5 | 1 | 0 | 0 | 14 | 0.032 | 0.000 | 0.000 | |
| 9 | | | | | | | | 215-09-016 | Single | 5 | 0 | 0 | 1 | 11 | 0.000 | 0.000 | 0.025 | |
| 10 | | | | | | | | 215-09-069 | Single | 15 | 1 | 0 | 0 | 17 | 0.039 | 0.000 | 0.000 | |
| 11 | | | | | | | | 215-03-042 | Single | 30 | 0 | 0 | 1 | 22 | 0.000 | 0.000 | 0.051 | |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | A | B | 245 | 25 | b | 110 | 10 | 215-09-071 | Single | 30 | 1 | 0 | 0 | 30 | 0.069 | 0.000 | 0.000 | |
| 13 | | | | | | | | 215-09-072 | Single | 30 | 0 | 0 | 1 | 86 | 0.000 | 0.000 | 0.199 | |
| 14 | | | | | | | | 215-09-073 | Single | 15 | 0 | 0 | 1 | 25 | 0.000 | 0.000 | 0.058 | |
| 15 | | | | | | | | 215-10-11 | Single | 30 | 0 | 1 | 0 | 164 | 0.000 | 0.380 | 0.000 | |
| 16 | | | | | | | | 215-10-17 | Single | 30 | 0 | 0 | 1 | 101 | 0.000 | 0.000 | 0.234 | |
| 17 | | | | | | | | 215-10-038 | Single | 15 | 1 | 0 | 0 | 144 | 0.333 | 0.000 | 0.000 | |
| 18 | | | | | | | | 215-10-07 | Single | 15 | 0 | 1 | 0 | 151 | 0.000 | 0.350 | 0.000 | |
| 19 | | | | | | | | 215-10-019ka | Single | 15 | 1 | 0 | 0 | 152 | 0.352 | 0.000 | 0.000 | |
| 20 | | | | | | | | 215-10-19 | Single | 15 | 0 | 0 | 1 | 83 | 0.000 | 0.000 | 0.192 | |
| 21 | | | | | | | | 215-08-038 | Single | 15 | 0 | 0 | 1 | 100 | 0.000 | 0.000 | 0.231 | |
| 22 | | | | 25 | c | 135 | 10 | 215-08-019 | Single | 5 | 0 | 0 | 1 | 24 | 0.000 | 0.000 | 0.056 | |
| 23 | | | | | | | | 215-10-18 | Single | 30 | 0 | 1 | 0 | 18 | 0.000 | 0.042 | 0.000 | |
| 24 | | | | | | | | 215-10-016 | Single | 30 | 0 | 1 | 0 | 259 | 0.000 | 0.600 | 0.000 | |
| 25 | | | | | | | | 215-10-041 | Single | 15 | 1 | 0 | 0 | 180 | 0.417 | 0.000 | 0.000 | |
| 26 | | | | | | | | 215-03-030 | Single | 15 | 0 | 0 | 1 | 171 | 0.000 | 0.000 | 0.396 | |
| 27 | | | | | | | | 215-10-001 | Single | 15 | 1 | 0 | 0 | 178 | 0.412 | 0.000 | 0.000 | |
| 28 | | | | | | | | 215-09-068 | Single | 5 | 0 | 0 | 1 | 27 | 0.000 | 0.000 | 0.063 | |
| 29 | | | | | | | | 215-09-068A | Single | 30 | 0 | 0 | 1 | 22 | 0.000 | 0.000 | 0.051 | |
| 30 | | | | | | | | 215-09-063 | Single | 5 | 0 | 1 | 0 | 293 | 0.000 | 0.678 | 0.000 | |
| 31 | | | | | | | | 215-09-59 | Single | 15 | 1 | 0 | 0 | 209 | 0.484 | 0.000 | 0.000 | |
| 32 | A | C | 130 | 50 | d | 130 | 12 | 215-09-59ka | Single | 30 | 0 | 1 | 0 | 128 | 0.000 | 0.296 | 0.000 | |
| 33 | | | | | | | | 215-09-60 | Single | 15 | 0 | 1 | 0 | 124 | 0.000 | 0.287 | 0.000 | |
| 34 | | | | | | | | 215-09-61 | Single | 15 | 1 | 0 | 0 | 116 | 0.269 | 0.000 | 0.000 | |
| 35 | | | | | | | | 215-09-63 | Single | 5 | 0 | 0 | 1 | 44 | 0.000 | 0.000 | 0.102 | |
| 36 | | | | | | | | 215-08-010dup1 | Single | 5 | 0 | 0 | 1 | 81 | 0.000 | 0.000 | 0.188 | |
| 37 | | | | | | | | 215-09-056 | Single | 15 | 0 | 0 | 1 | 81 | 0.000 | 0.000 | 0.188 | |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 38 | | | | | | | | 215-09-054 | Single | 5 | 0 | 1 | 0 | 282 | 0.000 | 0.653 | 0.000 | |
| 39 | | | | | | | | 215-09-46 | Single | 30 | 0 | 0 | 1 | 244 | 0.000 | 0.000 | 0.565 | |
| 40 | | | | | | | | 215-08-060 | Single | 5 | 1 | 0 | 0 | 132 | 0.306 | 0.000 | 0.000 | |
| 41 | | | | | | | | 215-09-046ka | Single | 30 | 1 | 0 | 0 | 246 | 0.569 | 0.000 | 0.000 | |
| 42 | | | | | | | | 215-09-044 | Single | 30 | 1 | 0 | 0 | 193 | 0.447 | 0.000 | 0.000 | |
| 43 | | | | | | | | 215-09-040 | Single | 30 | 0 | 0 | 1 | 226 | 0.000 | 0.000 | 0.523 | |
| 44 | | | | | | | | 215-09-038 | Single | 5 | 0 | 0 | 1 | 55 | 0.000 | 0.000 | 0.127 | |
| 45 | | | | | | | | 215-08-025 | Single | 30 | 1 | 0 | 0 | 229 | 0.530 | 0.000 | 0.000 | |
| 46 | | | | | | | | 215-08-031 | Single | 15 | 1 | 0 | 0 | 228 | 0.528 | 0.000 | 0.000 | |
| 47 | | | | | | | | 215-09-033 | Single | 30 | 0 | 1 | 0 | 176 | 0.000 | 0.407 | 0.000 | |
| 48 | | | | | | | | 215-09-032 | Single | 15 | 0 | 1 | 0 | 34 | 0.000 | 0.079 | 0.000 | |
| 49 | | | | | | | | 215-09-030 | Single | 30 | 1 | 0 | 0 | 150 | 0.347 | 0.000 | 0.000 | |
| 50 | C | D | 145 | 50 | e | 145 | 13 | 215-09-029 | Single | 15 | 0 | 0 | 1 | 213 | 0.000 | 0.000 | 0.493 | |
| 51 | | | | | | | | 215-09-048 | Single | 15 | 0 | 0 | 1 | 389 | 0.000 | 0.000 | 0.900 | |
| 52 | | | | | | | | 215-09-050 | Single | 30 | 0 | 0 | 1 | 282 | 0.000 | 0.000 | 0.653 | |
| 53 | | | | | | | | 215-09-051 | Single | 15 | 0 | 1 | 0 | 223 | 0.000 | 0.516 | 0.000 | |
| 54 | | | | | | | | 215-09-004 | Single | 30 | 0 | 0 | 1 | 129 | 0.000 | 0.000 | 0.299 | |
| 55 | | | | | | | | 215-09-005 | Single | 15 | 1 | 0 | 0 | 186 | 0.431 | 0.000 | 0.000 | |
| 56 | | | | | | | | 215-09-006 | Single | 15 | 1 | 0 | 0 | 180 | 0.417 | 0.000 | 0.000 | |
| 57 | | E | 170 | 50 | f | 170 | 16 | 215-09-007 | Single | 15 | 1 | 0 | 0 | 160 | 0.370 | 0.000 | 0.000 | |
| 58 | | | | | | | | 215-08-022 | Single | 30 | 0 | 0 | 1 | 209 | 0.000 | 0.000 | 0.484 | |
| 59 | | | | | | | | 215-08-059 | Single | 30 | 0 | 0 | 1 | 122 | 0.000 | 0.000 | 0.282 | |
| 60 | C | | | | | | | 215-08-056 | Single | 5 | 0 | 1 | 0 | 133 | 0.000 | 0.308 | 0.000 | |
| 61 | | | | | | | | 215-08-054 | Single | 30 | 1 | 0 | 0 | 256 | 0.593 | 0.000 | 0.000 | |
| 62 | | | | | | | | 215-08-052 | Single | 30 | 0 | 0 | 1 | 320 | 0.000 | 0.000 | 0.741 | |
| 63 | | | | | | | | 215-08-047ka | Single | 15 | 0 | 0 | 1 | 217 | 0.000 | 0.000 | 0.502 | |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 64 | | | | | | | | 215-08-047 | Single | 15 | 1 | 0 | 0 | 163 | 0.377 | 0.000 | 0.000 | |
| 65 | | | | | | | | 215-08-048 | Single | 15 | 0 | 0 | 1 | 122 | 0.000 | 0.000 | 0.282 | |
| 66 | | | | | | | | 215-08-046 | Single | 15 | 0 | 0 | 1 | 72 | 0.000 | 0.000 | 0.167 | |
| 67 | | | | | | | | 215-08-045 | Single | 15 | 0 | 0 | 1 | 117 | 0.000 | 0.000 | 0.271 | |
| 68 | | | | | | | | 215-08-045ka | Single | 30 | 0 | 1 | 0 | 206 | 0.000 | 0.477 | 0.000 | |
| 69 | | | | | | | | 215-08-039 | Single | 30 | 1 | 0 | 0 | 514 | 1.190 | 0.000 | 0.000 | |
| 70 | | | | | | | | 215-08-040 | Single | 5 | 1 | 0 | 0 | 17 | 0.039 | 0.000 | 0.000 | |
| 71 | | | | | | | | 215-08-041 | Single | 5 | 1 | 0 | 0 | 78 | 0.181 | 0.000 | 0.000 | |
| 72 | | | | | | | | 215-08-066 | Single | 15 | 1 | 0 | 0 | 69 | 0.160 | 0.000 | 0.000 | |
| 73 | E | F | 120 | 25 | g | 120 | 8 | 215-08-062 | Single | 30 | 0 | 0 | 1 | 372 | 0.000 | 0.000 | 0.861 | |
| 74 | | | | | | | | 215-09-501 | THREE | 21.25 | 0.33 | 0.33 | 0.33 | 2205 | 1.684 | 1.684 | 1.684 | |
| 75 | | | | | | | | 215-08-503 | THREE | 7.5kva | 0.33 | 0.33 | 0.33 | 418 | 0.319 | 0.319 | 0.319 | |
| 76 | | | | | | | | 215-03-012 | Single | 15 | 1 | 0 | 0 | 255 | 0.590 | 0.000 | 0.000 | |
| 77 | | | | | | | | 215-03-013 | Single | 15 | 1 | 0 | 0 | 356 | 0.824 | 0.000 | 0.000 | |
| 78 | | | | | | | | 215-03-006 | Single | 15 | 0 | 1 | 0 | 141 | 0.000 | 0.326 | 0.000 | |
| 79 | | | | | | | | 215-09-036 | Single | 30 | 0 | 1 | 0 | 321 | 0.000 | 0.743 | 0.000 | |
| 80 | | | | | | | | 215-03-008 | Single | 5 | 0 | 0 | 1 | 46 | 0.000 | 0.000 | 0.106 | |
| 81 | O | G | 180 | 25 | h | 75 | 6 | 215-03-009 | Single | 5 | 0 | 0 | 1 | 15 | 0.000 | 0.000 | 0.035 | |
| 82 | | | | | | | | 215-03-010 | Single | 5 | 0 | 0 | 1 | 14 | 0.000 | 0.000 | 0.032 | |
| 83 | | | | | | | | 215-03-011 | Single | 5 | 0 | 1 | 0 | 13 | 0.000 | 0.030 | 0.000 | |
| 84 | | | | | | | | 215-09-008 | Single | 30 | 0 | 1 | 0 | 24 | 0.000 | 0.056 | 0.000 | |
| 85 | | | | | | | | 215-09-010 | Single | 5 | 1 | 0 | 0 | 17 | 0.039 | 0.000 | 0.000 | |
| 86 | | | | | | | | 215-03-014 | Single | 15 | 1 | 0 | 0 | 9 | 0.021 | 0.000 | 0.000 | |
| 87 | | | | 25 | i | 105 | 10 | 215-03-015 | Single | 15 | 1 | 0 | 0 | 17 | 0.039 | 0.000 | 0.000 | |
| 88 | | | | | | | | 215-03-017 | Single | 15 | 0 | 0 | 1 | 13 | 0.000 | 0.000 | 0.030 | |
| 89 | | | | | | | | 215-03-018 | Single | 5 | 0 | 0 | 1 | 17 | 0.000 | 0.000 | 0.039 | |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 90 | | | | | | | | 215-03-020 | Single | 5 | 0 | 1 | 0 | 20 | 0.000 | 0.046 | 0.000 | |
| 91 | | | | | | | | 215-03-021 | Single | 15 | 1 | 0 | 0 | 20 | 0.046 | 0.000 | 0.000 | |
| 92 | | | | | | | | 215-03-022 | Single | 30 | 0 | 1 | 0 | 13 | 0.000 | 0.030 | 0.000 | |
| 93 | | | | | | | | 215-03-023 | Single | 5 | 0 | 1 | 0 | 11 | 0.000 | 0.025 | 0.000 | |
| 94 | | | | | | | | 215-03-024 | Single | 5 | 1 | 0 | 0 | 17 | 0.039 | 0.000 | 0.000 | |
| 95 | | | | | | | | 215-03-025 | Single | 5 | 0 | 0 | 1 | 15 | 0.000 | 0.000 | 0.035 | |
| 96 | | | | | | | | 215-03-026 | Single | 5 | 0 | 0 | 1 | 19 | 0.000 | 0.000 | 0.044 | |
| 97 | | | | | | | | 215-08-33 | Single | 5 | 0 | 1 | 0 | 54 | 0.000 | 0.125 | 0.000 | |
| 98 | | | | | | | | 215-09-018 | Single | 5 | 1 | 0 | 0 | 57 | 0.132 | 0.000 | 0.000 | |
| 99 | | | | | | | | 215-03-007 | Single | 5 | 1 | 0 | 0 | 24 | 0.056 | 0.000 | 0.000 | |
| 100 | | | | | | | | 215-08-034 | Single | 5 | 1 | 0 | 0 | 45 | 0.104 | 0.000 | 0.000 | |
| 101 | O | H | 95 | 25 | j | 95 | 5 | 215-03-027 | Single | 5 | 1 | 0 | 0 | 50 | 0.116 | 0.000 | 0.000 | |
| 102 | | | | | | | | 215-03-028 | Single | 5 | 1 | 0 | 0 | 29 | 0.067 | 0.000 | 0.000 | |
| 103 | | | | | | | | 215-03-029 | Single | 5 | 0 | 0 | 1 | 32 | 0.000 | 0.000 | 0.074 | |
| 104 | | | | | | | | 215-06-072 | Single | 30 | 0 | 0 | 1 | 57 | 0.000 | 0.000 | 0.132 | |
| 105 | | | | | | | | 215-06-073 | Single | 5 | 0 | 0 | 1 | 18 | 0.000 | 0.000 | 0.042 | |
| 106 | | | | | | | | 215-08-001 | Single | 15 | 0 | 0 | 1 | 86 | 0.000 | 0.000 | 0.199 | |
| 107 | | | | | | | | 215-09-008 | Single | 30 | 0 | 0 | 1 | 45 | 0.000 | 0.000 | 0.104 | |
| 108 | | | | | | | | 215-08-023 | Single | 30 | 1 | 0 | 0 | 24 | 0.056 | 0.000 | 0.000 | |
| 109 | | | | | | | | 215-08-016 | Single | 5 | 1 | 0 | 0 | 14 | 0.032 | 0.000 | 0.000 | |
| 110 | | | | 25 | k | 115 | 8 | 215-08-017 | Single | 30 | 0 | 0 | 1 | 90 | 0.000 | 0.000 | 0.208 | |
| 111 | H | I | 205 | | | | | 215-08-029A | Single | 15 | 0 | 0 | 1 | 83 | 0.000 | 0.000 | 0.192 | |
| 112 | | | | | | | | 215-09-070 | Single | 30 | 1 | 0 | 0 | 23 | 0.053 | 0.000 | 0.000 | |
| 113 | | | | | | | | 215-08-067 | Single | 5 | 0 | 1 | 0 | 22 | 0.000 | 0.051 | 0.000 | |
| 114 | | | | 25 | l | 90 | 8 | 215-08-024 | Single | 30 | 0 | 1 | 0 | 148 | 0.000 | 0.343 | 0.000 | |
| 115 | | | | | | | | 215-10-12 | Single | 15 | 1 | 0 | 0 | 292 | 0.676 | 0.000 | 0.000 | |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 116 | | | | | | | | 215-08-026 | Single | 15 | 1 | 0 | 0 | 129 | 0.299 | 0.000 | 0.000 | |
| 117 | | | | | | | | 215-08-028 | Single | 5 | 1 | 0 | 0 | 107 | 0.248 | 0.000 | 0.000 | |
| 118 | | | | | | | | 215-08-029 | Single | 5 | 0 | 0 | 1 | 25 | 0.000 | 0.000 | 0.058 | |
| 119 | | | | | | | | 215-10-20 | Single | 5 | 0 | 0 | 1 | 16 | 0.000 | 0.000 | 0.037 | |
| 120 | | | | | | | | 215-08-030 | Single | 30 | 0 | 1 | 0 | 110 | 0.000 | 0.255 | 0.000 | |
| 121 | | | | | | | | 215-03-031 | Single | 5 | 0 | 1 | 0 | 17 | 0.000 | 0.039 | 0.000 | |
| 122 | | | | | | | | 215-05-040 | Single | 30 | 0 | 1 | 0 | 209 | 0.000 | 2.484 | 0.000 | |
| 123 | | | | | | | | 215-03-038 | Single | 15 | 0 | 1 | 0 | 109 | 0.000 | 0.252 | 0.000 | |
| 124 | | | | | | | | 215-03-501 | THREE | 6.25kva | 0.33 | 0.33 | 0.33 | 1124 | 0.859 | 0.859 | 0.859 | |
| 125 | | | | | | | | 215-03-040 | Single | 30 | 0 | 0 | 1 | 196 | 0.000 | 0.000 | 0.454 | |
| 126 | | | | | | | | 215-03-033 | Single | 15 | 1 | 0 | 0 | 705 | 1.632 | 0.000 | 0.000 | |
| 127 | | | | | | | | 215-03-044 | Single | 30 | 0 | 0 | 1 | 159 | 0.000 | 0.000 | 0.368 | |
| 128 | I | L | 185 | 25 | m | 185 | 13 | 215-05-044 | Single | 5 | 0 | 1 | 0 | 155 | 0.000 | 0.359 | 0.000 | |
| 129 | | | | | | | | 215-05-042 | Single | 5 | 0 | 1 | 0 | 148 | 0.000 | 0.343 | 0.000 | |
| 130 | | | | | | | | 215-06-062 | Single | 15 | 1 | 0 | 0 | 205 | 0.475 | 0.000 | 0.000 | |
| 131 | | | | | | | | 215-06-59 | Single | 30 | 1 | 0 | 0 | 178 | 0.412 | 0.000 | 0.000 | |
| 132 | | | | | | | | 215-08-014 | Single | 30 | 0 | 0 | 1 | 645 | 0.000 | 0.000 | 1.493 | |
| 133 | | | | | | | | 215-06-057 | Single | 5 | 0 | 0 | 1 | 238 | 0.000 | 0.000 | 0.551 | |
| 135 | | | | | | | | 215-05-050 | Single | 5 | 0 | 1 | 0 | 134 | 0.000 | 0.310 | 0.000 | |
| 136 | | | | | | | | 215-06-065 | Single | 5 | 1 | 0 | 0 | 176 | 0.407 | 0.000 | 0.000 | |
| 137 | | | | | | | | 215-06-066 | Single | 15 | 0 | 0 | 1 | 236 | 0.000 | 0.000 | 0.546 | |
| 138 | | | | | | | | 215-06-068 | Single | 15 | 0 | 1 | 0 | 162 | 0.000 | 3.375 | 0.000 | |
| 139 | I | K | 135 | 25 | n | 135 | 10 | 215-06-070 | Single | 5 | 1 | 0 | 0 | 148 | 0.343 | 0.000 | 0.000 | |
| 140 | | | | | | | | 215-08-501 | THREE | 12.5kva | 0.33 | 0.33 | 0.33 | 1421 | 1.085 | 1.085 | 1.085 | |
| 141 | | | | | | | | 215-08-032ka | Single | 30 | 0 | 0 | 1 | 987 | 0.000 | 0.000 | 2.285 | |
| 142 | | | | | | | | 215-08-037 | Single | 30 | 0 | 0 | 1 | 981 | 0.000 | 0.000 | 2.271 | |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 143 | | | | | | | | 215-08-003 | Single | 15 | 0 | 1 | 0 | 175 | 0.000 | 3.405 | 0.000 | |
| 144 | | | | | | | | 215-08-005 | Single | 30 | 0 | 0 | 1 | 172 | 0.000 | 0.000 | 0.398 | |
| 145 | | | | | | | | 215-08-006 | Single | 15 | 1 | 0 | 0 | 161 | 0.373 | 0.000 | 0.000 | |
| 146 | I | J | 275 | 25 | 0 | 155 | 12 | 215-08-007 | Single | 15 | 1 | 0 | 0 | 231 | 0.535 | 0.000 | 0.000 | |
| 147 | | | | | | | | 215-08-008 | Single | 30 | 1 | 0 | 0 | 318 | 0.736 | 0.000 | 0.000 | |
| 148 | | | | | | | | 215-10-09 | Single | 30 | 0 | 1 | 0 | 353 | 0.000 | 1.817 | 0.000 | |
| 149 | | | | | | | | 215-08-11 | Single | 5 | 0 | 0 | 1 | 154 | 0.000 | 0.000 | 0.356 | |
| 150 | | | | | | | | 215-09-045 | Single | 30 | 1 | 0 | 0 | 479 | 1.109 | 0.000 | 0.000 | |
| 151 | | | | | | | | 215-09-058 | Single | 15 | 0 | 0 | 1 | 301 | 0.000 | 0.000 | 0.697 | |
| 152 | | | | | | | | 215-09-009 | Single | 5 | 0 | 1 | 0 | 162 | 0.000 | 2.375 | 0.000 | |
| 153 | | | | | | | | 215-09-012 | Single | 15 | 0 | 1 | 0 | 153 | 0.000 | 2.354 | 0.000 | |
| 154 | | | | | | | | 215-09-013 | Single | 15 | 1 | 0 | 0 | 107 | 0.248 | 0.000 | 0.000 | |
| 155 | | | | | | | | 215-09-014 | Single | 15 | 0 | 0 | 1 | 128 | 0.000 | 0.000 | 0.296 | |
| 156 | | | | | | | | 215-09-015 | Single | 30 | 0 | 0 | 1 | 229 | 0.000 | 0.000 | 0.530 | |
| 157 | | | | | | | | 215-08-015 | Single | 15 | 1 | 0 | 0 | 468 | 1.083 | 0.000 | 0.000 | |
| 158 | | | | 25 | p | 120 | 11 | 215-09-016a | Single | 15 | 0 | 0 | 1 | 894 | 0.000 | 0.000 | 2.069 | |
| 159 | | | | | | | | 215-09-017 | Single | 15 | 0 | 0 | 1 | 366 | 0.000 | 0.000 | 0.847 | |
| 160 | | | | | | | | 215-03-205 | THREE | 20kva | 0.33 | 0.33 | 0.33 | 5251 | 4.011 | 4.011 | 4.011 | |
| 161 | | | | | | | | 215-09-020 | Single | 30 | 1 | 0 | 0 | 188 | 0.435 | 0.000 | 0.000 | |
| 162 | | | | | | | | 215-09-022 | Single | 5 | 1 | 0 | 0 | 623 | 1.442 | 0.000 | 0.000 | |
| 163 | | | | | | | | 215-09-024 | Single | 30 | 0 | 0 | 1 | 211 | 0.000 | 0.000 | 0.488 | |
| 164 | | | | | | | | 215-09-026 | Single | 30 | 0 | 0 | 1 | 122 | 0.000 | 0.000 | 0.282 | |
| 165 | | | | | | | | 215-09-028 | Single | 5 | 0 | 1 | 0 | 229 | 0.000 | 3.530 | 0.000 | |
| 166 | | | | | | | | 215-09-029 | Single | 15 | 1 | 0 | 0 | 213 | 0.493 | 0.000 | 0.000 | |
| 167 | | | | | | | | 215-09-030 | Single | 30 | 0 | 0 | 1 | 128 | 0.000 | 0.000 | 0.296 | |

**Line and load data of Baisdhara LT feeder for etap**

| Specification | | | | | Peak Load, kW | | | Peak Current, A | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Points** | **Length, m** | **Size, sq. mm** | **Resistance, ohm/km** | **Reactance, ohm/km** | **R** | **Y** | **B** | **IR** | **IY** | **IB** |
| a | 150 | 50 | 0.796 | 0.09 | 0.417 | 0.208 | 0.264 | 1.907 | 0.953 | 1.208 |
| b | 110 | 25 | 1.49 | 0.096 | 0.755 | 0.729 | 0.914 | 3.454 | 3.337 | 4.185 |
| c | 135 | 25 | 1.49 | 0.096 | 1.313 | 1.319 | 0.565 | 6.007 | 6.039 | 2.585 |
| d | 130 | 50 | 0.796 | 0.09 | 1.590 | 1.236 | 1.565 | 7.278 | 5.657 | 7.162 |
| e | 145 | 50 | 0.796 | 0.09 | 2.252 | 1.002 | 2.472 | 10.308 | 4.587 | 11.315 |
| f | 170 | 50 | 0.796 | 0.09 | 2.910 | 0.785 | 2.729 | 13.317 | 3.591 | 12.490 |
| g | 120 | 25 | 1.49 | 0.096 | 3.418 | 3.073 | 2.971 | 15.643 | 14.065 | 13.599 |
| h | 75 | 25 | 1.49 | 0.096 | 0.060 | 0.086 | 0.067 | 0.275 | 0.392 | 0.307 |
| i | 105 | 25 | 1.49 | 0.096 | 0.125 | 0.102 | 0.148 | 0.572 | 0.466 | 0.678 |
| j | 95 | 25 | 1.49 | 0.096 | 0.475 | 0.125 | 0.248 | 2.172 | 0.572 | 1.134 |
| k | 115 | 25 | 1.49 | 0.096 | 0.141 | 0.051 | 0.704 | 0.646 | 0.233 | 3.221 |
| l | 90 | 25 | 1.49 | 0.096 | 1.222 | 0.637 | 0.095 | 5.594 | 2.913 | 0.434 |
| m | 185 | 25 | 1.49 | 0.096 | 3.377 | 4.606 | 3.724 | 15.456 | 21.081 | 17.045 |
| n | 135 | 25 | 1.49 | 0.096 | 12.208 | 12.866 | 11.585 | 55.873 | 58.881 | 53.023 |
| 0 | 155 | 25 | 1.49 | 0.096 | 3.711 | 6.546 | 1.880 | 16.982 | 29.960 | 8.602 |
| p | 120 | 25 | 1.49 | 0.096 | 7.465 | 7.541 | 7.995 | 34.164 | 34.514 | 36.590 |

**Line and load data of Baisdhara LT feeder for Matlab**

| Specification | | | | | Peak Load, kW | | | Peak Current, A | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Points** | **Length, m** | **Size, sq. mm** | **Resistance, ohm/km** | **Reactance, ohm/km** | **R** | **Y** | **B** | **IR** | **IY** | **IB** |
| A | 150 | 50 | 0.796 | 0.09 | 0.417 | 0.208 | 0.264 | 1.907 | 0.953 | 1.208 |
| B | 245 | 25 | 1.49 | 0.096 | 2.067 | 2.049 | 1.479 | 9.461 | 9.376 | 6.770 |
| C | 130 | 50 | 0.796 | 0.09 | 1.590 | 1.236 | 1.565 | 7.278 | 5.657 | 7.162 |
| D | 145 | 50 | 0.796 | 0.09 | 2.252 | 1.002 | 2.472 | 10.308 | 4.587 | 11.315 |
| E | 170 | 50 | 0.796 | 0.09 | 2.910 | 0.785 | 2.729 | 13.317 | 3.591 | 12.490 |
| F | 120 | 25 | 1.49 | 0.096 | 3.418 | 3.073 | 2.971 | 15.643 | 14.065 | 13.599 |
| G | 180 | 25 | 1.49 | 0.096 | 0.185 | 0.188 | 0.215 | 0.848 | 0.858 | 0.985 |
| H | 95 | 25 | 1.49 | 0.096 | 0.475 | 0.125 | 0.248 | 2.172 | 0.572 | 1.134 |
| I | 205 | 25 | 1.49 | 0.096 | 1.363 | 0.688 | 0.799 | 6.240 | 3.146 | 3.655 |
| L | 185 | 25 | 1.49 | 0.096 | 3.377 | 4.606 | 3.724 | 15.456 | 21.081 | 17.045 |
| K | 135 | 25 | 1.49 | 0.096 | 12.208 | 12.866 | 11.585 | 55.873 | 58.881 | 53.023 |
| J | 275 | 25 | 1.49 | 0.096 | 11.176 | 14.088 | 9.875 | 51.147 | 64.474 | 45.193 |

# APPENDIX E: LINE AND LOAD DATA FOR BUDDHAMAL DISTRIBUTION TRANSFORMER

**Transformer Location : Buddhamall**
**Capacity : 100 kVA**

| S.N | Specification | | | | | | Consumers | | Connected phase | | | Energy, kWh | Peak load kW | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | From | To | Total distance, m | size, sq. mm | Load point | Distance between Load point | consumer ID | No.of phases | R | Y | B | Billing of one month | R | Y | B | |
| 1 | 0 | A | 190 | 120 | a | 190 | 225-25-058 | 1 | 1 | 0 | 0 | 53 | 0.12 | 0.00 | 0.00 | |
| 2 | | | | | | | 225-25-057 | 1 | 0 | 0 | 1 | 12 | 0.00 | 0.00 | 0.03 | |
| 3 | | | | | | | 225-25-048 | 1 | 0 | 0 | 1 | 14 | 0.00 | 0.00 | 0.03 | |
| 4 | | | | | | | 225-25-067A | 1 | 0 | 1 | 0 | 26 | 0.00 | 0.06 | 0.00 | |
| 5 | | | | | | | 225-25-043Ka | 1 | 1 | 0 | 0 | 7 | 0.02 | 0.00 | 0.00 | |
| 6 | | | | | | | 225-25-908 | 1 | 0 | 1 | 0 | 16 | 0.00 | 0.04 | 0.00 | |
| 7 | | | | | | | 225-25-045 | 1 | 0 | 0 | 1 | 10 | 0.00 | 0.00 | 0.02 | |
| 8 | A | B | 70 | 95 | b | 70 | 225-25-043 | 1 | 1 | 0 | 0 | 13 | 0.03 | 0.00 | 0.00 | |
| 9 | | | | | | | 225-25-056 | 1 | 0 | 0 | 1 | 48 | 0.00 | 0.00 | 0.11 | |
| 10 | | | | | | | 225-22-026 | 1 | 0 | 1 | 0 | 11 | 0.00 | 0.03 | 0.00 | |
| 11 | | | | | | | 225-25-050 | 1 | 1 | 0 | 0 | 17 | 0.04 | 0.00 | 0.00 | |
| 12 | | | | | | | 225-25-052 | 1 | 1 | 0 | 0 | 33 | 0.08 | 0.00 | 0.00 | |
| 13 | | | | | | | 225-25-047Ka | 1 | 0 | 0 | 1 | 14 | 0.00 | 0.00 | 0.03 | |
| 14 | | | | | | | 225-25-064 | 1 | 0 | 0 | 1 | 24 | 0.00 | 0.00 | 0.06 | |
| 15 | | | | | | | 225-25-043Kha | 1 | 1 | 0 | 0 | 24 | 0.06 | 0.00 | 0.00 | |
| 16 | | | | | | | 225-25-071 | 1 | 1 | 0 | 0 | 34 | 0.08 | 0.00 | 0.00 | |
| 17 | B | C | 65 | 95 | c | 65 | 225-25-068 | 1 | 1 | 0 | 0 | 14 | 0.03 | 0.00 | 0.00 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 18 | | | | | | | 225-25-044 | 1 | 0 | 1 | 0 | 55 | 0.00 | 0.13 | 0.00 | |
| 19 | | | | | | | 225-25-072 | 1 | 0 | 0 | 1 | 53 | 0.00 | 0.00 | 0.12 | |
| 20 | | | | | | | 225-25-070 | 1 | 0 | 0 | 1 | 37 | 0.00 | 0.00 | 0.09 | |
| 21 | | | | | | | 225-25-076 | 1 | 0 | 0 | 1 | 15 | 0.00 | 0.00 | 0.03 | |
| 22 | | | | | | | 225-25-075 | 1 | 0 | 1 | 0 | 42 | 0.00 | 0.10 | 0.00 | |
| 23 | | | | | | | 225-25-040 | 1 | 1 | 0 | 0 | 32 | 0.07 | 0.00 | 0.00 | |
| 24 | | | | | | | 225-25-077 | 1 | 0 | 0 | 1 | 41 | 0.00 | 0.00 | 0.09 | |
| 25 | | | | | | | 225-22-046 | 1 | 1 | 0 | 0 | 13 | 0.03 | 0.00 | 0.00 | |
| 26 | | | | | | | 225-25-036 | 1 | 1 | 0 | 0 | 26 | 0.06 | 0.00 | 0.00 | |
| 27 | | | | | | | 225-25-035 | 1 | 0 | 0 | 1 | 17 | 0.00 | 0.00 | 0.04 | |
| 28 | | | | | | | 225-25-034 | 1 | 0 | 0 | 1 | 39 | 0.00 | 0.00 | 0.09 | |
| 29 | C | D | 70 | 50 | d | 70 | 225-22-051 | 1 | 0 | 0 | 1 | 19 | 0.00 | 0.00 | 0.04 | |
| 30 | | | | | | | 225-22-050 | 1 | 0 | 1 | 0 | 18 | 0.00 | 0.04 | 0.00 | |
| 31 | | | | | | | 225-22-030 | 1 | 1 | 0 | 0 | 130 | 0.30 | 0.00 | 0.00 | |
| 32 | | | | | | | 225-22-027 | 1 | 0 | 0 | 1 | 106 | 0.00 | 0.00 | 0.25 | |
| 33 | | | | | | | 225-22-033 | 1 | 0 | 1 | 0 | 106 | 0.00 | 0.25 | 0.00 | |
| 34 | | | | | | | 225-22-032 | 1 | 1 | 0 | 0 | 22 | 0.05 | 0.00 | 0.00 | |
| 35 | | | | | | | 225-25-038 | 1 | 0 | 1 | 0 | 90 | 0.00 | 0.21 | 0.00 | |
| 36 | | | | | | | 225-22-027 | 1 | 0 | 0 | 1 | 106 | 0.00 | 0.00 | 0.25 | |
| 37 | | | | | | | 225-25-037Ka | 1 | 0 | 1 | 0 | 40 | 0.00 | 0.09 | 0.00 | |
| 38 | | | | | | | 225-25-079 | 1 | 1 | 0 | 0 | 85 | 0.20 | 0.00 | 0.00 | |
| 39 | | | | | | | 225-24-112 | 1 | 0 | 0 | 1 | 1239 | 0.00 | 0.00 | 2.87 | |
| 40 | | | | | | | 225-22-048 | 1 | 0 | 0 | 1 | 26 | 0.00 | 0.00 | 0.06 | |
| 41 | | | | | | | 225-22-043 | 1 | 0 | 1 | 0 | 18 | 0.00 | 0.04 | 0.00 | |
| 42 | D | E | 50 | 25 | e | 50 | 225-22-045 | 1 | 0 | 0 | 1 | 165 | 0.00 | 0.00 | 0.38 | |
| 43 | | | | | | | 225-22-047 | 1 | 0 | 1 | 0 | 217 | 0.00 | 0.50 | 0.00 | |
| 44 | | | | | | | 225-22-029 | 1 | 0 | 0 | 1 | 370 | 0.00 | 0.00 | 0.86 | |
| 45 | | | | | | | 225-22-044 | 1 | 1 | 0 | 0 | 228 | 0.53 | 0.00 | 0.00 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 46 | | | | | | | 225-22-049 | 1 | 0 | 0 | 1 | 261 | 0.00 | 0.00 | 0.60 | |
| 47 | | | | | | | 225-22-034 | 1 | 0 | 0 | 1 | 217 | 0.00 | 0.00 | 0.50 | |
| 48 | | | | | | | 225-22-029 | 1 | 0 | 0 | 1 | 370 | 0.00 | 0.00 | 0.86 | |
| 49 | | | | | | | 225-24-116 | 1 | 1 | 0 | 0 | 247 | 0.57 | 0.00 | 0.00 | |
| 50 | | | | | | | 225-24-117 | 1 | 0 | 1 | 0 | 348 | 0.00 | 0.81 | 0.00 | |
| 51 | B | G | 395 | 95 | f | 70 | 225-22-036 | 1 | 0 | 1 | 0 | 174 | 0.00 | 0.40 | 0.00 | |
| 52 | | | | | | | 225-22-037 | 1 | 1 | 0 | 0 | 129 | 0.30 | 0.00 | 0.00 | |
| 53 | | | | | | | 225-25-039 | 1 | 0 | 1 | 0 | 73 | 0.00 | 0.17 | 0.00 | |
| 54 | | | | | | | 225-22-047 | 1 | 1 | 0 | 0 | 217 | 0.50 | 0.00 | 0.00 | |
| 55 | | | | | | | 225-22-046 | 1 | 1 | 0 | 0 | 70 | 0.16 | 0.00 | 0.00 | |
| 56 | | | | | | | 225-22-044 | 1 | 1 | 0 | 0 | 228 | 0.53 | 0.00 | 0.00 | |
| 57 | | | | | | | 225-25-061 | 1 | 0 | 1 | 0 | 54 | 0.00 | 0.13 | 0.00 | |
| 58 | | | | | | | 225-25-060 | 1 | 1 | 0 | 0 | 41 | 0.09 | 0.00 | 0.00 | |
| 59 | | | | | | | 225-25-201 | 1 | 0.3 | 0.3 | 0.3 | 140 | 0.11 | 0.11 | 0.11 | |
| 60 | | | | | | | 225-22-024DUP1 | 1 | 1 | 0 | 0 | 218 | 0.50 | 0.00 | 0.00 | |
| 61 | | | | 95 | g | 70 | 225-22-012 | 1 | 1 | 0 | 0 | 256 | 0.59 | 0.00 | 0.00 | |
| 62 | | | | | | | 225-22-013 | 1 | 1 | 0 | 0 | 39 | 0.09 | 0.00 | 0.00 | |
| 63 | | | | | | | 225-25-086 | 1 | 0 | 0 | 1 | 81 | 0.00 | 0.00 | 0.19 | |
| 64 | | | | | | | 225-25-087 | 1 | 0 | 0 | 1 | 169 | 0.00 | 0.00 | 0.39 | |
| 65 | | | | | | | 225-25-088 | 1 | 0 | 1 | 0 | 136 | 0.00 | 0.31 | 0.00 | |
| 66 | | | | | | | 225-25-090 | 1 | 1 | 0 | 0 | 246 | 0.57 | 0.00 | 0.00 | |
| 67 | | | | | | | 225-25-901Ka | 1 | 0 | 0 | 1 | 8 | 0.00 | 0.00 | 0.02 | |
| 68 | | | | | | | 225-25-501 | 3 | 0.3 | 0.3 | 0.3 | 156 | 0.12 | 0.12 | 0.12 | |
| 69 | | | | 95 | h | 90 | 225-25-037 | 1 | 0 | 1 | 0 | 196 | 0.00 | 0.45 | 0.00 | |
| 70 | | | | | | | 225-25-097 | 1 | 0 | 0 | 1 | 369 | 0.00 | 0.00 | 0.85 | |
| 71 | | | | | | | 225-25-101 | 1 | 1 | 0 | 0 | 223 | 0.52 | 0.00 | 0.00 | |
| 72 | | | | | | | 225-25-102 | 1 | 1 | 0 | 0 | 209 | 0.48 | 0.00 | 0.00 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 73 | | | | | | | 225-25-105 | 1 | 1 | 0 | 0 | 275 | 0.64 | 0.00 | 0.00 | |
| 74 | | | | | | | 225-25-107 | 1 | 1 | 0 | 0 | 238 | 0.55 | 0.00 | 0.00 | |
| 75 | | | | 95 | i | 75 | 225-25-029Ka | 1 | 0 | 0 | 1 | 135 | 0.00 | 0.00 | 0.31 | |
| 76 | | | | | | | 225-25-087 | 1 | 0 | 0 | 1 | 169 | 0.00 | 0.00 | 0.39 | |
| 77 | | | | | | | 225-25-088 | 1 | 0 | 1 | 0 | 136 | 0.00 | 0.31 | 0.00 | |
| 78 | | | | | | | 225-25-090 | 1 | 1 | 0 | 0 | 246 | 0.57 | 0.00 | 0.00 | |
| 79 | | | | | | | 225-25-041 | 1 | 0 | 0 | 1 | 81 | 0.00 | 0.00 | 0.19 | |
| 80 | | | | | | | 225-25-101 | 1 | 1 | 0 | 0 | 223 | 0.52 | 0.00 | 0.00 | |
| 81 | | | | | | | 225-25-102 | 1 | 1 | 0 | 0 | 209 | 0.48 | 0.00 | 0.00 | |
| 82 | | | | | | | 225-25-105 | 1 | 1 | 0 | 0 | 275 | 0.64 | 0.00 | 0.00 | |
| 83 | | | | | | | 225-25-108 | 1 | 0 | 0 | 1 | 118 | 0.00 | 0.00 | 0.27 | |
| 84 | | | | | | | 225-25-109 | 1 | 0 | 1 | 0 | 68 | 0.00 | 0.16 | 0.00 | |
| 85 | | | | | | | 225-22-011 | 1 | 1 | 0 | 0 | 150 | 0.35 | 0.00 | 0.00 | |
| 86 | | | | | | | 225-22-053 | 1 | 0 | 1 | 0 | 196 | 0.00 | 0.45 | 0.00 | |
| 87 | | | | | | | 225-25-080 | 1 | 0 | 1 | 0 | 230 | 0.00 | 0.53 | 0.00 | |
| 88 | | | | | | | 225-24-99 | 1 | 0 | 0 | 1 | 138 | 0.00 | 0.00 | 0.32 | |
| 89 | | | | | | | 225-25-063 | 1 | 0 | 0 | 1 | 69 | 0.00 | 0.00 | 0.16 | |
| 90 | | | | | | | 225-25-078 | 1 | 0 | 0 | 1 | 150 | 0.00 | 0.00 | 0.35 | |
| 91 | | | | 95 | j | 90 | 225-25-047 | 1 | 0 | 0 | 1 | 71 | 0.00 | 0.00 | 0.16 | |
| 92 | | | | | | | 225-24-99 | 1 | 0 | 0 | 0 | 138 | 0.00 | 0.00 | 0.00 | |
| 93 | | | | | | | 225-25-083 | 1 | 1 | 0 | 0 | 198 | 0.46 | 0.00 | 0.00 | |
| 94 | | | | | | | 225-24-104 | 1 | 0 | 1 | 0 | 242 | 0.00 | 0.56 | 0.00 | |
| 95 | | | | | | | 225-22-025A | 1 | 1 | 0 | 0 | 110 | 0.25 | 0.00 | 0.00 | |
| 96 | | | | | | | 225-22-054 | 1 | 0 | 1 | 0 | 163 | 0.00 | 0.38 | 0.00 | |
| 97 | | | | | | | 225-22-015 | 1 | 1 | 0 | 0 | 173 | 0.40 | 0.00 | 0.00 | |
| 98 | | | | | | | 225-22-014 | 1 | 1 | 0 | 0 | 244 | 0.56 | 0.00 | 0.00 | |
| 99 | G | H | 360 | 25 | k | 50 | 225-25-069 | 1 | 0 | 1 | 0 | 112 | 0.00 | 0.26 | 0.00 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 100 | | | | | | | 225-25-097 | 1 | 0 | 0 | 1 | 369 | 0.00 | 0.00 | 0.85 | |
| 101 | | | | | | | 225-25-067 | 1 | 0 | 1 | 0 | 175 | 0.00 | 0.41 | 0.00 | |
| 102 | | | | | | | 225-22-007 | 1 | 1 | 0 | 0 | 506 | 1.17 | 0.00 | 0.00 | |
| 103 | | | | | | | 225-25-066 | 1 | 1 | 0 | 0 | 282 | 0.65 | 0.00 | 0.00 | |
| 104 | | | | | | | 225-25-065 | 1 | 0 | 0 | 1 | 164 | 0.00 | 0.00 | 0.38 | |
| 105 | | | | | | | 225-22-008 | 1 | 1 | 0 | 0 | 1278 | 2.96 | 0.00 | 0.00 | |
| 106 | | | | | | | 225-22-039 | 3 | 0.3 | 0.3 | 0.3 | 426 | 0.33 | 0.33 | 0.33 | |
| 107 | | | | 25 | l | 70 | 225-25-082 | 1 | 0 | 1 | 0 | 377 | 0.00 | 0.87 | 0.00 | |
| 108 | | | | | | | 225-24-105 | 1 | 0 | 1 | 0 | 234 | 0.00 | 0.54 | 0.00 | |
| 109 | | | | | | | 225-24-106 | 1 | 1 | 0 | 0 | 338 | 0.78 | 0.00 | 0.00 | |
| 110 | | | | | | | 225-25-059 | 1 | 1 | 0 | 0 | 208 | 0.48 | 0.00 | 0.00 | |
| 111 | | | | | | | 225-22-008 | 1 | 0 | 1 | 0 | 1278 | 0.00 | 2.96 | 0.00 | |
| 112 | | | | | | | 225-22-007 | 1 | 1 | 0 | 0 | 506 | 1.17 | 0.00 | 0.00 | |
| 113 | | | | | | | 225-24-101 | 1 | 0 | 0 | 1 | 346 | 0.00 | 0.00 | 0.80 | |
| 114 | | | | | | | 225-24-102 | 1 | 0 | 0 | 1 | 491 | 0.00 | 0.00 | 1.14 | |
| 115 | | | | | | | 225-24-103 | 1 | 0 | 1 | 0 | 664 | 0.00 | 1.54 | 0.00 | |
| 116 | | | | | | | 225-25-054 | 1 | 1 | 0 | 0 | 275 | 0.64 | 0.00 | 0.00 | |
| 117 | | | | | | | 225-22-052 | 1 | 1 | 0 | 0 | 310 | 0.72 | 0.00 | 0.00 | |
| 118 | | | | 25 | m | 100 | 225-22-025 | 1 | 0 | 0 | 1 | 395 | 0.00 | 0.00 | 0.91 | |
| 119 | | | | | | | 225-22-505 | 3 | 0.3 | 0.3 | 0.3 | 3240 | 2.50 | 2.50 | 2.50 | |
| 120 | | | | | | | 225-24-127 | 1 | 1 | 0 | 0 | 305 | 0.71 | 0.00 | 0.00 | |
| 121 | | | | | | | 225-22-043Ka | 3 | 0.3 | 0.3 | 0.3 | 2352 | 1.81 | 1.81 | 1.81 | |
| 122 | | | | | | | 225-22-025 | 1 | 0 | 0 | 1 | 395 | 0.00 | 0.00 | 0.91 | |
| 123 | | | | | | | 225-25-046 | 1 | 1 | 0 | 0 | 100 | 0.23 | 0.00 | 0.00 | |
| 124 | | | | | | | 225-24-100 | 1 | 0 | 1 | 0 | 646 | 0.00 | 1.50 | 0.00 | |
| 125 | | | | | | | 225-24-099Ka3 | 1 | 0 | 0 | 1 | 240 | 0.00 | 0.00 | 0.56 | |
| 126 | | | | | | | 225-22-022 | 1 | 0 | 0 | 1 | 890 | 0.00 | 0.00 | 2.06 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 127 | | | | 25 | n | 140 | 225-22-023 | 1 | 0 | 0 | 1 | 514 | 0.00 | 0.00 | 1.19 | |
| 128 | | | | | | | 225-25-042 | 1 | 0 | 1 | 0 | 263 | 0.00 | 0.61 | 0.00 | |
| 129 | | | | | | | 225-24-107 | 1 | 0 | 1 | 0 | 938 | 0.00 | 2.17 | 0.00 | |
| 130 | | | | | | | 225-24-402 | 3 | 0.3 | 0.3 | 0.3 | 338 | 0.26 | 0.26 | 0.26 | |
| 131 | | | | | | | 225-24-110 | 3 | 0.3 | 0.3 | 0.3 | 2254 | 1.74 | 1.74 | 1.74 | |
| 132 | | | | | | | 225-24-113 | 1 | 0 | 1 | 0 | 656 | 0.00 | 1.52 | 0.00 | |
| 133 | | | | | | | 225-24-114 | 3 | 0.3 | 0.3 | 0.3 | 1525 | 1.18 | 1.18 | 1.18 | |
| 134 | | | | | | | 225-22-008 | 1 | 1 | 0 | 0 | 1278 | 2.96 | 0.00 | 0.00 | |
| 135 | | | | | | | 225-22-007 | 1 | 1 | 0 | 0 | 506 | 1.17 | 0.00 | 0.00 | |
| 136 | | | | | | | 225-22-009 | 1 | 0 | 1 | 0 | 727 | 0.00 | 1.68 | 0.00 | |
| 137 | | | | | | | 225-22-51Ka | 1 | 0 | 1 | 0 | 499 | 0.00 | 1.16 | 0.00 | |
| 138 | | | | | | | 225-22-21 | 1 | 0 | 1 | 0 | 419 | 0.00 | 0.97 | 0.00 | |
| 139 | | | | | | | 225-25-025 | 1 | 0 | 0 | 1 | 168 | 0.00 | 0.00 | 0.39 | |

**Line and load data of Buddhamall LT feeder for etap**

| Specification | | | | | Peak Load, kW | | | Peak Current, A | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Points | Length, m | Size, sq. mm | Resistance, ohm/km | Reactance, ohm/km | R | Y | B | IR | IY | IB |
| a | 190 | 120 | 0.314 | 0.084 | 0.139 | 0.097 | 0.083 | 0.636 | 0.445 | 0.381 |
| b | 70 | 95 | 0.397 | 0.086 | 0.280 | 0.025 | 0.199 | 1.282 | 0.117 | 0.911 |
| c | 65 | 95 | 0.397 | 0.086 | 0.197 | 0.225 | 0.468 | 0.901 | 1.028 | 2.140 |
| d | 70 | 50 | 0.796 | 0.09 | 0.549 | 0.630 | 3.463 | 2.511 | 2.882 | 15.849 |
| e | 50 | 25 | 1.49 | 0.096 | 1.100 | 1.308 | 3.201 | 5.032 | 5.986 | 14.652 |
| f | 70 | 95 | 0.397 | 0.086 | 2.198 | 0.805 | 0.108 | 10.061 | 3.683 | 0.494 |
| g | 70 | 95 | 0.397 | 0.086 | 1.373 | 0.435 | 0.718 | 6.282 | 1.992 | 3.284 |
| h | 90 | 95 | 0.397 | 0.086 | 2.188 | 0.454 | 0.854 | 10.011 | 2.076 | 3.909 |
| i | 75 | 95 | 0.397 | 0.086 | 2.553 | 1.458 | 1.991 | 11.685 | 6.674 | 9.111 |
| j | 90 | 95 | 0.397 | 0.086 | 1.678 | 0.938 | 0.164 | 7.681 | 4.291 | 0.752 |
| k | 50 | 25 | 1.49 | 0.096 | 5.111 | 0.993 | 1.563 | 23.392 | 4.545 | 7.151 |
| l | 70 | 25 | 1.49 | 0.096 | 3.789 | 5.910 | 1.938 | 17.343 | 27.047 | 8.867 |
| m | 100 | 25 | 1.49 | 0.096 | 5.252 | 5.810 | 8.759 | 24.038 | 26.591 | 40.088 |
| n | 140 | 25 | 1.49 | 0.096 | 7.306 | 11.283 | 4.755 | 33.439 | 51.639 | 21.764 |

**Line and load data of Buddhamall LT feeder for Matlab**

| Specification | | | | | Peak Load, kW | | | Peak Current, A | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Points | Length, m | Size, sq. mm | Resistance, ohm/km | Reactance, ohm/km | R | Y | B | IR | IY | IB |
| A | 190 | 120 | 0.314 | 0.084 | 0.139 | 0.097 | 0.083 | 0.636 | 0.445 | 0.381 |
| B | 70 | 95 | 0.397 | 0.086 | 0.280 | 0.025 | 0.199 | 1.282 | 0.117 | 0.911 |
| C | 65 | 95 | 0.397 | 0.086 | 0.197 | 0.225 | 0.468 | 0.901 | 1.028 | 2.140 |
| D | 70 | 50 | 0.796 | 0.09 | 0.549 | 0.630 | 3.463 | 2.511 | 2.882 | 15.849 |
| E | 50 | 25 | 1.49 | 0.096 | 1.100 | 1.308 | 3.201 | 5.032 | 5.986 | 14.652 |
| G | 395 | 95 | 0.397 | 0.086 | 9.990 | 4.090 | 3.835 | 45.721 | 18.716 | 17.551 |
| H | 360 | 25 | 1.49 | 0.096 | 21.459 | 23.996 | 17.015 | 98.211 | 109.822 | 77.870 |

# APPENDIX F: LINE AND LOAD DATA FOR WATER BORING DISTRIBUTION TRANSFORMER

**Transformer Location : Waterboaring, Balaju**
**Capacity : 300 kVA**

| S.N | Specification | | | | | | consumers | | Connected Phase | | | Energy, kWh | PEAK LOAD, kW | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | From | To | Total distance, m | size, sq. mm | Load point | Distance between Load point | consumers ID | No. of Phases | R | Y | B | Billing of one month | R | Y | B | |
| 1 | O | A | 190 | 95 | a | 190 | 225.23.045ka | 1 | 1 | 0 | 0 | 40 | 0.093 | 0.000 | 0.000 | |
| 2 | | | | | | | 225.23.046 | 1 | 0 | 1 | 0 | 16 | 0.000 | 0.037 | 0.000 | |
| 3 | | | | | | | 225.24.019ka | 1 | 0 | 0 | 1 | 20 | 0.000 | 0.000 | 0.046 | |
| 4 | A | J | 190 | 25 | z | 60 | 225.22.083 | 1 | 0 | 0 | 1 | 14 | 0.000 | 0.000 | 0.032 | |
| 5 | | | | | | | 225.23.054 | 1 | 1 | 0 | 0 | 5 | 0.012 | 0.000 | 0.000 | |
| 6 | | | | | | | 225.23.051 | 1 | 0 | 1 | 0 | 11 | 0.000 | 0.025 | 0.000 | |
| 7 | | | | | | | 225.23..027 | 1 | 0 | 0 | 1 | 28 | 0.000 | 0.000 | 0.065 | |
| 8 | | | | | | | 225.23.081 | 1 | 1 | 0 | 0 | 7 | 0.016 | 0.000 | 0.000 | |
| 9 | | | | 25 | a1 | 70 | 225.23.041 | 1 | 1 | 0 | 0 | 28 | 0.065 | 0.000 | 0.000 | |
| 10 | | | | | | | 225.24.016 | 1 | 0 | 1 | 0 | 97 | 0.000 | 0.225 | 0.000 | |
| 11 | | | | | | | 225.23.063 | 1 | 1 | 0 | 0 | 33 | 0.076 | 0.000 | 0.000 | |
| 12 | | | | | | | 225.23.034 | 1 | 0 | 1 | 0 | 86 | 0.000 | 0.199 | 0.000 | |
| 13 | | | | 25 | b1 | 60 | 225.23.052 | 1 | 0 | 0 | 1 | 80 | 0.000 | 0.000 | 0.185 | |
| 14 | | | | | | | 225.23.045 | 1 | 1 | 0 | 0 | 62 | 0.144 | 0.000 | 0.000 | |
| 15 | | | | | | | 225.25.902 | 1 | 0 | 0 | 1 | 25 | 0.000 | 0.000 | 0.058 | |
| 16 | | | | | | | 225.23.061 | 1 | 0 | 1 | 0 | 34 | 0.000 | 0.079 | 0.000 | |
| 17 | | | | | | | 225.23.043 | 1 | 0 | 0 | 1 | 38 | 0.000 | 0.000 | 0.088 | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 18 | | | | | | | 225.23.053 | 1 | 0 | 1 | 0 | 63 | 0.000 | 0.146 | 0.000 | |
| 19 | | | | | | | 225.24.013 | 1 | 1 | 1 | 1 | 78 | 0.181 | 0.181 | 0.181 | |
| 20 | | | | | | | 225.23.055 | 1 | 0 | 0 | 1 | 46 | 0.000 | 0.000 | 0.106 | |
| 21 | | | | | | | 225.23.057 | 1 | 0 | 0 | 1 | 35 | 0.000 | 0.000 | 0.081 | |
| 22 | | | | | | | 225.23.042 | 1 | 0 | 0 | 1 | 51 | 0.000 | 0.000 | 0.118 | |
| 23 | | | | | | | 225.23.901 | 1 | 0 | 1 | 0 | 20 | 0.000 | 0.046 | 0.000 | |
| 24 | | | | | | | 225.22.043kha | 1 | 0 | 0 | 1 | 70 | 0.000 | 0.000 | 0.162 | |
| 25 | | | | | | | 225.23.037 | 1 | 1 | 0 | 0 | 14 | 0.032 | 0.000 | 0.000 | |
| 26 | | | | | | | 225.23.062ka | 1 | 1 | 0 | 0 | 75 | 0.174 | 0.000 | 0.000 | |
| 27 | J | K | 65 | 95 | I1 | 65 | 225.23.075 | 1 | 0 | 0 | 1 | 19 | 0.000 | 0.000 | 0.044 | |
| 28 | | | | | | | 225.23.076 | 1 | 0 | 0 | 1 | 24 | 0.000 | 0.000 | 0.056 | |
| 29 | | | | | | | 225.25.901ka | 1 | 1 | 0 | 0 | 10 | 0.023 | 0.000 | 0.000 | |
| 30 | | | | | | | 225.25.001 | 1 | 1 | 0 | 0 | 16 | 0.037 | 0.000 | 0.000 | |
| 31 | | | | | | | 225.25.011 | 1 | 0 | 1 | 0 | 11 | 0.000 | 0.025 | 0.000 | |
| 32 | | | | | | | 225.25.015 | 1 | 1 | 0 | 0 | 12 | 0.028 | 0.000 | 0.000 | |
| 33 | J | H | 295 | 95 | c1 | 55 | 225.23.067 | 1 | 0 | 0 | 1 | 96 | 0.000 | 0.000 | 0.222 | |
| 34 | | | | | | | 225.23.038 | 1 | 0 | 0 | 1 | 157 | 0.000 | 0.000 | 0.363 | |
| 35 | | | | 95 | d1 | 45 | 225.23.060ka | 1 | 0 | 0 | 1 | 156 | 0.000 | 0.000 | 0.361 | |
| 36 | | | | | | | 225.23.064 | 1 | 0 | 0 | 1 | 175 | 0.000 | 0.000 | 0.405 | |
| 37 | | | | | | | 225.23.064ka | 1 | 1 | 0 | 0 | 136 | 0.315 | 0.000 | 0.000 | |
| 38 | | | | | | | 225.23.056 | 1 | 0 | 0 | 1 | 104 | 0.000 | 0.000 | 0.241 | |
| 39 | | | | 95 | e1 | 35 | 225.23.066 | 1 | 1 | 0 | 0 | 97 | 0.225 | 0.000 | 0.000 | |
| 40 | | | | | | | 225.23.069 | 1 | 0 | 0 | 1 | 108 | 0.000 | 0.000 | 0.250 | |
| 41 | | | | | | | 225.23.049 | 1 | 0 | 1 | 0 | 104 | 0.000 | 0.241 | 0.000 | |
| 42 | | | | | | | 225.23.071 | 1 | 1 | 0 | 0 | 112 | 0.259 | 0.000 | 0.000 | |
| 43 | | | | | | | 225.23.071ka | 1 | 0 | 0 | 1 | 70 | 0.000 | 0.000 | 0.162 | |
| 44 | | | | 95 | f1 | 40 | 225.23.072 | 1 | 0 | 1 | 0 | 53 | 0.000 | 0.123 | 0.000 | |
| 45 | | | | | | | 225.23.073 | 1 | 1 | 0 | 0 | 89 | 0.206 | 0.000 | 0.000 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 46 | | | | | | | 225.23.074 | 1 | 0 | 0 | 1 | 79 | 0.000 | 0.000 | 0.183 | |
| 47 | | | | | | | 225.23.044 | 1 | 0 | 1 | 0 | 77 | 0.000 | 0.178 | 0.000 | |
| 48 | | | | | | | 225.23.070 | 1 | 0 | 1 | 0 | 63 | 0.000 | 0.146 | 0.000 | |
| 49 | | | | | | | 225.23.077 | 1 | 0 | 1 | 0 | 87 | 0.000 | 0.201 | 0.000 | |
| 50 | | | | | | | 225.23.079 | 1 | 0 | 0 | 1 | 82 | 0.000 | 0.000 | 0.190 | |
| 51 | | | | 95 | g1 | 55 | 225.23.080 | 1 | 1 | 0 | 0 | 162 | 0.375 | 0.000 | 0.000 | |
| 52 | | | | | | | 225.23.032 | 1 | 1 | 0 | 0 | 107 | 0.248 | 0.000 | 0.000 | |
| 53 | | | | | | | 225.24.020 | 1 | 0 | 1 | 0 | 114 | 0.000 | 0.264 | 0.000 | |
| 54 | | | | | | | 225.25.002 | 1 | 0 | 0 | 1 | 73 | 0.000 | 0.000 | 0.169 | |
| 55 | | | | | | | 225.25.003 | 1 | 0 | 1 | 0 | 40 | 0.000 | 0.093 | 0.000 | |
| 56 | | | | | | | 225.25.004 | 1 | 0 | 1 | 0 | 51 | 0.000 | 0.118 | 0.000 | |
| 57 | | | | | | | 225.22.076 | 1 | 1 | 0 | 0 | 124 | 0.287 | 0.000 | 0.000 | |
| 58 | | | | | | | 225.25.005 | 1 | 0 | 0 | 1 | 34 | 0.000 | 0.000 | 0.079 | |
| 59 | | | | | | | 225.25.021A | 1 | 0 | 0 | 1 | 35 | 0.000 | 0.000 | 0.081 | |
| 60 | | | | | | | 225.25.007 | 1 | 1 | 0 | 0 | 75 | 0.174 | 0.000 | 0.000 | |
| 61 | | | | | | | 225.25.201 | 1 | 0 | 1 | 0 | 207 | 0.000 | 0.479 | 0.000 | |
| 62 | | | | 95 | h1 | 65 | 225.25.010 | 1 | 0 | 0 | 1 | 55 | 0.000 | 0.000 | 0.127 | |
| 63 | | | | | | | 225.23.026 | 1 | 1 | 0 | 0 | 128 | 0.296 | 0.000 | 0.000 | |
| 64 | | | | | | | 225.25.013 | 1 | 1 | 0 | 0 | 51 | 0.118 | 0.000 | 0.000 | |
| 65 | | | | | | | 225.25.014 | 1 | 1 | 0 | 0 | 45 | 0.104 | 0.000 | 0.000 | |
| 66 | | | | | | | 225.24.002 | 1 | 1 | 0 | 0 | 154 | 0.356 | 0.000 | 0.000 | |
| 67 | | | | | | | 225.25.016 | 1 | 1 | 0 | 0 | 52 | 0.120 | 0.000 | 0.000 | |
| 68 | | | | | | | 225.23.024 | 1 | 0 | 1 | 0 | 158 | 0.000 | 0.366 | 0.000 | |
| 69 | | | | | | | 225.25.903 | 1 | 0 | 0 | 1 | 16 | 0.000 | 0.000 | 0.037 | |
| 70 | A | B | 345 | 50 | b | 45 | 225.24.012 | 1 | 1 | 0 | 0 | 137 | 0.317 | 0.000 | 0.000 | |
| 71 | | | | 50 | c | 35 | 225.23.019 | 1 | 1 | 0 | 0 | 138 | 0.319 | 0.000 | 0.000 | |
| 72 | | | | | | | 225.23.020 | 1 | 0 | 0 | 1 | 185 | 0.000 | 0.000 | 0.428 | |
| 73 | | | | | | | 225.22.061 | 3 | 0.33 | 0.33 | 0.33 | 112 | 0.086 | 0.086 | 0.086 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 74 | | | | 50 | d | 45 | 225.23.014 | 1 | 0 | 1 | 0 | 262 | 0.000 | 0.606 | 0.000 | |
| 75 | | | | | | | 225.23.015 | 1 | 0 | 0 | 1 | 174 | 0.000 | 0.000 | 0.403 | |
| 76 | | | | | | | 225.22.076 | 1 | 0 | 0 | 1 | 124 | 0.000 | 0.000 | 0.287 | |
| 77 | | | | | | | 225.23.050 | 1 | 0 | 0 | 1 | 130 | 0.000 | 0.000 | 0.301 | |
| 78 | | | | | | | 225.22.088 | 1 | 0 | 1 | 0 | 194 | 0.000 | 0.449 | 0.000 | |
| 79 | | | | | | | 225.22.063 | 1 | 0 | 1 | 0 | 251 | 0.000 | 0.581 | 0.000 | |
| 80 | | | | | | | 225.22.080 | 1 | 0 | 0 | 1 | 146 | 0.000 | 0.000 | 0.338 | |
| 81 | | | | | | | 225.22.087 | 1 | 1 | 0 | 0 | 117 | 0.271 | 0.000 | 0.000 | |
| 82 | | | | | | | 225.22.066 | 1 | 1 | 0 | 0 | 198 | 0.458 | 0.000 | 0.000 | |
| 83 | | | | | | | 225.23.016 | 1 | 1 | 0 | 0 | 158 | 0.366 | 0.000 | 0.000 | |
| 84 | | | | | | | 225.23.017 | 1 | 0 | 0 | 1 | 77 | 0.000 | 0.000 | 0.178 | |
| 85 | | | | | | | 225.24.003 | 1 | 0 | 0 | 1 | 201 | 0.000 | 0.000 | 0.465 | |
| 86 | | | | 50 | e | 50 | 225.23.007 | 1 | 1 | 0 | 0 | 268 | 0.620 | 0.000 | 0.000 | |
| 87 | | | | | | | 225.22.059a | 1 | 0 | 0 | 1 | 249 | 0.000 | 0.000 | 0.576 | |
| 88 | | | | | | | 225.22.076 | 1 | 0 | 0 | 1 | 124 | 0.000 | 0.000 | 0.287 | |
| 89 | | | | | | | 225.22.066 | 1 | 1 | 0 | 0 | 198 | 0.458 | 0.000 | 0.000 | |
| 90 | | | | 50 | f | 45 | 225.23.005 | 1 | 0 | 0 | 1 | 82 | 0.000 | 0.000 | 0.190 | |
| 91 | | | | | | | 225.23.006 | 1 | 0 | 1 | 0 | 45 | 0.000 | 0.104 | 0.000 | |
| 92 | | | | | | | 225.23.099 | 1 | 1 | 0 | 0 | 167 | 0.387 | 0.000 | 0.000 | |
| 93 | | | | | | | 225.24.002 | 1 | 0 | 1 | 0 | 154 | 0.000 | 0.356 | 0.000 | |
| 94 | | | | | | | 225.24.026 | 1 | 0 | 1 | 0 | 148 | 0.000 | 0.343 | 0.000 | |
| 95 | | | | | | | 225.22.099 | 1 | 1 | 0 | 0 | 221 | 0.512 | 0.000 | 0.000 | |
| 96 | | | | 50 | g | 35 | 225.23.015 | 1 | 0 | 0 | 1 | 174 | 0.000 | 0.000 | 0.403 | |
| 97 | | | | | | | 225.24.014 | 1 | 1 | 0 | 0 | 136 | 0.315 | 0.000 | 0.000 | |
| 98 | | | | 50 | h | 50 | 225.22.081 | 1 | 0 | 0 | 1 | 141 | 0.000 | 0.000 | 0.326 | |
| 99 | | | | | | | 225.22.088 | 1 | 0 | 1 | 0 | 194 | 0.000 | 0.449 | 0.000 | |
| 100 | | | | 50 | i | 40 | 225.22.080 | 1 | 0 | 0 | 1 | 146 | 0.000 | 0.000 | 0.338 | |
| 101 | | | | | | | 225.22.087 | 1 | 1 | 0 | 0 | 117 | 0.271 | 0.000 | 0.000 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 102 | B | E | 50 | 50 | u | 50 | 225.22.402 | 1 | 1 | 0 | 0 | 356 | 0.824 | 0.000 | 0.000 | |
| 103 | | | | | | | 225.22.077 | 1 | 0 | 0 | 1 | 304 | 0.000 | 0.000 | 0.704 | |
| 104 | | | | | | | 225.24.509 | 3 | 0.33 | 0.33 | 0.33 | 346 | 0.264 | 0.264 | 0.264 | |
| 105 | | | | | | | 225.22.088 | 1 | 0 | 1 | 0 | 194 | 0.000 | 0.449 | 0.000 | |
| 106 | | | | | | | 225.24.503 | 3 | 0.33 | 0.33 | 0.33 | 391 | 0.299 | 0.299 | 0.299 | |
| 107 | | | | | | | 225.24.009 | 1 | 0 | 0 | 1 | 290 | 0.000 | 0.000 | 0.671 | |
| 108 | | | | | | | 225.25.017 | 1 | 0 | 0 | 1 | 335 | 0.000 | 0.000 | 0.775 | |
| 109 | | | | | | | 225.23.062A | 1 | 1 | 0 | 0 | 201 | 0.465 | 0.000 | 0.000 | |
| 110 | | | | | | | 225.23.036 | 1 | 0 | 1 | 0 | 346 | 0.000 | 0.801 | 0.000 | |
| 111 | | | | | | | 225.24.018 | 1 | 1 | 0 | 0 | 208 | 0.481 | 0.000 | 0.000 | |
| 112 | | | | | | | 225.24.027 | 1 | 1 | 0 | 0 | 219 | 0.507 | 0.000 | 0.000 | |
| 113 | E | G | 95 | 25 | x | 45 | 225.22.063 | 1 | 1 | 0 | 0 | 251 | 0.581 | 0.000 | 0.000 | |
| 114 | | | | | | | 225.22.064 | 1 | 0 | 1 | 0 | 439 | 0.000 | 1.016 | 0.000 | |
| 115 | | | | 25 | y | 50 | 225.24.008 | 1 | 0 | 0 | 1 | 312 | 0.000 | 0.000 | 0.722 | |
| 116 | | | | | | | 225.22.065 | 1 | 1 | 0 | 0 | 529 | 1.225 | 0.000 | 0.000 | |
| 117 | | | | | | | 225.23.031 | 1 | 1 | 0 | 0 | 342 | 0.792 | 0.000 | 0.000 | |
| 118 | | | | | | | 225.22.077 | 1 | 0 | 0 | 1 | 304 | 0.000 | 0.000 | 0.704 | |
| 119 | | | | | | | 225.23.009 | 1 | 1 | 0 | 0 | 368 | 0.852 | 0.000 | 0.000 | |
| 120 | | | | | | | 225.23.021 | 1 | 0 | 1 | 0 | 457 | 0.000 | 1.058 | 0.000 | |
| 121 | | | | | | | 225.22.503 | 3 | 0.33 | 0.33 | 0.33 | 509 | 0.389 | 0.389 | 0.389 | |
| 122 | | | | | | | 225.22.077 | 1 | 0 | 0 | 1 | 304 | 0.000 | 0.000 | 0.704 | |
| 123 | | | | | | | 225.22.059 | 1 | 0 | 0 | 1 | 406 | 0.000 | 0.000 | 0.940 | |
| 124 | | | | | | | 225.22.502 | 3 | 0.33 | 0.33 | 0.33 | 324 | 0.248 | 0.248 | 0.248 | |
| 125 | B | C | 135 | 25 | k | 45 | 225.22.064 | 1 | 0 | 1 | 0 | 439 | 0.000 | 1.016 | 0.000 | |
| 126 | | | | | | | 225.24.001 | 1 | 1 | 0 | 0 | 317 | 0.734 | 0.000 | 0.000 | |
| 127 | | | | 25 | l | 40 | 225.22.085 | 1 | 1 | 0 | 0 | 506 | 1.171 | 0.000 | 0.000 | |
| 128 | | | | | | | 225.22.503 | 3 | 0.33 | 0.33 | 0.33 | 509 | 0.389 | 0.389 | 0.389 | |
| 129 | | | | | | | 225.24.001 | 1 | 0 | 1 | 0 | 317 | 0.000 | 0.734 | 0.000 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 130 | | | | | | | 225.23.402 | 3 | 0.33 | 0.33 | 0.33 | 384 | 0.296 | 0.296 | 0.296 | |
| 131 | | | | | | | 225.22.059 | 1 | 0 | 0 | 1 | 406 | 0.000 | 0.000 | 0.940 | |
| 132 | | | | 25 | m | 50 | 225.22.094A | 1 | 0 | 1 | 0 | 445 | 0.000 | 1.030 | 0.000 | |
| 133 | | | | | | | 225.23.008 | 1 | 1 | 0 | 0 | 518 | 1.199 | 0.000 | 0.000 | |
| 134 | | | | | | | 225.22.056 | 1 | 0 | 1 | 0 | 397 | 0.000 | 0.919 | 0.000 | |
| 135 | B | D | 310 | 25 | n | 65 | 225.22.078 | 1 | 1 | 0 | 0 | 616 | 1.426 | 0.000 | 0.000 | |
| 136 | | | | | | | 225.22.062 | 1 | 0 | 1 | 0 | 549 | 0.000 | 1.271 | 0.000 | |
| 137 | | | | 25 | o | 35 | 225.22.085 | 1 | 1 | 0 | 0 | 506 | 1.171 | 0.000 | 0.000 | |
| 138 | | | | | | | 225.22.092 | 1 | 1 | 0 | 0 | 540 | 1.250 | 0.000 | 0.000 | |
| 139 | | | | 25 | p | 50 | 225.24.511 | 3 | 0.33 | 0.33 | 0.33 | 2388 | 1.843 | 1.843 | 1.843 | |
| 140 | | | | | | | 225.23.501 | 3 | 0.33 | 0.33 | 0.33 | 1668 | 1.274 | 1.274 | 1.274 | |
| 141 | | | | | | | 225.22.093 | 1 | 0 | 0 | 1 | 945 | 0.000 | 0.000 | 2.188 | |
| 142 | | | | | | | 225.23.401 | 3 | 0.3 | 0.3 | 0.3 | 8019 | 6.126 | 6.126 | 6.126 | |
| 143 | | | | | | | 225.22.023 | 1 | 0 | 0 | 1 | 708 | 0.000 | 0.000 | 1.639 | |
| 144 | | | | | | | 225.22.078 | 1 | 0 | 1 | 0 | 616 | 0.000 | 1.426 | 0.000 | |
| 145 | | | | | | | 225.22.95Dup1 | 3 | 0.33 | 0.33 | 0.33 | 1243 | 0.950 | 0.950 | 0.950 | |
| 146 | | | | 25 | q | 45 | 225.24.406 | 3 | 0.33 | 0.33 | 0.33 | 4446 | 3.396 | 3.396 | 3.396 | |
| 147 | | | | | | | 225.24.403 | 3 | 0.33 | 0.33 | 0.33 | 2226 | 1.700 | 1.700 | 1.700 | |
| 148 | | | | 25 | r | 60 | 225.22.094 | 1 | 0 | 1 | 0 | 1191 | 0.000 | 2.757 | 0.000 | |
| 149 | | | | | | | 229.22.418 | ToD | 0.33 | 0.33 | 0.33 | 27677 | 21.142 | 21.142 | 21.142 | |
| 150 | | | | | | | 225.24.028 | 1 | 0 | 0 | 1 | 647 | 0.000 | 0.000 | 1.498 | |
| 151 | | | | 25 | s | 55 | 225.24.031 | 1 | 0 | 0 | 1 | 710 | 0.000 | 0.000 | 1.644 | |
| 152 | | | | | | | 225.23.010 | 1 | 0 | 1 | 0 | 754 | 0.000 | 1.745 | 0.000 | |

**Line and load data of Waterboring LT feeder for etap**

| Specification | | | | | Peak Load, kW | | | Peak Current, A | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Points | Length, m | Size, sq. mm | Resistance, ohm/km | Reactance, ohm/km | R | Y | B | IR | IY | IB |
| a | 190 | 95 | 0.397 | 0.086 | 0.093 | 0.037 | 0.046 | 0.424 | 0.170 | 0.212 |
| z | 60 | 25 | 1.49 | 0.096 | 0.028 | 0.025 | 0.097 | 0.127 | 0.117 | 0.445 |
| a1 | 70 | 25 | 1.49 | 0.096 | 0.141 | 0.424 | 0.000 | 0.646 | 1.939 | 0.000 |
| b1 | 60 | 25 | 1.49 | 0.096 | 0.530 | 0.451 | 0.979 | 2.426 | 2.066 | 4.481 |
| i1 | 65 | 95 | 0.397 | 0.086 | 0.088 | 0.025 | 0.100 | 0.403 | 0.117 | 0.456 |
| c1 | 55 | 95 | 0.397 | 0.086 | 0.000 | 0.000 | 0.586 | 0.000 | 0.000 | 2.680 |
| d1 | 45 | 95 | 0.397 | 0.086 | 0.315 | 0.000 | 1.007 | 1.441 | 0.000 | 4.608 |
| e1 | 35 | 95 | 0.397 | 0.086 | 0.484 | 0.241 | 0.412 | 2.214 | 1.102 | 1.886 |
| f1 | 40 | 95 | 0.397 | 0.086 | 0.206 | 0.648 | 0.373 | 0.943 | 2.966 | 1.706 |
| g1 | 55 | 95 | 0.397 | 0.086 | 1.083 | 0.954 | 0.329 | 4.958 | 4.365 | 1.504 |
| h1 | 65 | 95 | 0.397 | 0.086 | 0.995 | 0.366 | 0.164 | 4.555 | 1.674 | 0.752 |
| b | 45 | 50 | 0.796 | 0.09 | 0.317 | 0.000 | 0.000 | 1.451 | 0.000 | 0.000 |
| c | 35 | 50 | 0.796 | 0.09 | 0.405 | 0.086 | 0.514 | 1.854 | 0.392 | 2.351 |
| d | 45 | 50 | 0.796 | 0.09 | 1.095 | 1.637 | 1.972 | 5.011 | 7.490 | 9.026 |
| e | 50 | 50 | 0.796 | 0.09 | 1.079 | 0.000 | 0.863 | 4.937 | 0.000 | 3.952 |
| f | 45 | 50 | 0.796 | 0.09 | 0.898 | 0.803 | 0.190 | 4.111 | 3.676 | 0.869 |
| g | 35 | 50 | 0.796 | 0.09 | 0.315 | 0.000 | 0.403 | 1.441 | 0.000 | 1.843 |
| h | 50 | 50 | 0.796 | 0.09 | 0.000 | 0.449 | 0.326 | 0.000 | 2.055 | 1.494 |
| i | 40 | 50 | 0.796 | 0.09 | 0.271 | 0.000 | 0.338 | 1.240 | 0.000 | 1.547 |
| u | 50 | 50 | 0.796 | 0.09 | 2.841 | 1.813 | 2.713 | 13.001 | 8.297 | 12.419 |
| x | 45 | 25 | 1.49 | 0.096 | 0.581 | 1.016 | 0.000 | 2.659 | 4.651 | 0.000 |
| y | 50 | 25 | 1.49 | 0.096 | 3.504 | 1.694 | 3.706 | 16.038 | 7.754 | 16.960 |
| k | 45 | 25 | 1.49 | 0.096 | 0.734 | 1.016 | 0.000 | 3.358 | 4.651 | 0.000 |
| l | 40 | 25 | 1.49 | 0.096 | 1.856 | 1.419 | 1.625 | 8.496 | 6.494 | 7.437 |
| m | 50 | 25 | 1.49 | 0.096 | 1.199 | 1.949 | 0.000 | 5.488 | 8.920 | 0.000 |
| n | 65 | 25 | 1.49 | 0.096 | 1.426 | 1.271 | 0.000 | 6.526 | 5.816 | 0.000 |
| o | 35 | 25 | 1.49 | 0.096 | 2.421 | 0.000 | 0.000 | 11.081 | 0.000 | 0.000 |
| p | 50 | 25 | 1.49 | 0.096 | 10.192 | 11.618 | 14.018 | 46.645 | 53.171 | 64.157 |
| q | 45 | 25 | 1.49 | 0.096 | 5.097 | 5.097 | 5.097 | 23.326 | 23.326 | 23.326 |
| r | 60 | 25 | 1.49 | 0.096 | 21.142 | 23.899 | 22.640 | 96.760 | 109.378 | 103.615 |
| s | 55 | 25 | 1.49 | 0.096 | 0.000 | 1.745 | 1.644 | 0.000 | 7.988 | 7.522 |

**Line and load data of Waterboring LT feeder for Matlab**

| Specification | | | | | Peak Load, kW | | | Peak Current, A | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Points | Length, m | Size, sq. mm | Resistance, ohm/km | Reactance, ohm/km | R | Y | B | IR | IY | IB |
| A | 190 | 95 | 0.397 | 0.086 | 0.093 | 0.037 | 0.046 | 0.424 | 0.170 | 0.212 |
| J | 190 | 25 | 1.49 | 0.096 | 0.699 | 0.900 | 1.076 | 3.199 | 4.121 | 4.926 |
| K | 65 | 95 | 0.397 | 0.086 | 0.088 | 0.025 | 0.100 | 0.403 | 0.117 | 0.456 |
| H | 295 | 95 | 0.397 | 0.086 | 3.083 | 2.208 | 2.870 | 14.111 | 10.107 | 13.137 |
| B | 345 | 50 | 0.796 | 0.09 | 4.380 | 2.974 | 4.606 | 20.044 | 13.613 | 21.082 |
| E | 50 | 50 | 0.796 | 0.09 | 2.841 | 1.813 | 2.713 | 13.001 | 8.297 | 12.419 |
| G | 95 | 25 | 1.49 | 0.096 | 4.085 | 2.710 | 3.706 | 18.697 | 12.405 | 16.960 |
| C | 135 | 25 | 1.49 | 0.096 | 3.789 | 4.384 | 1.625 | 17.342 | 20.065 | 7.437 |
| D | 310 | 25 | 1.49 | 0.096 | 40.278 | 43.630 | 43.398 | 184.338 | 199.679 | 198.619 |

## APPENDIX G: LINE AND LOAD DATA FOR MACHHAPOKHARI ‘1’ DISTRIBUTION TRANSFORMER

**Transformer Location : Machhapokhari1**
**Transformer Capacity : 250 kVA**

| S.N | Specification | | | | | | Consumers | | Connected phase | | | Energy, kWh | Peak load, kW | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | From | To | Total distance, m | size, sq. mm | Load point | Distance between Load point | consumers ID | No. of Phase | R | Y | B | Billing of one month | R | Y | B | |
| 1 | 0 | A | 120 | 120 | a | 120 | 225-18-031 | 1 | 1 | 0 | 0 | 64 | 0.148 | 0.000 | 0.000 | |
| 2 | | | | | | | 225-18-099B | 1 | 1 | 0 | 0 | 63 | 0.146 | 0.000 | 0.000 | |
| 3 | | | | | | | 225-16-073 | 1 | 0 | 0 | 1 | 569 | 0.000 | 0.000 | 1.317 | |
| 4 | | | | | | | 225-20-104 | 1 | 0 | 1 | 0 | 61 | 0.000 | 0.141 | 0.000 | |
| 5 | | | | | | | 225-18-005 | 1 | 0 | 1 | 0 | 70 | 0.000 | 0.162 | 0.000 | |
| 6 | | | | | | | 225-15-501 | 3 | 0.33 | 0.33 | 0.33 | 43 | 0.033 | 0.033 | 0.033 | |
| 7 | | | | | | | 225-15-053 | 1 | 1 | 0 | 0 | 27 | 0.063 | 0.000 | 0.000 | |
| 8 | | | | | | | 225-16-044 | 1 | 1 | 0 | 0 | 911 | 2.109 | 0.000 | 0.000 | |
| 9 | | | | | | | 225-17-402 | 3 | 0.33 | 0.33 | 0.33 | 2847 | 2.175 | 2.175 | 2.175 | |
| 10 | A | B | 65 | 120 | b | 65 | 225-18-105kha | 1 | 0 | 0 | 1 | 89 | 0.000 | 0.000 | 0.206 | |
| 11 | | | | | | | 225-20-406 | 3 | 0.33 | 0.33 | 0.33 | 61 | 0.047 | 0.047 | 0.047 | |
| 12 | | | | | | | 225-20-082 | 1 | 0 | 1 | 0 | 82 | 0.000 | 0.190 | 0.000 | |
| 13 | | | | | | | 225-18-037 | 1 | 1 | 0 | 0 | 84 | 0.194 | 0.000 | 0.000 | |
| 14 | | | | | | | 225-18-111 | 1 | 0 | 1 | 0 | 67 | 0.000 | 0.155 | 0.000 | |
| 15 | | | | | | | 225-18-004 | 1 | 0 | 0 | 1 | 81 | 0.000 | 0.000 | 0.188 | |
| 16 | | | | | | | 225-18-501 | 3 | 0.33 | 0.33 | 0.33 | 1010 | 0.772 | 0.772 | 0.772 | |
| 17 | | | | | | | 225-16-54E | 1 | 0 | 0 | 0 | 1098 | 0.000 | 0.000 | 0.000 | |
| 18 | | | | | | | 225-18-059 | 1 | 1 | 0 | 0 | 99 | 0.229 | 0.000 | 0.000 | |
| 19 | | | | | | | 225-18-071 | 1 | 1 | 0 | 0 | 64 | 0.148 | 0.000 | 0.000 | |
| 20 | | | | | | | 225-18-046 | 1 | 0 | 0 | 1 | 70 | 0.000 | 0.000 | 0.162 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21 | B | C | 95 | 95 | c | 95 | 225-17-050 | 1 | 1 | 0 | 0 | 83 | 0.192 | 0.000 | 0.000 | |
| 22 | | | | | | | 225-17-049 | 1 | 0 | 0 | 1 | 79 | 0.000 | 0.000 | 0.183 | |
| 23 | | | | | | | 225-16-60ka2 | 1 | 0 | 1 | 0 | 601 | 0.000 | 1.391 | 0.000 | |
| 24 | | | | | | | 225-18-503 | 3 | 0.33 | 0.33 | 0.33 | 686 | 0.524 | 0.524 | 0.524 | |
| 25 | | | | | | | 225-17-043 | 1 | 0 | 0 | 1 | 647 | 0.000 | 0.000 | 1.498 | |
| 26 | | | | | | | 225-17-017ka | 1 | 0 | 0 | 1 | 85 | 0.000 | 0.000 | 0.197 | |
| 27 | | | | | | | 225-18-040 | 1 | 1 | 0 | 0 | 93 | 0.215 | 0.000 | 0.000 | |
| 28 | | | | | | | 225-18-050 | 1 | 0 | 0 | 1 | 83 | 0.000 | 0.000 | 0.192 | |
| 29 | C | D | 75 | 120 | d | 75 | 225-18-101A | 1 | 0 | 0 | 1 | 181 | 0.000 | 0.000 | 0.419 | |
| 30 | | | | | | | 225-18-101dup1 | 1 | 0 | 0 | 1 | 174 | 0.000 | 0.000 | 0.403 | |
| 31 | | | | | | | 225-18-096 | 1 | 0 | 1 | 0 | 104 | 0.000 | 0.241 | 0.000 | |
| 32 | | | | | | | 225-16-53ka | 1 | 0 | 0 | 1 | 160 | 0.000 | 0.000 | 0.370 | |
| 33 | | | | | | | 225-18-065 | 1 | 0 | 0 | 1 | 189 | 0.000 | 0.000 | 0.438 | |
| 34 | | | | | | | 225-18-099 | 1 | 0 | 0 | 1 | 346 | 0.000 | 0.000 | 0.801 | |
| 35 | | | | | | | 225-20-103 | 1 | 0 | 1 | 0 | 469 | 0.000 | 1.086 | 0.000 | |
| 36 | D | E | 130 | 120 | e | 70 | 225-15-083 | 1 | 0 | 0 | 1 | 138 | 0.000 | 0.000 | 0.319 | |
| 37 | | | | | | | 225-15-085 | 1 | 0 | 0 | 1 | 143 | 0.000 | 0.000 | 0.331 | |
| 38 | | | | | | | 225-20-093 | 1 | 0 | 1 | 0 | 153 | 0.000 | 0.354 | 0.000 | |
| 39 | | | | | | | 225-16-55ka2 | 1 | 0 | 0 | 1 | 24 | 0.000 | 0.000 | 0.056 | |
| 40 | | | | | | | 225-18-053 | 1 | 1 | 0 | 0 | 104 | 0.241 | 0.000 | 0.000 | |
| 41 | | | | | | | 225-18-056 | 1 | 0 | 0 | 1 | 186 | 0.000 | 0.000 | 0.431 | |
| 42 | | | | 120 | f | 60 | 225-18-057 | 1 | 0 | 1 | 0 | 187 | 0.000 | 0.433 | 0.000 | |
| 43 | | | | | | | 225-20-085 | 1 | 1 | 0 | 0 | 112 | 0.259 | 0.000 | 0.000 | |
| 44 | | | | | | | 225-18-058 | 1 | 1 | 0 | 0 | 196 | 0.454 | 0.000 | 0.000 | |
| 45 | | | | | | | 225-16-078 | 1 | 1 | 0 | 0 | 154 | 0.356 | 0.000 | 0.000 | |
| 46 | | | | | | | 225-15-080 | 1 | 0 | 0 | 1 | 186 | 0.000 | 0.000 | 0.431 | |
| 47 | | | | | | | 225-17-103 | 1 | 1 | 0 | 0 | 171 | 0.396 | 0.000 | 0.000 | |
| 48 | E | F | 50 | 95 | g | 50 | 225-15-080 | 1 | 1 | 0 | 0 | 186 | 0.431 | 0.000 | 0.000 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 49 | | | | | | | 225-15-71ka | 1 | 1 | 0 | 0 | 167 | 0.387 | 0.000 | 0.000 | |
| 50 | | | | | | | 225-15-077 | 1 | 1 | 0 | 0 | 152 | 0.352 | 0.000 | 0.000 | |
| 51 | | | | | | | 225-16-54C | 1 | 1 | 0 | 0 | 22 | 0.051 | 0.000 | 0.000 | |
| 52 | | | | | | | 225-20-088 | 1 | 0 | 0 | 1 | 234 | 0.000 | 0.000 | 0.542 | |
| 53 | | | | | | | 225-18-051 | 1 | 0 | 0 | 1 | 203 | 0.000 | 0.000 | 0.470 | |
| 54 | | | | | | | 225-17-17kha | 1 | 0 | 0 | 1 | 278 | 0.000 | 0.000 | 0.644 | |
| 55 | | | | | | | 225-15-17 | 1 | 0 | 1 | 0 | 202 | 0.000 | 0.468 | 0.000 | |
| 56 | | | | 50 | h | 80 | 225-15-017kha | 1 | 1 | 0 | 0 | 278 | 0.644 | 0.000 | 0.000 | |
| 57 | | | | | | | 225-17-008 | 1 | 0 | 0 | 1 | 214 | 0.000 | 0.000 | 0.495 | |
| 58 | | | | | | | 225-17-009 | 1 | 0 | 1 | 0 | 235 | 0.000 | 0.544 | 0.000 | |
| 59 | | | | | | | 225-15-065 | 1 | 0 | 1 | 0 | 260 | 0.000 | 0.602 | 0.000 | |
| 60 | F | G | 130 | | | | 225-16-076 | 1 | 0 | 0 | 1 | 297 | 0.000 | 0.000 | 0.688 | |
| 61 | | | | | | | 225-20-089 | 1 | 1 | 0 | 0 | 217 | 0.502 | 0.000 | 0.000 | |
| 62 | | | | | | | 225-15-065 | 1 | 0 | 1 | 0 | 260 | 0.000 | 0.602 | 0.000 | |
| 63 | | | | | | | 225-20-080 | 1 | 0 | 0 | 1 | 234 | 0.000 | 0.000 | 0.542 | |
| 64 | | | | | | | 225-20-078kha | 1 | 0 | 0 | 1 | 217 | 0.000 | 0.000 | 0.502 | |
| 65 | | | | 50 | i | 50 | 225-15-076 | 1 | 1 | 0 | 0 | 206 | 0.477 | 0.000 | 0.000 | |
| 66 | | | | | | | 225-20-090 | 1 | 0 | 0 | 1 | 230 | 0.000 | 0.000 | 0.532 | |
| 67 | | | | | | | 225-17-004 | 1 | 0 | 0 | 1 | 194 | 0.000 | 0.000 | 0.449 | |
| 68 | | | | | | | 225-18-002 | 1 | 1 | 0 | 0 | 204 | 0.472 | 0.000 | 0.000 | |
| 69 | | | | | | | 225-18-008 | 1 | 0 | 1 | 0 | 357 | 0.000 | 0.826 | 0.000 | |
| 70 | | | | | | | 225-18-018 | 1 | 1 | 0 | 0 | 333 | 0.771 | 0.000 | 0.000 | |
| 71 | | | | | | | 225-18-006 | 1 | 1 | 0 | 0 | 379 | 0.877 | 0.000 | 0.000 | |
| 72 | | | | 25 | j | 65 | 225-18-019 | 1 | 0 | 0 | 1 | 324 | 0.000 | 0.000 | 0.750 | |
| 73 | G | H | 145 | | | | 225-20-94 | 1 | 0 | 0 | 1 | 319 | 0.000 | 0.000 | 0.738 | |
| 74 | | | | | | | 225-20-105 | 1 | 0 | 0 | 1 | 296 | 0.000 | 0.000 | 0.685 | |
| 75 | | | | 25 | k | 80 | 225-20-97 | 1 | 0 | 0 | 1 | 234 | 0.000 | 0.000 | 0.542 | |
| 76 | | | | | | | 225-20-105 | 1 | 1 | 0 | 0 | 296 | 0.685 | 0.000 | 0.000 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 77 | | | | | | | 225-18-101ka | 1 | 1 | 0 | 0 | 238 | 0.551 | 0.000 | 0.000 | |
| 78 | | | | | | | 225-18-103 | 1 | 1 | 0 | 0 | 228 | 0.528 | 0.000 | 0.000 | |
| 79 | | | | | | | 225-15-009 | 1 | 0 | 1 | 0 | 380 | 0.000 | 0.880 | 0.000 | |
| 80 | D | I | 175 | 120 | l | 100 | 225-18-101 | 1 | 0 | 1 | 0 | 189 | 0.000 | 0.438 | 0.000 | |
| 81 | | | | | | | 225-18-003 | 1 | 0 | 0 | 1 | 177 | 0.000 | 0.000 | 0.410 | |
| 82 | | | | | | | 225-15-072 | 1 | 1 | 0 | 0 | 178 | 0.412 | 0.000 | 0.000 | |
| 83 | | | | | | | 225-15-073 | 1 | 0 | 0 | 1 | 153 | 0.000 | 0.000 | 0.354 | |
| 84 | | | | | | | 225-15-079 | 1 | 1 | 0 | 0 | 207 | 0.479 | 0.000 | 0.000 | |
| 85 | | | | | | | 225-18-007 | 1 | 0 | 1 | 0 | 194 | 0.000 | 0.449 | 0.000 | |
| 86 | | | | | | | 225-17-078 | 1 | 0 | 0 | 1 | 144 | 0.000 | 0.000 | 0.333 | |
| 87 | | | | | | | 225-17-014 | 1 | 1 | 0 | 0 | 162 | 0.375 | 0.000 | 0.000 | |
| 88 | | | | | | | 225-17-033 | 1 | 1 | 0 | 0 | 96 | 0.222 | 0.000 | 0.000 | |
| 89 | | | | | | | 225-18-049dup1 | 1 | 1 | 0 | 0 | 198 | 0.458 | 0.000 | 0.000 | |
| 90 | | | | 120 | m | 75 | 225-18-032B | 1 | 0 | 0 | 1 | 100 | 0.000 | 0.000 | 0.231 | |
| 91 | | | | | | | 225-17-012A | 1 | 0 | 1 | 0 | 161 | 0.000 | 0.373 | 0.000 | |
| 92 | | | | | | | 225-17-017 | 1 | 0 | 1 | 0 | 202 | 0.000 | 0.468 | 0.000 | |
| 93 | | | | | | | 225-17-018 | 1 | 1 | 0 | 0 | 156 | 0.361 | 0.000 | 0.000 | |
| 94 | | | | | | | 225-17-019 | 1 | 1 | 0 | 0 | 100 | 0.231 | 0.000 | 0.000 | |
| 95 | | | | | | | 225-17-016 | 1 | 1 | 0 | 0 | 115 | 0.266 | 0.000 | 0.000 | |
| 96 | | | | | | | 225-15-081 | 1 | 0 | 1 | 0 | 113 | 0.000 | 0.262 | 0.000 | |
| 97 | | | | | | | 225-17-039 | 1 | 1 | 0 | 0 | 186 | 0.431 | 0.000 | 0.000 | |
| 98 | I | J | 155 | 95 | n | 75 | 225-17-045 | 1 | 1 | 0 | 0 | 153 | 0.354 | 0.000 | 0.000 | |
| 99 | | | | | | | 225-17-042 | 1 | 0 | 0 | 1 | 140 | 0.000 | 0.000 | 0.324 | |
| 100 | | | | | | | 225-17-036 | 1 | 0 | 0 | 1 | 125 | 0.000 | 0.000 | 0.289 | |
| 101 | | | | | | | 225-17-089 | 1 | 0 | 1 | 0 | 129 | 0.000 | 0.299 | 0.000 | |
| 102 | | | | | | | 225-17-031 | 1 | 0 | 0 | 1 | 160 | 0.000 | 0.000 | 0.370 | |
| 103 | | | | | | | 225-18-010 | 1 | 0 | 0 | 1 | 158 | 0.000 | 0.000 | 0.366 | |
| 104 | | | | 95 | o | 80 | 225-17-012 | 1 | 0 | 0 | 1 | 299 | 0.000 | 0.000 | 0.692 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 105 | | | | | | | 225-17-038 | 1 | 0 | 1 | 0 | 251 | 0.000 | 0.581 | 0.000 | |
| 106 | | | | | | | 225-17-013 | 1 | 0 | 0 | 1 | 211 | 0.000 | 0.000 | 0.488 | |
| 107 | | | | | | | 225-15-086 | 1 | 0 | 1 | 0 | 198 | 0.000 | 0.458 | 0.000 | |
| 108 | | | | | | | 225-17-101 | 1 | 1 | 0 | 0 | 193 | 0.447 | 0.000 | 0.000 | |
| 109 | | | | | | | 225-18-014 | 1 | 1 | 0 | 0 | 191 | 0.442 | 0.000 | 0.000 | |
| 110 | J | K | 65 | 95 | p | 65 | 225-16-061kha | 1 | 0 | 1 | 0 | 221 | 0.000 | 0.512 | 0.000 | |
| 111 | | | | | | | 225-16-070 | 1 | 0 | 0 | 1 | 205 | 0.000 | 0.000 | 0.475 | |
| 112 | | | | | | | 225-15-084 | 1 | 0 | 0 | 1 | 280 | 0.000 | 0.000 | 0.648 | |
| 113 | | | | | | | 225-15-082 | 1 | 1 | 0 | 0 | 215 | 0.498 | 0.000 | 0.000 | |
| 114 | | | | | | | 225-17-044 | 1 | 0 | 1 | 0 | 276 | 0.000 | 0.639 | 0.000 | |
| 115 | | | | | | | 225-17-028 | 1 | 0 | 0 | 1 | 257 | 0.000 | 0.000 | 0.595 | |
| 116 | | | | | | | 225-18-012 | 1 | 1 | 0 | 0 | 299 | 0.692 | 0.000 | 0.000 | |
| 117 | | | | | | | 225-18-013 | 1 | 0 | 1 | 0 | 211 | 0.000 | 0.488 | 0.000 | |
| 118 | J | L | 140 | 95 | q | 65 | 225-18-029 | 1 | 0 | 0 | 1 | 280 | 0.000 | 0.000 | 0.648 | |
| 119 | | | | | | | 225-18-034 | 1 | 1 | 0 | 0 | 307 | 0.711 | 0.000 | 0.000 | |
| 120 | | | | | | | 225-18-104 | 1 | 0 | 0 | 1 | 201 | 0.000 | 0.000 | 0.465 | |
| 121 | | | | | | | 225-18-105ga | 1 | 0 | 0 | 1 | 201 | 0.000 | 0.000 | 0.465 | |
| 122 | | | | | | | 225-16-038 | 1 | 1 | 0 | 0 | 256 | 0.593 | 0.000 | 0.000 | |
| 123 | | | | | | | 225-16-57 | 1 | 0 | 0 | 1 | 212 | 0.000 | 0.000 | 0.491 | |
| 124 | | | | 95 | r | 75 | 225-16-56 | 1 | 0 | 1 | 0 | 272 | 0.000 | 0.630 | 0.000 | |
| 125 | | | | | | | 225-18-029ka | 1 | 1 | 0 | 0 | 199 | 0.461 | 0.000 | 0.000 | |
| 126 | | | | | | | 225-18-029A | 1 | 1 | 0 | 0 | 208 | 0.481 | 0.000 | 0.000 | |
| 127 | | | | | | | 225-18-029B | 1 | 1 | 1 | 1 | 219 | 0.507 | 0.507 | 0.507 | |
| 128 | J | M | 150 | 95 | s | 50 | 225-18-102 | 1 | 0 | 1 | 0 | 215 | 0.000 | 0.498 | 0.000 | |
| 129 | | | | | | | 225-18-099ka | 1 | 0 | 0 | 1 | 204 | 0.000 | 0.000 | 0.472 | |
| 130 | | | | | | | 225-16-072 | 1 | 1 | 0 | 0 | 267 | 0.618 | 0.000 | 0.000 | |
| 131 | | | | | | | 225-18-051 | 1 | 0 | 1 | 0 | 203 | 0.000 | 0.470 | 0.000 | |
| 132 | | | | | | | 225-20-010 | 1 | 0 | 0 | 1 | 274 | 0.000 | 0.000 | 0.634 | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 133 | | | | | | | 225-15-063 | 1 | 0 | 0 | 1 | 249 | 0.000 | 0.000 | 0.576 | |
| 134 | | | | | | | 225-15-065 | 1 | 0 | 1 | 0 | 260 | 0.000 | 0.602 | 0.000 | |
| 135 | | | | | | | 225-15-066 | 1 | 0 | 0 | 1 | 223 | 0.000 | 0.000 | 0.516 | |
| 136 | | | | | | | 225-16-075 | 1 | 0 | 0 | 1 | 240 | 0.000 | 0.000 | 0.556 | |
| 137 | | | | | | | 225-18-107 | 1 | 0 | 1 | 0 | 200 | 0.000 | 0.463 | 0.000 | |
| 138 | | | | 95 | t | 100 | 225-18-100 | 1 | 1 | 0 | 0 | 288 | 0.667 | 0.000 | 0.000 | |
| 139 | | | | | | | 225-16-062 | 1 | 0 | 0 | 1 | 319 | 0.000 | 0.000 | 0.738 | |
| 140 | | | | | | | 225-17-048 | 1 | 0 | 0 | 1 | 230 | 0.000 | 0.000 | 0.532 | |
| 141 | | | | | | | 225-18-063 | 1 | 1 | 0 | 0 | 256 | 0.593 | 0.000 | 0.000 | |
| 142 | | | | | | | 225-18-001 | 1 | 1 | 0 | 0 | 236 | 0.546 | 0.000 | 0.000 | |
| 143 | | | | | | | 225-18-055 | 1 | 0 | 0 | 1 | 337 | 0.000 | 0.000 | 0.780 | |
| 144 | | | | | | | 225-15-046 | 1 | 0 | 1 | 0 | 381 | 0.000 | 0.882 | 0.000 | |
| 145 | | | | | | | 225-16-60ka | 1 | 1 | 0 | 0 | 302 | 0.699 | 0.000 | 0.000 | |
| 146 | | | | | | | 225-16-58 | 1 | 0 | 1 | 0 | 303 | 0.000 | 0.701 | 0.000 | |
| 147 | | | | 50 | u | 50 | 225-18-067 | 1 | 1 | 0 | 0 | 366 | 0.847 | 0.000 | 0.000 | |
| 148 | | | | | | | 225-18-062 | 1 | 0 | 1 | 0 | 319 | 0.000 | 0.738 | 0.000 | |
| 149 | | | | | | | 225-16-061 | 1 | 1 | 0 | 0 | 362 | 0.838 | 0.000 | 0.000 | |
| 150 | | | | | | | 225-16-068 | 1 | 0 | 0 | 1 | 318 | 0.000 | 0.000 | 0.736 | |
| 151 | | | | | | | 225-16-065 | 1 | 0 | 0 | 1 | 367 | 0.000 | 0.000 | 0.850 | |
| 152 | M | N | 115 | | | | 225-15-064 | 1 | 0 | 0 | 1 | 353 | 0.000 | 0.000 | 0.817 | |
| 153 | | | | | | | 225-18-106 | 1 | 0 | 1 | 0 | 352 | 0.000 | 0.815 | 0.000 | |
| 154 | | | | | | | 225-18-106kha | 1 | 0 | 1 | 0 | 341 | 0.000 | 0.789 | 0.000 | |
| 155 | | | | | | | 225-16-041 | 1 | 0 | 0 | 1 | 333 | 0.000 | 0.000 | 0.771 | |
| 156 | | | | 50 | v | 65 | 225-18-029ga | 1 | 1 | 0 | 0 | 312 | 0.722 | 0.000 | 0.000 | |
| 157 | | | | | | | 225-15-043 | 1 | 0 | 1 | 0 | 374 | 0.000 | 0.866 | 0.000 | |
| 158 | | | | | | | 225-16-077 | 1 | 1 | 0 | 0 | 447 | 1.035 | 0.000 | 0.000 | |
| 159 | | | | | | | 225-18-108 | 1 | 1 | 0 | 0 | 361 | 0.836 | 0.000 | 0.000 | |
| 160 | | | | | | | 225-18-109 | 1 | 0 | 1 | 0 | 246 | 0.000 | 0.569 | 0.000 | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 161 | N | O | 105 | 25 | w | 50 | 225-16-064 | 1 | 1 | 0 | 0 | 565 | 1.308 | 0.000 | 0.000 | |
| 162 | | | | | | | 225-16-061ka | 1 | 0 | 0 | 1 | 433 | 0.000 | 0.000 | 1.002 | |
| 163 | | | | | | | 225-18-039 | 1 | 0 | 0 | 1 | 17 | 0.000 | 0.000 | 0.039 | |
| 164 | | | | | | | 225-17-027 | 1 | 1 | 0 | 0 | 541 | 1.252 | 0.000 | 0.000 | |
| 165 | | | | | | | 225-18-031ka | 1 | 1 | 0 | 0 | 522 | 1.208 | 0.000 | 0.000 | |
| 166 | | | | | | | 225-18-032 | 1 | 0 | 1 | 0 | 401 | 0.000 | 0.928 | 0.000 | |
| 167 | | | | | | | 225-18-009 | 1 | 0 | 0 | 1 | 411 | 0.000 | 0.000 | 0.951 | |
| 168 | | | | | | | 225-17-011 | 1 | 0 | 0 | 1 | 511 | 0.000 | 0.000 | 1.183 | |
| 169 | | | | | | | 225-18-101B | 1 | 1 | 0 | 0 | 463 | 1.072 | 0.000 | 0.000 | |
| 170 | | | | 25 | x | 55 | 225-18-009 | 1 | 0 | 0 | 1 | 411 | 0.000 | 0.000 | 0.951 | |
| 171 | | | | | | | 225-20-98 | 1 | 0 | 0 | 1 | 134 | 0.000 | 0.000 | 0.310 | |
| 172 | | | | | | | 225-20-106 | 1 | 0 | 0 | 1 | 70 | 0.000 | 0.000 | 0.162 | |
| 173 | | | | | | | 225-16-54kha1 | 1 | 1 | 0 | 0 | 412 | 0.954 | 0.000 | 0.000 | |
| 174 | | | | | | | 225-20-96 | 1 | 0 | 1 | 0 | 410 | 0.000 | 0.949 | 0.000 | |
| 175 | | | | | | | 225-18-106ka | 1 | 0 | 1 | 0 | 459 | 0.000 | 1.063 | 0.000 | |
| 176 | | | | | | | 225-16-042 | 1 | 0 | 1 | 0 | 449 | 0.000 | 1.039 | 0.000 | |
| 177 | O | P | 140 | 50 | y | 75 | 225-16-54ka | 1 | 0 | 1 | 0 | 505 | 0.000 | 1.169 | 0.000 | |
| 178 | | | | | | | 225-18-034ka | 1 | 0 | 1 | 0 | 880 | 0.000 | 2.037 | 0.000 | |
| 179 | | | | | | | 225-20-102 | 1 | 0 | 1 | 0 | 634 | 0.000 | 1.468 | 0.000 | |
| 180 | | | | | | | 225-18-059ka | 1 | 1 | 0 | 0 | 66 | 0.153 | 0.000 | 0.000 | |
| 181 | | | | | | | 225-16-54ka4 | 1 | 0 | 1 | 0 | 98 | 0.000 | 0.227 | 0.000 | |
| 182 | | | | | | | 225-18-054 | 1 | 1 | 1 | 1 | 920 | 2.130 | 2.130 | 2.130 | |
| 183 | | | | | | | 225-16-501 | 3 | 0.33 | 0.33 | 0.33 | 1491 | 1.139 | 1.139 | 1.139 | |
| 184 | | | | | | | 225-16-53 | 1 | 0 | 1 | 0 | 604 | 0.000 | 1.398 | 0.000 | |
| 185 | | | | | | | 225-18-049ka | 1 | 0 | 1 | 0 | 88 | 0.000 | 0.204 | 0.000 | |
| 186 | | | | | | | 225-18-038 | 1 | 1 | 0 | 0 | 81 | 0.188 | 0.000 | 0.000 | |
| 187 | | | | | | | 225-18-049 | 1 | 0 | 0 | 1 | 79 | 0.000 | 0.000 | 0.183 | |
| 188 | | | | | | | 225-16-060 | 1 | 0 | 1 | 0 | 685 | 0.000 | 1.586 | 0.000 | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 189 | | | | | | | 225-16-59 | 1 | 1 | 0 | 0 | 502 | 1.162 | 0.000 | 0.000 | |
| 190 | | | | | | | 225-18-039 | 1 | 0 | 1 | 0 | 17 | 0.000 | 0.039 | 0.000 | |
| 191 | | | | | | | 225-20-083 | 1 | 0 | 1 | 0 | 62 | 0.000 | 0.144 | 0.000 | |
| 192 | | | | 50 | z | 65 | 225-15-065A | 3 | 0.33 | 0.33 | 0.33 | 1670 | 1.276 | 1.276 | 1.276 | |
| 193 | | | | | | | 225-19-023 | 1 | 0 | 1 | 0 | 705 | 0.000 | 1.632 | 0.000 | |
| 194 | | | | | | | 225-15-045 | 1 | 0 | 0 | 0 | 861 | 0.000 | 0.000 | 0.000 | |
| 195 | | | | | | | 225-18-098A | 1 | 1 | 0 | 0 | 141 | 0.326 | 0.000 | 0.000 | |
| 196 | | | | | | | 225-15-047 | 1 | 0 | 1 | 0 | 171 | 0.000 | 0.396 | 0.000 | |
| 197 | | | | | | | 225-15-049 | 1 | 1 | 0 | 0 | 163 | 0.377 | 0.000 | 0.000 | |
| 198 | | | | | | | 225-16-55 | 1 | 1 | 0 | 0 | 122 | 0.282 | 0.000 | 0.000 | |
| 199 | | | | | | | 225-18-098 | 1 | 0 | 1 | 0 | 190 | 0.000 | 0.440 | 0.000 | |
| 200 | | | | 95 | a1 | 75 | 225-20-012 | 1 | 0 | 0 | 1 | 131 | 0.000 | 0.000 | 0.303 | |
| 201 | | | | | | | 225-18-099A | 1 | 0 | 0 | 1 | 120 | 0.000 | 0.000 | 0.278 | |
| 202 | | | | | | | 225-18-047 | 1 | 0 | 0 | 1 | 172 | 0.000 | 0.000 | 0.398 | |
| 203 | | | | | | | 225-15-044 | 1 | 0 | 0 | 1 | 174 | 0.000 | 0.000 | 0.403 | |
| 204 | | | | | | | 225-18-045 | 1 | 0 | 0 | 1 | 167 | 0.000 | 0.000 | 0.387 | |
| 205 | A | F1 | 135 | | | | 225-18-035 | 1 | 1 | 0 | 0 | 135 | 0.313 | 0.000 | 0.000 | |
| 206 | | | | | | | 225-18-036 | 1 | 0 | 0 | 1 | 125 | 0.000 | 0.000 | 0.289 | |
| 207 | | | | | | | 225-16-063 | 1 | 1 | 0 | 0 | 188 | 0.435 | 0.000 | 0.000 | |
| 208 | | | | | | | 225-16-069 | 1 | 1 | 0 | 0 | 115 | 0.266 | 0.000 | 0.000 | |
| 209 | | | | | | | 225-18-042 | 1 | 1 | 0 | 0 | 140 | 0.324 | 0.000 | 0.000 | |
| 210 | | | | | | | 225-18-043 | 1 | 0 | 1 | 0 | 137 | 0.000 | 0.317 | 0.000 | |
| 211 | | | | 95 | b1 | 60 | 225-15-502 | 3 | 0.33 | 0.33 | 0.33 | 138 | 0.105 | 0.105 | 0.105 | |
| 212 | | | | | | | 225-18-098E | 1 | 1 | 0 | 0 | 142 | 0.329 | 0.000 | 0.000 | |
| 213 | | | | | | | 225-18-098B | 1 | 0 | 0 | 1 | 134 | 0.000 | 0.000 | 0.310 | |
| 214 | | | | | | | 225-18-101kha | 1 | 1 | 0 | 0 | 122 | 0.282 | 0.000 | 0.000 | |
| 215 | | | | | | | 225-18-105 | 1 | 0 | 1 | 0 | 130 | 0.000 | 0.301 | 0.000 | |
| 216 | | | | | | | 225-18-097 | 1 | 1 | 0 | 0 | 171 | 0.396 | 0.000 | 0.000 | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 217 | | | | | | | 225-18-095 | 1 | 0 | 0 | 1 | 179 | 0.000 | 0.000 | 0.414 | |

**Line and load data of Machhapokhari1 LT feeder for etap**

| Specification | | | | | Peak Load, kW | | | Peak Current, A | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Points | Length, m | Size, sq. mm | Resistance, ohm/km | Reactance, ohm/km | R | Y | B | IR | IY | IB |
| a | 120 | 120 | 0.314 | 0.084 | 4.673 | 2.511 | 3.525 | 21.386 | 11.491 | 16.132 |
| b | 65 | 120 | 0.314 | 0.084 | 1.390 | 1.163 | 1.374 | 6.361 | 5.323 | 6.287 |
| c | 95 | 95 | 0.397 | 0.086 | 0.931 | 1.915 | 2.593 | 4.263 | 8.765 | 11.869 |
| d | 75 | 120 | 0.314 | 0.084 | 0.000 | 1.326 | 2.431 | 0.000 | 6.070 | 11.124 |
| e | 70 | 120 | 0.314 | 0.084 | 0.241 | 0.354 | 1.137 | 1.102 | 1.621 | 5.202 |
| f | 60 | 120 | 0.314 | 0.084 | 1.465 | 0.433 | 0.431 | 6.706 | 1.981 | 1.971 |
| g | 50 | 95 | 0.397 | 0.086 | 1.220 | 0.000 | 0.000 | 5.583 | 0.000 | 0.000 |
| h | 80 | 50 | 0.796 | 0.09 | 0.644 | 1.613 | 2.838 | 2.945 | 7.384 | 12.988 |
| i | 50 | 50 | 0.796 | 0.09 | 1.451 | 1.428 | 2.025 | 6.643 | 6.537 | 9.270 |
| j | 65 | 25 | 1.49 | 0.096 | 1.648 | 0.000 | 2.174 | 7.543 | 0.000 | 9.948 |
| k | 80 | 25 | 1.49 | 0.096 | 1.764 | 0.880 | 0.542 | 8.073 | 4.026 | 2.479 |
| l | 100 | 120 | 0.314 | 0.084 | 1.947 | 0.887 | 1.097 | 8.910 | 4.058 | 5.022 |
| m | 75 | 120 | 0.314 | 0.084 | 1.289 | 1.102 | 0.231 | 5.901 | 5.043 | 1.059 |
| n | 75 | 95 | 0.397 | 0.086 | 0.354 | 0.299 | 1.350 | 1.621 | 1.367 | 6.176 |
| o | 80 | 95 | 0.397 | 0.086 | 0.889 | 1.039 | 1.181 | 4.068 | 4.757 | 5.403 |
| p | 65 | 95 | 0.397 | 0.086 | 1.190 | 1.639 | 1.718 | 5.445 | 7.501 | 7.861 |
| q | 65 | 95 | 0.397 | 0.086 | 1.303 | 0.000 | 2.069 | 5.964 | 0.000 | 9.471 |
| r | 75 | 95 | 0.397 | 0.086 | 1.449 | 1.137 | 0.507 | 6.632 | 5.202 | 2.320 |
| s | 50 | 95 | 0.397 | 0.086 | 0.618 | 1.569 | 1.683 | 2.829 | 7.183 | 7.702 |
| t | 100 | 95 | 0.397 | 0.086 | 1.806 | 0.463 | 2.343 | 8.263 | 2.119 | 10.721 |
| u | 50 | 50 | 0.796 | 0.09 | 2.384 | 2.322 | 2.366 | 10.912 | 10.626 | 10.827 |
| v | 65 | 50 | 0.796 | 0.09 | 2.593 | 3.039 | 1.588 | 11.865 | 13.910 | 7.268 |
| w | 50 | 25 | 1.49 | 0.096 | 4.840 | 0.928 | 3.176 | 22.152 | 4.248 | 14.535 |
| x | 55 | 25 | 1.49 | 0.096 | 0.954 | 3.051 | 1.424 | 4.365 | 13.963 | 6.515 |
| y | 75 | 50 | 0.796 | 0.09 | 4.771 | 11.396 | 3.451 | 21.835 | 52.155 | 15.796 |
| z | 65 | 50 | 0.796 | 0.09 | 1.276 | 3.051 | 1.276 | 5.838 | 13.964 | 5.838 |
| a1 | 75 | 95 | 0.397 | 0.086 | 1.299 | 0.836 | 1.769 | 5.943 | 3.824 | 8.094 |
| b1 | 60 | 95 | 0.397 | 0.086 | 2.138 | 0.723 | 1.119 | 9.784 | 3.311 | 5.123 |

**Line and load data of Machhapokhari1 LT feeder for Matlab**

| Specification | | | | | Peak Load, kW | | | Peak Current, A | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Points | Length, m | Size, sq. mm | Resistance, ohm/km | Reactance, ohm/km | R | Y | B | IR | IY | IB |
| A | 120 | 120 | 0.314 | 0.084 | 4.673 | 2.511 | 3.525 | 21.386 | 11.491 | 16.132 |
| B | 65 | 120 | 0.314 | 0.084 | 1.390 | 1.163 | 1.374 | 6.361 | 5.323 | 6.287 |
| C | 95 | 95 | 0.397 | 0.086 | 0.931 | 1.915 | 2.593 | 4.263 | 8.765 | 11.869 |
| D | 75 | 120 | 0.314 | 0.084 | 0.000 | 1.326 | 2.431 | 0.000 | 6.070 | 11.124 |
| E | 130 | 120 | 0.314 | 0.084 | 1.706 | 0.787 | 1.567 | 7.808 | 3.602 | 7.172 |
| F | 50 | 95 | 0.397 | 0.086 | 1.220 | 0.000 | 0.000 | 5.583 | 0.000 | 0.000 |
| G | 130 | 50 | 0.796 | 0.09 | 2.095 | 3.042 | 4.863 | 9.588 | 13.921 | 22.258 |
| H | 145 | 25 | 1.49 | 0.096 | 3.412 | 0.880 | 2.715 | 15.616 | 4.026 | 12.427 |
| I | 175 | 120 | 0.314 | 0.084 | 3.236 | 1.988 | 1.329 | 14.811 | 9.100 | 6.081 |
| J | 155 | 95 | 0.397 | 0.086 | 1.243 | 1.338 | 2.530 | 5.689 | 6.123 | 11.579 |
| K | 65 | 95 | 0.397 | 0.086 | 1.190 | 1.639 | 1.718 | 5.445 | 7.501 | 7.861 |
| L | 140 | 95 | 0.397 | 0.086 | 2.752 | 1.137 | 2.576 | 12.596 | 5.202 | 11.791 |
| M | 150 | 95 | 0.397 | 0.086 | 2.424 | 2.032 | 4.025 | 11.092 | 9.302 | 18.423 |
| N | 115 | 50 | 0.796 | 0.09 | 4.977 | 5.361 | 3.954 | 22.777 | 24.536 | 18.095 |
| O | 105 | 25 | 1.49 | 0.096 | 5.794 | 3.979 | 4.600 | 26.517 | 18.211 | 21.051 |
| P | 140 | 50 | 0.796 | 0.09 | 6.047 | 14.447 | 4.727 | 27.673 | 66.119 | 21.635 |
| F1 | 135 | 95 | 0.397 | 0.086 | 3.436 | 1.559 | 2.888 | 15.727 | 7.136 | 13.217 |

## APPENDIX H: LINE AND LOAD DATA FOR MACHHAPOKHARI ‘2’ DISTRIBUTION TRANSFOMER

**Transformer Location : Machhapokhari2**
**Capacity : 300 kVA**

| S.N | Specification | | | | | | Consumers | | Connected phase | | | Energy, kWh | Peak load, kW | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | From | To | Total distance, m | size, sq. mm | Load point | Distance between Load point | consumers ID | No. of phase | R | Y | B | Billing of one month | R | Y | B | |
| 1 | 0 | A | 195 | 95 | a | 110 | 225-16-038 | 1 | 1 | 0 | 0 | 256 | 0.593 | 0.000 | 0.000 | |
| 2 | | | | | | | 225-16-042 | 1 | 0 | 1 | 0 | 449 | 0.000 | 1.039 | 0.000 | |
| 3 | | | | | | | 225-16-041 | 1 | 0 | 0 | 1 | 333 | 0.000 | 0.000 | 0.771 | |
| 4 | | | | 95 | b | 85 | 225-13-086 | 1 | 1 | 0 | 0 | 24 | 0.056 | 0.000 | 0.000 | |
| 5 | A | B | 455 | 95 | c | 85 | 225-12-019 | 1 | 0 | 0 | 1 | 33 | 0.000 | 0.000 | 0.076 | |
| 6 | | | | | | | 225-11-034 | 1 | 1 | 0 | 0 | 96 | 0.222 | 0.000 | 0.000 | |
| 7 | | | | | | | 225-12-002 | 1 | 0 | 1 | 0 | 72 | 0.000 | 0.167 | 0.000 | |
| 8 | | | | | | | 225-15-004 | 1 | 1 | 0 | 0 | 218 | 0.505 | 0.000 | 0.000 | |
| 9 | | | | | | | 225-16-016 | 1 | 1 | 1 | 1 | 15 | 0.035 | 0.035 | 0.035 | |
| 10 | | | | | | | 225-13-070 | 1 | 0 | 0 | 1 | 316 | 0.000 | 0.000 | 0.731 | |
| 11 | | | | | | | 225-16-023A | 1 | 1 | 0 | 0 | 214 | 0.495 | 0.000 | 0.000 | |
| 12 | | | | | | | 225-16-028 | 1 | 1 | 0 | 0 | 226 | 0.523 | 0.000 | 0.000 | |
| 13 | | | | | | | 225-16-029 | 1 | 0 | 0 | 1 | 22 | 0.000 | 0.000 | 0.051 | |
| 14 | | | | | | | 225-16-030 | 1 | 0 | 0 | 1 | 110 | 0.000 | 0.000 | 0.255 | |
| 15 | | | | 95 | d | 100 | 225-16-031 | 1 | 0 | 1 | 0 | 345 | 0.000 | 0.799 | 0.000 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16 | | | | | | | 225-16-032 | 1 | 1 | 0 | 0 | 314 | 0.727 | 0.000 | 0.000 | |
| 17 | | | | | | | 225-16-033 | 1 | 1 | 0 | 0 | 540 | 1.250 | 0.000 | 0.000 | |
| 18 | | | | | | | 225-11-067 | 1 | 0 | 0 | 1 | 214 | 0.000 | 0.000 | 0.495 | |
| 19 | | | | | | | 225-16-035 | 1 | 1 | 0 | 0 | 287 | 0.664 | 0.000 | 0.000 | |
| 20 | | | | | | | 225-16-037 | 1 | 0 | 0 | 1 | 305 | 0.000 | 0.000 | 0.706 | |
| 21 | | | | | | | 225-15-004 | 1 | 0 | 0 | 1 | 280 | 0.000 | 0.000 | 0.648 | |
| 22 | | | | | | | 225-15-005 | 1 | 0 | 0 | 1 | 396 | 0.000 | 0.000 | 0.917 | |
| 23 | | | | | | | 225-15-007 | 1 | 0 | 1 | 0 | 471 | 0.000 | 1.090 | 0.000 | |
| 24 | | | | | | | 225-15-009 | 1 | 0 | 1 | 0 | 380 | 0.000 | 0.880 | 0.000 | |
| 25 | | | | | | | 225-15-012 | 1 | 1 | 0 | 0 | 541 | 1.252 | 0.000 | 0.000 | |
| 26 | | | | | | | 225-15-013 | 1 | 1 | 0 | 0 | 288 | 0.667 | 0.000 | 0.000 | |
| 27 | | | | 95 | e | 120 | 225-15-016 | 1 | 1 | 0 | 0 | 347 | 0.803 | 0.000 | 0.000 | |
| 28 | | | | | | | 225-15-017 | 1 | 0 | 0 | 1 | 307 | 0.000 | 0.000 | 0.711 | |
| 29 | | | | | | | 225-15-040 | 1 | 0 | 0 | 1 | 326 | 0.000 | 0.000 | 0.755 | |
| 30 | | | | | | | 225-15-042 | 1 | 0 | 1 | 0 | 245 | 0.000 | 0.567 | 0.000 | |
| 31 | | | | | | | 225-15-039 | 1 | 0 | 1 | 0 | 198 | 0.000 | 0.458 | 0.000 | |
| 32 | | | | | | | 225-15-028 | 1 | 0 | 1 | 0 | 314 | 0.000 | 0.727 | 0.000 | |
| 33 | | | | | | | 225-15-037 | 1 | 1 | 0 | 0 | 60 | 0.139 | 0.000 | 0.000 | |
| 34 | | | | 95 | f | 65 | 225-15-029 | 1 | 0 | 0 | 1 | 147 | 0.000 | 0.000 | 0.340 | |
| 35 | | | | | | | 225-15-035 | 1 | 0 | 0 | 1 | | 0.000 | 0.000 | 0.000 | |
| 36 | | | | | | | 225-15-036 | 1 | 0 | 0 | 1 | 71 | 0.000 | 0.000 | 0.164 | |
| 37 | | | | | | | 225-15-034 | 1 | 0 | 1 | 0 | 195 | 0.000 | 0.451 | 0.000 | |
| 38 | | | | 95 | g | 85 | 225-13-042 | 1 | 0 | 0 | 1 | 187 | 0.000 | 0.000 | 0.433 | |
| 39 | | | | | | | 225-13-041 | 1 | 1 | 0 | 0 | 52 | 0.120 | 0.000 | 0.000 | |
| 40 | | | | | | | 225-13-044 | 1 | 1 | 0 | 0 | 316 | 0.731 | 0.000 | 0.000 | |
| 41 | B | C | 80 | 95 | h | 35 | 225-13-045 | 1 | 0 | 0 | 1 | 59 | 0.000 | 0.000 | 0.137 | |
| 42 | | | | | | | 225-13-046 | 1 | 0 | 0 | 1 | 267 | 0.000 | 0.000 | 0.618 | |
| 43 | | | | 95 | i | 45 | 225-13-039 | 1 | 0 | 1 | 0 | 156 | 0.000 | 0.361 | 0.000 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 44 | | | | | | | 225-13-040 | 1 | 1 | 0 | 0 | 176 | 0.407 | 0.000 | 0.000 | |
| 45 | | | | | | | 225-13-032 | 1 | 0 | 1 | 0 | 105 | 0.000 | 0.243 | 0.000 | |
| 46 | | | | | | | 225-13-050 | 1 | 1 | 0 | 0 | 126 | 0.292 | 0.000 | 0.000 | |
| 47 | | | | 95 | j | 55 | 225-13-048 | 1 | 0 | 0 | 1 | 777 | 0.000 | 0.000 | 1.799 | |
| 48 | | | | | | | 225-13-049 | 1 | 0 | 0 | 1 | 88 | 0.000 | 0.000 | 0.204 | |
| 49 | | | | | | | 225-13-051 | 1 | 0 | 0 | 1 | 149 | 0.000 | 0.000 | 0.345 | |
| 50 | | | | | | | 225-13-052 | 1 | 0 | 1 | 0 | 180 | 0.000 | 0.417 | 0.000 | |
| 51 | | | | | | | 225-13-065 | 1 | 0 | 0 | 1 | 423 | 0.000 | 0.000 | 0.979 | |
| 52 | | | | 95 | k | 60 | 225-13-066 | 1 | 1 | 0 | 0 | 193 | 0.447 | 0.000 | 0.000 | |
| 53 | | | | | | | 225-13-055 | 1 | 1 | 0 | 0 | 199 | 0.461 | 0.000 | 0.000 | |
| 54 | | | | | | | 225-13-064 | 1 | 0 | 0 | 1 | 384 | 0.000 | 0.000 | 0.889 | |
| 55 | C | D | 175 | | | | 225-13-061 | 1 | 0 | 0 | 1 | 119 | 0.000 | 0.000 | 0.275 | |
| 56 | | | | | | | 225-13-057 | 1 | 0 | 1 | 0 | 142 | 0.000 | 0.329 | 0.000 | |
| 57 | | | | | | | 225-13-059 | 1 | 1 | 0 | 0 | 83 | 0.192 | 0.000 | 0.000 | |
| 58 | | | | | | | 225-13-060 | 1 | 0 | 0 | 1 | 149 | 0.000 | 0.000 | 0.345 | |
| 59 | | | | | | | 225-13-071 | 1 | 1 | 0 | 0 | 1248 | 2.889 | 0.000 | 0.000 | |
| 60 | | | | 95 | l | 60 | 225-13-073 | 1 | 0 | 0 | 1 | 651 | 0.000 | 0.000 | 1.507 | |
| 61 | | | | | | | 225-13-074 | 1 | 0 | 0 | 1 | 179 | 0.000 | 0.000 | 0.414 | |
| 62 | | | | | | | 225-13-075 | 1 | 0 | 0 | 1 | 107 | 0.000 | 0.000 | 0.248 | |
| 63 | | | | | | | 225-13-077 | 1 | 0 | 1 | 0 | 317 | 0.000 | 0.734 | 0.000 | |
| 64 | | | | | | | 225-13-076 | 1 | 1 | 0 | 0 | 126 | 0.292 | 0.000 | 0.000 | |
| 65 | | | | | | | 225-13-036 | 1 | 1 | 0 | 0 | 284 | 0.657 | 0.000 | 0.000 | |
| 66 | | | | | | | 225-13-040 | 1 | 1 | 0 | 0 | 176 | 0.407 | 0.000 | 0.000 | |
| 67 | | | | | | | 225-13-029 | 1 | 0 | 0 | 1 | 156 | 0.000 | 0.000 | 0.361 | |
| 68 | C | E | 180 | 95 | m | 50 | 225-13-030 | 1 | 0 | 0 | 1 | 154 | 0.000 | 0.000 | 0.356 | |
| 69 | | | | | | | 225-13-025ka | 1 | 0 | 1 | 0 | 188 | 0.000 | 0.435 | 0.000 | |
| 70 | | | | | | | 225-13-027 | 1 | 1 | 0 | 0 | 226 | 0.523 | 0.000 | 0.000 | |
| 71 | | | | | | | 225-13-013 | 1 | 0 | 0 | 1 | 699 | 0.000 | 0.000 | 1.618 | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 72 | | | | | | | 225-13-025 | 1 | 0 | 1 | 0 | 266 | 0.000 | 0.616 | 0.000 | |
| 73 | | | | | | | 225-13-024 | 1 | 1 | 0 | 0 | 135 | 0.313 | 0.000 | 0.000 | |
| 74 | | | | | | | 225-13-023 | 1 | 0 | 0 | 1 | 90 | 0.000 | 0.000 | 0.208 | |
| 75 | | | | | | | 225-13-014 | 1 | 0 | 0 | 1 | 380 | 0.000 | 0.000 | 0.880 | |
| 76 | | | | | | | 225-13-013ka | 1 | 0 | 1 | 0 | 52 | 0.000 | 0.120 | 0.000 | |
| 77 | | | | | | | 225-13-012 | 1 | 1 | 0 | 0 | 180 | 0.417 | 0.000 | 0.000 | |
| 78 | | | | 95 | n | 80 | 225-13-008 | 1 | 1 | 0 | 0 | 178 | 0.412 | 0.000 | 0.000 | |
| 79 | | | | | | | 225-13-010 | 1 | 1 | 0 | 0 | 238 | 0.551 | 0.000 | 0.000 | |
| 80 | | | | | | | 225-13-011 | 1 | 1 | 0 | 0 | 423 | 0.979 | 0.000 | 0.000 | |
| 81 | | | | | | | 225-13-009 | 1 | 0 | 0 | 1 | 366 | 0.000 | 0.000 | 0.847 | |
| 82 | | | | | | | 225-13-006 | 1 | 0 | 0 | 1 | 377 | 0.000 | 0.000 | 0.873 | |
| 83 | | | | | | | 225-13-004 | 1 | 0 | 1 | 0 | 1603 | 0.000 | 3.711 | 0.000 | |
| 84 | | | | 95 | o | 50 | 225-13-001 | 1 | 1 | 0 | 0 | 903 | 2.090 | 0.000 | 0.000 | |
| 85 | | | | | | | 225-13-002 | 1 | 0 | 1 | 0 | 818 | 0.000 | 1.894 | 0.000 | |
| 86 | | | | | | | 225-13-007 | 1 | 0 | 1 | 0 | 1738 | 0.000 | 4.023 | 0.000 | |
| 87 | | | | | | | 225-13-004 | 1 | 1 | 0 | 0 | 1603 | 3.711 | 0.000 | 0.000 | |
| 88 | | | | | | | 225-12-005 | 1 | 1 | 0 | 0 | 136 | 0.315 | 0.000 | 0.000 | |
| 89 | | | | 95 | p | 65 | 225-12-006A | 1 | 1 | 0 | 0 | 405 | 0.938 | 0.000 | 0.000 | |
| 90 | | | | | | | 225-11-031 | 1 | 1 | 0 | 0 | 100 | 0.231 | 0.000 | 0.000 | |
| 91 | | | | | | | 225-11-032 | 1 | 0 | 0 | 1 | 131 | 0.000 | 0.000 | 0.303 | |
| 92 | | | | | | | 225-16-015 | 1 | 0 | 1 | 0 | 462 | 0.000 | 1.069 | 0.000 | |
| 93 | | | | 95 | q | 85 | 225-15-019 | 3 | 0.33 | 0.33 | 0.33 | 1131 | 0.864 | 0.864 | 0.864 | |
| 94 | A | I | 270 | | | | 225-16-014 | 1 | 1 | 0 | 0 | 550 | 1.273 | 0.000 | 0.000 | |
| 95 | | | | | | | 225-16-016 | 1 | 1 | 0 | 0 | 119 | 0.275 | 0.000 | 0.000 | |
| 96 | | | | | | | 225-16-009 | 1 | 1 | 0 | 0 | 326 | 0.755 | 0.000 | 0.000 | |
| 97 | | | | 95 | r | 55 | 225-16-012 | 1 | 0 | 0 | 1 | 770 | 0.000 | 0.000 | 1.782 | |
| 98 | | | | | | | 225-16-011 | 1 | 0 | 0 | 1 | 199 | 0.000 | 0.000 | 0.461 | |
| 99 | | | | | | | 225-16-004 | 1 | 0 | 1 | 0 | 133 | 0.000 | 0.308 | 0.000 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 100 | | | | | | | 225-16-003 | 1 | 1 | 0 | 0 | 955 | 2.211 | 0.000 | 0.000 | |
| 101 | | | | 95 | s | 65 | 225-16-001 | 1 | 0 | 0 | 1 | 331 | 0.000 | 0.000 | 0.766 | |
| 102 | | | | | | | 225-19-201 | 3 | 0.33 | 0.33 | 0.33 | 121 | 0.092 | 0.092 | 0.092 | |
| 103 | B | F | 330 | 95 | t | 75 | 225-15-018 | 1 | 1 | 0 | 0 | 520 | 1.204 | 0.000 | 0.000 | |
| 104 | | | | | | | 225-15-18A | 1 | 0 | 0 | 1 | 46 | 0.000 | 0.000 | 0.106 | |
| 105 | | | | 95 | u | 50 | 225-15-022 | 1 | 0 | 0 | 1 | 126 | 0.000 | 0.000 | 0.292 | |
| 106 | | | | | | | 225-15-025 | 1 | 0 | 0 | 1 | 12 | 0.000 | 0.000 | 0.028 | |
| 107 | | | | | | | 225-15-027 | 1 | 1 | 0 | 0 | 156 | 0.361 | 0.000 | 0.000 | |
| 108 | | | | | | | 225-15-027A | 1 | 0 | 1 | 0 | 157 | 0.000 | 0.363 | 0.000 | |
| 109 | | | | | | | 225-15-026 | 1 | 1 | 0 | 0 | 291 | 0.674 | 0.000 | 0.000 | |
| 110 | | | | | | | 225-15-026ka | 1 | 1 | 0 | 0 | 133 | 0.308 | 0.000 | 0.000 | |
| 111 | | | | | | | 225-15-019 | 3 | 0.33 | 0.33 | 0.33 | 1131 | 0.864 | 0.864 | 0.864 | |
| 112 | | | | 95 | v | 95 | 225-11-041 | 1 | 0 | 0 | 1 | 284 | 0.000 | 0.000 | 0.657 | |
| 113 | | | | | | | 225-11-042 | 1 | 0 | 0 | 1 | 166 | 0.000 | 0.000 | 0.384 | |
| 114 | | | | | | | 225-11-040 | 1 | 0 | 1 | 0 | 113 | 0.000 | 0.262 | 0.000 | |
| 115 | | | | | | | 225-11-043ka | 1 | 1 | 0 | 0 | 212 | 0.491 | 0.000 | 0.000 | |
| 116 | | | | 95 | w | 110 | 225-11-082 | 1 | 0 | 1 | 0 | 195 | 0.000 | 0.451 | 0.000 | |
| 117 | | | | | | | 225-11-045 | 1 | 1 | 0 | 0 | 42 | 0.097 | 0.000 | 0.000 | |
| 118 | | | | | | | 225-11-044 | 1 | 0 | 0 | 1 | 110 | 0.000 | 0.000 | 0.255 | |
| 119 | | | | | | | 225-11-046 | 1 | 0 | 0 | 1 | 106 | 0.000 | 0.000 | 0.245 | |
| 120 | | | | | | | 225-11-068 | 1 | 0 | 0 | 1 | 233 | 0.000 | 0.000 | 0.539 | |
| 121 | | | | | | | 225-11-064 | 1 | 0 | 0 | 1 | 233 | 0.000 | 0.000 | 0.539 | |
| 122 | | | | | | | 225-11-063 | 1 | 0 | 1 | 0 | 259 | 0.000 | 0.600 | 0.000 | |
| 123 | | | | | | | 225-11-061 | 1 | 0 | 0 | 1 | 155 | 0.000 | 0.000 | 0.359 | |
| 124 | | | | | | | 225-11-053 | 1 | 1 | 0 | 0 | 249 | 0.576 | 0.000 | 0.000 | |
| 125 | | | | | | | 225-11-062 | 1 | 1 | 0 | 0 | 130 | 0.301 | 0.000 | 0.000 | |
| 126 | F | H | 160 | 25 | x | 85 | 225-11-058 | 1 | 1 | 0 | 0 | 126 | 0.292 | 0.000 | 0.000 | |
| 127 | | | | | | | 225-11-055 | 1 | 0 | 0 | 1 | 130 | 0.000 | 0.000 | 0.301 | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 128 | | | | | | | 225-11-035 | 1 | 0 | 1 | 0 | 212 | 0.000 | 0.491 | 0.000 | |
| 129 | | | | | | | 225-15-002 | 1 | 0 | 0 | 1 | 900 | 0.000 | 0.000 | 2.083 | |
| 130 | | | | | | | 225-11-036 | 1 | 0 | 0 | 1 | 151 | 0.000 | 0.000 | 0.350 | |
| 131 | | | | | | | 225-11-037 | 1 | 0 | 0 | 1 | 236 | 0.000 | 0.000 | 0.546 | |
| 132 | | | | | | | 225-16-019 | 1 | 0 | 0 | 1 | 1164 | 0.000 | 0.000 | 2.694 | |
| 133 | | | | | | | 225-16-017 | 1 | 0 | 1 | 0 | 1477 | 0.000 | 3.419 | 0.000 | |
| 134 | | | | | | | 225-11-038 | 1 | 1 | 0 | 0 | 241 | 0.558 | 0.000 | 0.000 | |
| 135 | | | | | | | 225-12-001 | 1 | 0 | 0 | 1 | 223 | 0.000 | 0.000 | 0.516 | |
| 136 | | | | | | | 225-15-003 | 1 | 0 | 0 | 1 | 676 | 0.000 | 0.000 | 1.565 | |
| 137 | | | | | | | 225-16-020 | 1 | 0 | 0 | 1 | 1311 | 0.000 | 0.000 | 3.035 | |
| 138 | | | | 25 | y | 75 | 225-16-021 | 1 | 0 | 0 | 1 | 839 | 0.000 | 0.000 | 1.942 | |
| 139 | | | | | | | 225-12-008 | 1 | 1 | 0 | 0 | 254 | 0.588 | 0.000 | 0.000 | |
| 140 | | | | | | | 225-15-001 | 3 | 0.33 | 0.33 | 0.33 | 5236 | 4.000 | 4.000 | 4.000 | |
| 141 | | | | | | | 225-12-020 | 1 | 0 | 1 | 0 | 718 | 0.000 | 1.662 | 0.000 | |
| 142 | | | | | | | 225-12-017 | 1 | 0 | 0 | 1 | 320 | 0.000 | 0.000 | 0.741 | |
| 143 | | | | | | | 225-12-014 | 1 | 0 | 1 | 0 | 100 | 0.000 | 0.231 | 0.000 | |
| 144 | | | | | | | 225-13-001 | 1 | 1 | 0 | 0 | 903 | 2.090 | 0.000 | 0.000 | |
| 145 | | | | | | | 225-13-002 | 1 | 0 | 1 | 0 | 818 | 0.000 | 1.894 | 0.000 | |
| 146 | | | | | | | 225-13-007 | 1 | 0 | 1 | 0 | 1738 | 0.000 | 4.023 | 0.000 | |
| 147 | | | | | | | 225-15-002 | 1 | 0 | 1 | 1 | 900 | 0.000 | 2.083 | 2.083 | |
| 148 | F | G | 65 | 25 | z | 65 | 225-13-004 | 1 | 0 | 1 | 0 | 1603 | 0.000 | 3.711 | 0.000 | |
| 149 | | | | | | | 225-12-012 | 1 | 1 | 0 | 0 | 109 | 0.252 | 0.000 | 0.000 | |
| 150 | | | | | | | 225-13-086 | 1 | 1 | 0 | 0 | 954 | 2.208 | 0.000 | 0.000 | |
| 151 | | | | | | | 225-12-013 | 1 | 0 | 0 | 1 | 59 | 0.000 | 0.000 | 0.137 | |
| 152 | | | | | | | 225-12-015 | 1 | 0 | 0 | 1 | 160 | 0.000 | 0.000 | 0.370 | |
| 153 | | | | | | | 225-12-013A | 1 | 0 | 0 | 1 | 104 | 0.000 | 0.000 | 0.241 | |
| 154 | | | | | | | 225-12-010 | 1 | 0 | 1 | 0 | 104 | 0.000 | 0.241 | 0.000 | |
| 155 | | | | | | | 225-12-011 | 1 | 1 | 0 | 0 | 243 | 0.563 | 0.000 | 0.000 | |

**Line and load data of Machhapokhari2 LT feeder for etap**

| Specification | | | | | Peak Load, kW | | | Peak Current, A | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Points | Length, m | Size, sq. mm | Resistance, ohm/km | Reactance, ohm/km | R | Y | B | IR | IY | IB |
| a | 110 | 95 | 0.397 | 0.086 | 0.593 | 1.039 | 0.771 | 2.712 | 4.757 | 3.528 |
| b | 85 | 95 | 0.397 | 0.086 | 0.056 | 0.000 | 0.000 | 0.254 | 0.000 | 0.000 |
| c | 85 | 95 | 0.397 | 0.086 | 1.780 | 0.201 | 1.148 | 8.147 | 0.922 | 5.255 |
| d | 100 | 95 | 0.397 | 0.086 | 2.641 | 2.769 | 2.766 | 12.088 | 12.671 | 12.660 |
| e | 120 | 95 | 0.397 | 0.086 | 2.722 | 0.567 | 1.465 | 12.459 | 2.596 | 6.706 |
| f | 65 | 95 | 0.397 | 0.086 | 0.139 | 1.637 | 0.505 | 0.636 | 7.490 | 2.310 |
| g | 85 | 95 | 0.397 | 0.086 | 0.120 | 0.000 | 0.433 | 0.551 | 0.000 | 1.981 |
| h | 35 | 95 | 0.397 | 0.086 | 0.731 | 0.000 | 0.755 | 3.348 | 0.000 | 3.454 |
| i | 45 | 95 | 0.397 | 0.086 | 0.407 | 0.604 | 0.000 | 1.865 | 2.765 | 0.000 |
| j | 55 | 95 | 0.397 | 0.086 | 0.292 | 0.000 | 2.002 | 1.335 | 0.000 | 9.164 |
| k | 60 | 95 | 0.397 | 0.086 | 0.907 | 0.745 | 2.488 | 4.153 | 3.411 | 11.389 |
| l | 60 | 95 | 0.397 | 0.086 | 3.373 | 0.734 | 2.514 | 15.436 | 3.358 | 11.505 |
| m | 50 | 95 | 0.397 | 0.086 | 1.900 | 1.051 | 2.544 | 8.698 | 4.810 | 11.643 |
| n | 80 | 95 | 0.397 | 0.086 | 2.359 | 0.120 | 1.727 | 10.795 | 0.551 | 7.903 |
| o | 50 | 95 | 0.397 | 0.086 | 5.801 | 9.627 | 0.873 | 26.549 | 44.061 | 3.994 |
| p | 65 | 95 | 0.397 | 0.086 | 1.484 | 0.000 | 0.000 | 6.791 | 0.000 | 0.000 |
| q | 85 | 95 | 0.397 | 0.086 | 2.413 | 1.933 | 1.167 | 11.042 | 8.849 | 5.342 |
| r | 55 | 95 | 0.397 | 0.086 | 2.965 | 0.308 | 2.243 | 13.571 | 1.409 | 10.266 |
| s | 65 | 95 | 0.397 | 0.086 | 0.092 | 0.092 | 0.859 | 0.423 | 0.423 | 3.930 |
| t | 75 | 95 | 0.397 | 0.086 | 1.204 | 0.000 | 0.106 | 5.509 | 0.000 | 0.487 |
| u | 50 | 95 | 0.397 | 0.086 | 2.207 | 1.227 | 1.183 | 10.099 | 5.617 | 5.416 |
| v | 95 | 95 | 0.397 | 0.086 | 0.491 | 0.262 | 1.042 | 2.246 | 1.197 | 4.767 |
| w | 110 | 95 | 0.397 | 0.086 | 0.975 | 1.051 | 1.938 | 4.460 | 4.810 | 8.867 |
| x | 85 | 25 | 1.49 | 0.096 | 0.850 | 3.910 | 5.975 | 3.888 | 17.893 | 27.343 |
| y | 75 | 25 | 1.49 | 0.096 | 4.588 | 5.662 | 11.058 | 20.996 | 25.912 | 50.607 |
| z | 65 | 25 | 1.49 | 0.096 | 5.113 | 12.183 | 3.572 | 23.402 | 55.757 | 16.347 |

**Line and load data of Machhapokhari2 LT feeder for Matlab**

| Specification | | | | | Peak Load, kW | | | Peak Current, A | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Points | Length, m | Size, sq. mm | Resistance, ohm/km | Reactance, ohm/km | R | Y | B | IR | IY | IB |
| A | 195 | 95 | 0.397 | 0.086 | 0.648 | 1.039 | 0.771 | 2.966 | 4.757 | 3.528 |
| B | 455 | 95 | 0.397 | 0.086 | 7.403 | 5.174 | 6.317 | 33.880 | 23.678 | 28.911 |
| C | 80 | 95 | 0.397 | 0.086 | 1.139 | 0.604 | 0.755 | 5.212 | 2.765 | 3.454 |
| D | 175 | 95 | 0.397 | 0.086 | 4.572 | 1.479 | 7.005 | 20.923 | 6.770 | 32.058 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| E | 180 | 95 | 0.397 | 0.086 | 10.060 | 10.799 | 5.144 | 46.042 | 49.422 | 23.540 |
| I | 270 | 95 | 0.397 | 0.086 | 6.954 | 2.334 | 4.269 | 31.826 | 10.681 | 19.537 |
| F | 330 | 95 | 0.397 | 0.086 | 4.876 | 2.540 | 4.269 | 22.314 | 11.624 | 19.538 |
| H | 160 | 25 | 1.49 | 0.096 | 5.437 | 9.571 | 17.032 | 24.884 | 43.805 | 77.950 |
| G | 65 | 25 | 1.49 | 0.096 | 5.113 | 12.183 | 3.572 | 23.402 | 55.757 | 16.347 |

## APPENDIX I: LINE AND LOAD DATA FOR PUSAL DISTRIBUTION TRANSFORMER

**Transformer Location: Pusal**
**Capacity: 50 KVA**

| S.N | Specification | | | | | | Consumers | | Connected Phase | | | Energy, kWh | PEAK LOAD, kW | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | From | To | Total distance, m | size, sq. mm | Load point | Distance between Load point | Consumers ID | No. of phases | R | Y | B | Billing of one month | R | Y | B | Remarks |
| 1 | 0 | WC | 200 | 120 | a | 200 | 217-08-021KA | Single | 1 | | | 22 | 0.102 | 0.000 | 0.000 | |
| 2 | | | | | | | 217-05-002 | Single | | | 1 | 19 | 0.000 | 0.000 | 0.088 | |
| 3 | | | | | | | 217-06-033KA2 | Single | | | 1 | 34 | 0.000 | 0.000 | 0.157 | |
| 4 | | | | | | | 217-06-045KHA | Single | | 1 | | 14 | 0.000 | 0.065 | 0.000 | |
| 5 | WC | A | 100 | 95 | b | 100 | 217-05-007 | Single | 1 | | | 17 | 0.079 | 0.000 | 0.000 | |
| 6 | | | | | | | 217-05-012 | Single | | | 1 | 27 | 0.000 | 0.000 | 0.125 | |
| 7 | | | | | | | 217-06-040 | Single | | 1 | | 43 | 0.000 | 0.199 | 0.000 | |
| 8 | A | B | 75 | 50 | c | 75 | 217-05-017 | Single | 1 | | | 3 | 0.014 | 0.000 | 0.000 | |
| 9 | | | | | | | 217-08-28 | Single | 1 | | | 20 | 0.093 | 0.000 | 0.000 | |
| 10 | | | | | | | 217-06-081 | Single | | | 1 | 40 | 0.000 | 0.000 | 0.185 | |
| 11 | | | | | | | 217-06-013 | Single | | | 1 | 46 | 0.000 | 0.000 | 0.213 | |
| 12 | B | C | 200 | 50 | d | 55 | 217-08-030 | Single | | 1 | | 11 | 0.000 | 0.051 | 0.000 | |
| 13 | | | | | | | 217-08-027 | Single | | 1 | | 26 | 0.000 | 0.120 | 0.000 | |
| 14 | | | | | | | 217-08-025 | Single | | 1 | | 13 | 0.000 | 0.060 | 0.000 | |
| 15 | | | | | | | 217-08-014DUP1 | Single | | 1 | | 4 | 0.000 | 0.019 | 0.000 | |
| 16 | | | | | | | 217-08-28A | Single | 1 | | | 14 | 0.065 | 0.000 | 0.000 | |
| 17 | | | | 50 | e | 80 | 217-08-024 | Single | | | 1 | 15 | 0.000 | 0.000 | 0.069 | |
| 18 | | | | | | | 217-05-003NGA | Single | | | 1 | 13 | 0.000 | 0.000 | 0.060 | |
| 19 | | | | | | | 217-08-023 | Single | | | 1 | 41 | 0.000 | 0.000 | 0.190 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | | | | | | | 217-08-021 | Single | | | 1 | 53 | 0.000 | 0.000 | 0.245 | |
| 21 | | | | | | | 217-06-034C | Single | | | 1 | 19 | 0.000 | 0.000 | 0.088 | |
| 22 | | | | | | | 217-08-018KHA | Single | | | 1 | 13 | 0.000 | 0.000 | 0.060 | |
| 23 | | | | | | | 217-08-016-KA | Single | 1 | | | 11 | 0.051 | 0.000 | 0.000 | |
| 24 | | | | 50 | f | 65 | 217-08-016 | Single | | | 1 | 22 | 0.000 | 0.000 | 0.102 | |
| 25 | | | | | | | 217-08-015 | Single | | | 1 | 57 | 0.000 | 0.000 | 0.264 | |
| 26 | | | | | | | 217-08-15KA | Single | | 1 | | 57 | 0.000 | 0.264 | 0.000 | |
| 27 | | | | | | | 217-08-14 | Single | 1 | | | 11 | 0.051 | 0.000 | 0.000 | |
| 28 | | | | | | | 217-05-003YA1 | Single | | 1 | | 40 | 0.000 | 0.185 | 0.000 | |
| 29 | C | D | 70 | 25 | g | 70 | 217-08-009E | Single | | 1 | | 53 | 0.000 | 0.245 | 0.000 | |
| 30 | | | | | | | 217-08-010 | Single | 1 | | | 85 | 0.394 | 0.000 | 0.000 | |
| 31 | | | | | | | 217-08-011 | Single | 1 | | | 100 | 0.463 | 0.000 | 0.000 | |
| 32 | | | | | | | 217-06-033GA | Single | | 1 | | 13 | 0.000 | 0.060 | 0.000 | |
| 33 | | | | | | | 217-05-012GA | Single | | | 1 | 99 | 0.000 | 0.000 | 0.458 | |
| 34 | D | E | 85 | 25 | h | 85 | 217-05-013 | Single | 1 | | | 45 | 0.208 | 0.000 | 0.000 | |
| 35 | | | | | | | 217-05-012KA | Single | 1 | | | 100 | 0.463 | 0.000 | 0.000 | |
| 36 | | | | | | | 217-06-078 | Single | | 1 | | 22 | 0.000 | 0.102 | 0.000 | |
| 37 | | | | | | | 217-05-006 | Single | | 1 | | 100 | 0.000 | 0.463 | 0.000 | |
| 38 | | | | | | | 217-05-001A | Single | | 1 | | 100 | 0.000 | 0.463 | 0.000 | |
| 39 | D | F | 50 | 25 | i | 50 | 217-05-001 | Single | | | 1 | 100 | 0.000 | 0.000 | 0.463 | |
| 40 | | | | | | | 217-06-076 | Single | | 1 | | 54 | 0.000 | 0.250 | 0.000 | |
| 41 | | | | | | | 217-05-003 | Single | | | 1 | 100 | 0.000 | 0.000 | 0.463 | |
| 42 | | | | | | | 217-06-008 | Single | | | 1 | 50 | 0.000 | 0.000 | 0.231 | |
| 43 | | | | | | | 217-06-008KHA | Single | | 1 | | 55 | 0.000 | 0.255 | 0.000 | |
| 44 | A | G | 190 | 95 | j | 190 | 217-06-045E | Single | 1 | | | 42 | 0.194 | 0.000 | 0.000 | |
| 45 | | | | | | | 217-06-045GA | Single | 1 | | | 29 | 0.134 | 0.000 | 0.000 | |
| 46 | | | | | | | 217-06-045GHA | Single | 1 | | | 28 | 0.130 | 0.000 | 0.000 | |
| 47 | G | H | 165 | 50 | k | 55 | 217-05-003CHHA | Single | | | 1 | 46 | 0.000 | 0.000 | 0.213 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 48 | | | | | | | 217-05-003CHHA3 | Single | | | 1 | 26 | 0.000 | 0.000 | 0.120 | |
| 49 | | | | | | | 217-06-19 | Single | | | 1 | 39 | 0.000 | 0.000 | 0.181 | |
| 50 | | | | | | | 217-05-003JA1 | Single | 1 | | | 41 | 0.190 | 0.000 | 0.000 | |
| 51 | | | | | | | 217-08-026 | Single | | 1 | | 100 | 0.000 | 0.463 | 0.000 | |
| 52 | | | | 50 | l | 45 | 217-06-044 | Single | | 1 | | 100 | 0.000 | 0.463 | 0.000 | |
| 53 | | | | | | | 217-08-029 | Single | | 1 | | 88 | 0.000 | 0.407 | 0.000 | |
| 54 | | | | | | | 217-05-003GA | Single | | | 1 | 100 | 0.000 | 0.000 | 0.463 | |
| 56 | | | | | | | 217-05-013 | Single | 1 | | | 100 | 0.463 | 0.000 | 0.000 | |
| 57 | | | | 50 | m | 65 | 217-05-025DUP1 | Single | | 1 | | 134 | 0.000 | 0.620 | 0.000 | |
| 58 | | | | | | | 217-05-021 | Single | | | 1 | 237 | 0.000 | 0.000 | 1.097 | |
| 59 | | | | | | | 217-06-080A | Single | 1 | | | 96 | 0.444 | 0.000 | 0.000 | |
| 60 | | | | | | | 217-06-046 | Single | | 1 | | 100 | 0.000 | 0.463 | 0.000 | |
| 61 | | | | | | | 217-06-022KA | Single | | 1 | | 100 | 0.000 | 0.463 | 0.000 | |
| 62 | | | | | | | 217-06-023 | Single | | 1 | | 100 | 0.000 | 0.463 | 0.000 | |
| 63 | H | I | 130 | 25 | n | 130 | 217-06-045KA | Single | | | 1 | 157 | 0.000 | 0.000 | 0.727 | |
| 64 | | | | | | | 217-06-045KHA1 | Single | | 1 | | 51 | 0.000 | 0.236 | 0.000 | |
| 65 | | | | | | | 217-06-014 | Single | | 1 | | 20 | 0.000 | 0.093 | 0.000 | |
| 66 | | | | | | | 217-06-015 | Single | | 1 | | 39 | 0.000 | 0.181 | 0.000 | |
| 67 | | | | | | | 217-06-017 | Single | | | 1 | 100 | 0.000 | 0.000 | 0.463 | |
| 68 | I | L | 120 | 25 | o | 50 | 217-05-003KHA | Single | | | 1 | 100 | 0.000 | 0.000 | 0.463 | |
| 69 | | | | | | | 217-06-012 | Single | | | 1 | 206 | 0.000 | 0.000 | 0.954 | |
| 70 | | | | | | | 217-08-022 | Single | | 1 | | 121 | 0.000 | 0.560 | 0.000 | |
| 71 | | | | | | | 217-06-010 | Single | | | 1 | 116 | 0.000 | 0.000 | 0.537 | |
| 72 | | | | | | | 217-06-020 | Single | | | 1 | 79 | 0.000 | 0.000 | 0.366 | |
| 73 | | | | 25 | p | 70 | 217-06-023 | Single | | | 1 | 100 | 0.000 | 0.000 | 0.463 | |
| 74 | | | | | | | 217-06-022 | Single | | | 1 | 22 | 0.000 | 0.000 | 0.102 | |
| 75 | | | | | | | 217-06-001 | Single | 1 | | | 100 | 0.463 | 0.000 | 0.000 | |
| 76 | | | | | | | 217-06-004 | Single | 1 | | | 100 | 0.463 | 0.000 | 0.000 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 77 | | | | | | | 217-05-015 | Single | | 1 | | 100 | 0.000 | 0.463 | 0.000 | |
| 78 | I | J | 135 | 25 | q | 135 | 217-05-016 | Single | | | 1 | 107 | 0.000 | 0.000 | 0.495 | |
| 79 | | | | | | | 217-06-008KA | Single | | | 1 | 21 | 0.000 | 0.000 | 0.097 | |
| 80 | | | | | | | 217-06-025 | Single | 1 | | | 141 | 0.653 | 0.000 | 0.000 | |
| 81 | | | | | | | 217-06-028 | Single | 1 | | | 100 | 0.463 | 0.000 | 0.000 | |
| 82 | | | | | | | 217-06-029 | Single | 1 | | | 149 | 0.690 | 0.000 | 0.000 | |
| 83 | H | K | 265 | 25 | r | 45 | 217-06-031KA | Single | | | 1 | 100 | 0.000 | 0.000 | 0.463 | |
| 84 | | | | | | | 217-05-023DUP1 | Single | 1 | | | 100 | 0.463 | 0.000 | 0.000 | |
| 85 | | | | | | | 217-05-015KA | Single | | | 1 | 100 | 0.000 | 0.000 | 0.463 | |
| 86 | | | | | | | 217-06-080 | Single | | 1 | | 100 | 0.000 | 0.463 | 0.000 | |
| 87 | | | | 25 | s | 55 | 217-06-034F | Single | | 1 | | 188 | 0.000 | 0.870 | 0.000 | |
| 88 | | | | | | | 217-05-017KA | Single | 1 | | | 163 | 0.755 | 0.000 | 0.000 | |
| 89 | | | | | | | 217-05-018KA | Single | 1 | | | 177 | 0.819 | 0.000 | 0.000 | |
| 90 | | | | | | | 217-05-099 | Three | 1 | 1 | 1 | 2920 | 13.519 | 13.519 | 13.519 | |
| 91 | | | | 25 | t | 65 | 217-06-037 | Single | | 1 | | 101 | 0.000 | 0.468 | 0.000 | |
| 92 | | | | | | | 217-06-035 | Single | | 1 | | 80 | 0.000 | 0.370 | 0.000 | |
| 93 | | | | | | | 217-06-033 | Single | | 1 | | 100 | 0.000 | 0.463 | 0.000 | |
| 94 | | | | | | | 217-06-033KA | Single | | 1 | | 67 | 0.000 | 0.310 | 0.000 | |
| 95 | | | | 25 | u | 50 | 217-06-033KHA | Single | | 1 | | 100 | 0.000 | 0.463 | 0.000 | |
| 96 | | | | | | | 217-05-024DUP1 | Single | | | 1 | 100 | 0.000 | 0.000 | 0.463 | |
| 97 | | | | | | | 217-08-018 | Single | 1 | 0 | | 253 | 1.171 | 0.000 | 0.000 | |
| 98 | | | | | | | 217-06-033KA3 | Single | | | 1 | 64 | 0.000 | 0.000 | 0.296 | |
| 99 | | | | 25 | v | 50 | 217-06-034 | Single | | | 1 | 96 | 0.000 | 0.000 | 0.444 | |
| 100 | | | | | | | 217-06-034KA | Single | | | 1 | 122 | 0.000 | 0.000 | 0.565 | |
| 101 | | | | | | | 217-05-022 | Single | | | 1 | 300 | 0.000 | 0.000 | 1.389 | |
| 102 | | | | | | | 217-05-023DUP2 | Single | 1 | | | 380 | 1.759 | 0.000 | 0.000 | |
| 103 | B | M | 80 | 25 | w | 80 | 217-05-031KA | Single | | 1 | | 93 | 0.000 | 0.431 | 0.000 | |
| 104 | | | | | | | 217-06-034A | Single | | | 1 | 22 | 0.000 | 0.000 | 0.102 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 105 | | | | | | | 217-05-003CHA | Single | 1 | | | 17 | 0.079 | 0.000 | 0.000 | |
| 106 | | | | | | | 217-05-003JA | Single | 1 | | | 23 | 0.106 | 0.000 | 0.000 | |
| 107 | | | | | | | 217-05-015A | Single | 1 | | | 58 | 0.269 | 0.000 | 0.000 | |

**Line and load data of Pusal LT feeder for etap**

| Specification | | | | | Peak Load, kW | | | Peak Current, A | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Points** | **Length, m** | **Size, sq. mm** | **Resistance, ohm/km** | **Reactance, ohm/km** | **R** | **Y** | **B** | **IR** | **IY** | **IB** |
| a | 200 | 120 | 0.314 | 0.084 | 0.102 | 0.065 | 0.245 | 0.447 | 0.285 | 1.078 |
| b | 100 | 95 | 0.397 | 0.086 | 0.079 | 0.199 | 0.125 | 0.346 | 0.874 | 0.549 |
| c | 75 | 50 | 0.796 | 0.09 | 0.106 | 0.000 | 0.398 | 0.468 | 0.000 | 1.749 |
| d | 55 | 50 | 0.796 | 0.09 | 0.065 | 0.250 | 0.000 | 0.285 | 1.098 | 0.000 |
| e | 80 | 50 | 0.796 | 0.09 | 0.000 | 0.000 | 0.653 | 0.000 | 0.000 | 2.867 |
| f | 65 | 50 | 0.796 | 0.09 | 0.051 | 0.264 | 0.426 | 0.224 | 1.159 | 1.871 |
| g | 70 | 25 | 1.49 | 0.096 | 0.907 | 0.431 | 0.000 | 3.985 | 1.891 | 0.000 |
| h | 85 | 25 | 1.49 | 0.096 | 0.671 | 0.162 | 0.458 | 2.948 | 0.712 | 2.013 |
| i | 50 | 25 | 1.49 | 0.096 | 0.000 | 1.176 | 0.926 | 0.000 | 5.164 | 4.066 |
| j | 190 | 95 | 0.397 | 0.086 | 0.458 | 0.255 | 0.231 | 2.013 | 1.118 | 1.017 |
| k | 55 | 50 | 0.796 | 0.09 | 0.190 | 0.463 | 0.514 | 0.834 | 2.033 | 2.257 |
| l | 45 | 50 | 0.796 | 0.09 | 0.463 | 0.870 | 0.463 | 2.033 | 3.822 | 2.033 |
| m | 65 | 50 | 0.796 | 0.09 | 0.444 | 2.009 | 1.097 | 1.952 | 8.824 | 4.819 |
| n | 130 | 25 | 1.49 | 0.096 | 0.000 | 0.509 | 1.190 | 0.000 | 2.237 | 5.225 |
| o | 50 | 25 | 1.49 | 0.096 | 0.000 | 0.560 | 2.319 | 0.000 | 2.460 | 10.186 |
| p | 70 | 25 | 1.49 | 0.096 | 0.926 | 0.463 | 0.565 | 4.066 | 2.033 | 2.481 |
| q | 135 | 25 | 1.49 | 0.096 | 1.806 | 0.000 | 0.593 | 7.930 | 0.000 | 2.603 |
| r | 45 | 25 | 1.49 | 0.096 | 0.463 | 0.463 | 0.926 | 2.033 | 2.033 | 4.066 |
| s | 55 | 25 | 1.49 | 0.096 | 15.093 | 14.389 | 13.519 | 66.283 | 63.192 | 59.370 |
| t | 65 | 25 | 1.49 | 0.096 | 0.000 | 1.611 | 0.000 | 0.000 | 7.076 | 0.000 |
| u | 50 | 25 | 1.49 | 0.096 | 1.171 | 0.463 | 0.759 | 5.144 | 2.033 | 3.334 |
| v | 50 | 25 | 1.49 | 0.096 | 1.759 | 0.000 | 2.398 | 7.726 | 0.000 | 10.532 |
| w | 80 | 25 | 1.49 | 0.096 | 0.454 | 0.431 | 0.102 | 1.993 | 1.891 | 0.447 |

**Line and load data of Pusal LT feeder for Matlab**

| Specification | | | | | Peak Load, kW | | | Peak Current, A | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Points** | **Length, m** | **Size, sq. mm** | **Resistance, ohm/km** | **Reactance, ohm/km** | **R** | **Y** | **B** | **IR** | **IY** | **IB** |
| WC | 200 | 120 | 0.314 | 0.084 | 0.102 | 0.065 | 0.245 | 0.447 | 0.285 | 1.078 |
| A | 100 | 95 | 0.397 | 0.086 | 0.079 | 0.199 | 0.125 | 0.346 | 0.874 | 0.549 |
| B | 75 | 50 | 0.796 | 0.09 | 0.106 | 0.000 | 0.398 | 0.468 | 0.000 | 1.749 |
| C | 200 | 50 | 0.796 | 0.09 | 0.116 | 0.514 | 1.079 | 0.508 | 2.257 | 4.737 |
| D | 70 | 25 | 1.49 | 0.096 | 0.907 | 0.431 | 0.000 | 3.985 | 1.891 | 0.000 |
| E | 85 | 25 | 1.49 | 0.096 | 0.671 | 0.162 | 0.458 | 2.948 | 0.712 | 2.013 |
| F | 50 | 25 | 1.49 | 0.096 | 0.000 | 1.176 | 0.926 | 0.000 | 5.164 | 4.066 |
| G | 190 | 95 | 0.397 | 0.086 | 0.458 | 0.255 | 0.231 | 2.013 | 1.118 | 1.017 |
| H | 165 | 50 | 0.796 | 0.09 | 1.097 | 3.343 | 2.074 | 4.819 | 14.680 | 9.109 |
| I | 130 | 25 | 1.49 | 0.096 | 0.000 | 0.509 | 1.190 | 0.000 | 2.237 | 5.225 |
| L | 120 | 25 | 1.49 | 0.096 | 0.926 | 1.023 | 2.884 | 4.066 | 4.493 | 12.667 |
| J | 135 | 25 | 1.49 | 0.096 | 1.806 | 0.000 | 0.593 | 7.930 | 0.000 | 2.603 |
| K | 265 | 25 | 1.49 | 0.096 | 18.486 | 16.926 | 17.602 | 81.186 | 74.334 | 77.303 |
| M | 80 | 25 | 1.49 | 0.096 | 0.454 | 0.431 | 0.102 | 1.993 | 1.891 | 0.447 |

## APPENDIX J: LINE AND LOAD DATA FOR MAHANKAL DISTRIBUTION TRANSFORMER

**Transformer Location: Mahankal**

**Transformer capacity: 50 KVA**

| S.N | Specification | | | | | | Consumers | | Connected phase | | | Energy, kWh | PEAK LOAD, kW | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | From | To | Total distance, m | size, sq. mm | Load point | Distance between Load point | Consumers ID | No. of phases | R | Y | B | Billling of one month | R | Y | B | Remarks |
| 1 | 0 | A | 135 | 50 | a | 135 | 217-01-025 | Single | 0 | 1 | 0 | 11 | 0.000 | 0.051 | 0.000 | |
| 2 | | | | | | | 217-02-013 | Single | 1 | 0 | 0 | 3 | 0.014 | 0.000 | 0.000 | |
| 3 | | | | | | | 217-01-042 | Single | 0 | 1 | 0 | 11 | 0.000 | 0.051 | 0.000 | |
| 4 | | | | | | | 217-01-007 | Single | 1 | 0 | 0 | 7 | 0.032 | 0.000 | 0.000 | |
| 5 | | | | | | | 217-01-017ka | Single | 1 | 0 | 0 | 14 | 0.065 | 0.000 | 0.000 | |
| 6 | | | | | | | 217-02-021kha | Single | 0 | 1 | 0 | 12 | 0.000 | 0.056 | 0.000 | |
| 7 | | | | | | | 217-04-005KA | Single | 0 | 1 | 0 | 8 | 0.000 | 0.037 | 0.000 | |
| 8 | A | R | 50 | 50 | b | 50 | 217-02-001 | Single | 0 | 1 | 0 | 11 | 0.000 | 0.051 | 0.000 | |
| 9 | | | | | | | 217-02-003 | Single | 0 | 1 | 0 | 13 | 0.000 | 0.060 | 0.000 | |
| 10 | | | | | | | 217-02-006 | Single | 1 | 0 | 0 | 12 | 0.056 | 0.000 | 0.000 | |
| 11 | | | | | | | 217-02-005 | Single | 1 | 0 | 0 | 13 | 0.060 | 0.000 | 0.000 | |
| 12 | A | B | 95 | 25 | c | 95 | 217-02-007 | Single | 1 | 0 | 0 | 21 | 0.097 | 0.000 | 0.000 | |
| 14 | | | | | | | 217-02-011 | Single | 0 | 1 | 0 | 13 | 0.000 | 0.060 | 0.000 | |
| 15 | | | | | | | 217-02-011ga | Single | 0 | 1 | 0 | 12 | 0.000 | 0.056 | 0.000 | |
| 16 | | | | | | | 217-02-011ka | Single | 1 | 0 | 0 | 14 | 0.065 | 0.000 | 0.000 | |
| 17 | B | C | 85 | 25 | d | 85 | 217-02-001 | Single | 0 | 1 | 0 | 14 | 0.000 | 0.065 | 0.000 | |
| 18 | | | | | | | 217-02-009ka1 | Single | 0 | 1 | 0 | 13 | 0.000 | 0.060 | 0.000 | |
| 19 | | | | | | | 217-03-036 | Single | 0 | 1 | 0 | 14 | 0.000 | 0.065 | 0.000 | |
| 20 | | | | | | | 217-02-014 | Single | 0 | 0 | 1 | 11 | 0.000 | 0.000 | 0.051 | |
| 21 | | | | | | | 217-02-015 | Single | 0 | 1 | 0 | 14 | 0.000 | 0.065 | 0.000 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22 | | | | | | | 217-02-014ka | Single | 0 | 0 | 1 | 9 | 0.000 | 0.000 | 0.042 | |
| 23 | | | | | | | 217-02-015ka | Single | 0 | 1 | 0 | 13 | 0.000 | 0.060 | 0.000 | |
| 24 | | | | | | | 217-02-015ka1 | Single | 0 | 1 | 0 | 7 | 0.000 | 0.032 | 0.000 | |
| 25 | B | G | 100 | 25 | e | 100 | 217-02-020G1 | Single | 1 | 0 | 0 | 15 | 0.069 | 0.000 | 0.000 | |
| 26 | | | | | | | 217-02-021 | Single | 1 | 0 | 0 | 11 | 0.051 | 0.000 | 0.000 | |
| 27 | | | | | | | 217-02-020 | Single | 1 | 0 | 0 | 13 | 0.060 | 0.000 | 0.000 | |
| 28 | | | | | | | 217-02-021ka | Single | 0 | 0 | 1 | 12 | 0.000 | 0.000 | 0.056 | |
| 31 | | | | | | | 217-02-023 | Single | 0 | 0 | 1 | 9 | 0.000 | 0.000 | 0.042 | |
| 32 | | | | | | | 217-02-002 | Single | 0 | 0 | 1 | 18 | 0.000 | 0.000 | 0.083 | |
| 33 | | | | | | | 217-02-025 | Single | 1 | 0 | 0 | 23 | 0.106 | 0.000 | 0.000 | |
| 34 | | | | | | | 217-02-027 | Single | 0 | 1 | 0 | 5 | 0.000 | 0.023 | 0.000 | |
| 35 | C | D | 60 | 25 | f | 60 | 217-01-006 | Single | 0 | 1 | 0 | 22 | 0.000 | 0.102 | 0.000 | |
| 36 | | | | | | | 217-03-40A | Single | 1 | 0 | 0 | 14 | 0.065 | 0.000 | 0.000 | |
| 37 | | | | | | | 217-01-005 | Single | 0 | 0 | 1 | 13 | 0.000 | 0.000 | 0.060 | |
| 41 | | | | | | | 217-01-012 | Single | 0 | 0 | 1 | 11 | 0.000 | 0.000 | 0.051 | |
| 42 | | | | | | | 217-01-018 | Single | 0 | 0 | 1 | 18 | 0.000 | 0.000 | 0.083 | |
| 43 | C | E | 50 | 25 | g | 50 | 217-01-019 | Single | 0 | 1 | 0 | 14 | 0.000 | 0.065 | 0.000 | |
| 44 | | | | | | | 217-01-016 | Single | 0 | 0 | 1 | 11 | 0.000 | 0.000 | 0.051 | |
| 45 | | | | | | | 217-01-020 | Single | 1 | 0 | 0 | 15 | 0.069 | 0.000 | 0.000 | |
| 46 | | | | | | | 217-03-034 | Single | 0 | 1 | 0 | 17 | 0.000 | 0.079 | 0.000 | |
| 47 | | | | | | | 217-01-017A | Single | 1 | 0 | 0 | 26 | 0.120 | 0.000 | 0.000 | |
| 48 | | | | | | | 217-01-027 | Single | 0 | 0 | 1 | 11 | 0.000 | 0.000 | 0.051 | |
| 49 | B | H | 245 | 25 | h | 245 | 217-01-050A | Single | 0 | 0 | 1 | 13 | 0.000 | 0.000 | 0.060 | |
| 50 | | | | | | | 217-01-048 | Single | 0 | 1 | 0 | 14 | 0.000 | 0.065 | 0.000 | |
| 51 | | | | | | | 217-01-050 | Single | 1 | 0 | 0 | 11 | 0.051 | 0.000 | 0.000 | |
| 52 | | | | | | | 217-01-055 | Single | 0 | 1 | 0 | 14 | 0.000 | 0.065 | 0.000 | |
| 53 | | | | | | | 217-03-040 | Single | 0 | 0 | 1 | 18 | 0.000 | 0.000 | 0.083 | |
| 54 | | | | | | | 217-01-045 | Single | 1 | 0 | 0 | 16 | 0.074 | 0.000 | 0.000 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 55 | | | | | | | 217-01-046ka1 | Single | 0 | 0 | 1 | 21 | 0.000 | 0.000 | 0.097 | |
| 56 | | | | | | | 217-01-046ka | Single | 0 | 1 | 0 | 23 | 0.000 | 0.106 | 0.000 | |
| 57 | | | | | | | 217-01-043 | Single | 0 | 0 | 1 | 22 | 0.000 | 0.000 | 0.102 | |
| 58 | H | I | 100 | 25 | i | 50 | 217-01-029 | Single | 0 | 1 | 0 | 11 | 0.000 | 0.051 | 0.000 | |
| 59 | | | | | | | 217-01-029ka | Single | 1 | 0 | 0 | 15 | 0.069 | 0.000 | 0.000 | |
| 60 | | | | | | | 217-01-031 | Single | 1 | 0 | 0 | 14 | 0.065 | 0.000 | 0.000 | |
| 62 | | | | | | | 217-01-040A | Single | 1 | 0 | 0 | 16 | 0.074 | 0.000 | 0.000 | |
| 63 | | | | | | | 217-01-040 | Single | 1 | 0 | 0 | 13 | 0.060 | 0.000 | 0.000 | |
| 64 | | | | | | | 217-01-038DUP1 | Single | 0 | 0 | 1 | 11 | 0.000 | 0.000 | 0.051 | |
| 65 | | | | 25 | j | 50 | 217-01-025A | Single | 0 | 0 | 1 | 14 | 0.000 | 0.000 | 0.065 | |
| 66 | | | | | | | 217-01-038 | Single | 0 | 1 | 0 | 31 | 0.000 | 0.144 | 0.000 | |
| 67 | | | | | | | 217-01-023KHA | Single | 1 | 0 | 0 | 32 | 0.148 | 0.000 | 0.000 | |
| 68 | | | | | | | 217-01-025 | Single | 0 | 0 | 1 | 11 | 0.000 | 0.000 | 0.051 | |
| 69 | | | | | | | 217-01-012 | Single | 0 | 1 | 0 | 13 | 0.000 | 0.060 | 0.000 | |
| 70 | | | | | | | 217-01-012KA | Single | 1 | 0 | 0 | 22 | 0.102 | 0.000 | 0.000 | |
| 71 | | | | | | | 217-01-012KHA | Single | 0 | 0 | 1 | 21 | 0.000 | 0.000 | 0.097 | |
| 72 | H | J | 135 | 25 | k | 135 | 217-01-010 | Single | 0 | 0 | 1 | 13 | 0.000 | 0.000 | 0.060 | |
| 73 | | | | | | | 217-01-011 | Single | 0 | 0 | 1 | 12 | 0.000 | 0.000 | 0.056 | |
| 74 | | | | | | | 217-01-014GA | Single | 0 | 1 | 0 | 16 | 0.000 | 0.074 | 0.000 | |
| 75 | | | | | | | 217-01-015 | Single | 1 | 0 | 0 | 33 | 0.153 | 0.000 | 0.000 | |
| 76 | J | L | 95 | 25 | l | 95 | 217-01-016A | Single | 1 | 0 | 0 | 25 | 0.116 | 0.000 | 0.000 | |
| 77 | | | | | | | 217-01-021 | Single | 1 | 0 | 0 | 16 | 0.074 | 0.000 | 0.000 | |
| 78 | | | | | | | 217-02-001 | Single | 1 | 0 | 0 | 14 | 0.065 | 0.000 | 0.000 | |
| 79 | | | | | | | 217-02-028KA1 | Single | 0 | 0 | 1 | 16 | 0.000 | 0.000 | 0.074 | |
| 81 | L | M | 180 | 25 | m | 95 | 217-02-028 | Single | 0 | 0 | 1 | 64 | 0.000 | 0.000 | 0.296 | |
| 82 | | | | | | | 217-01-046KHA | Single | 0 | 1 | 0 | 16 | 0.000 | 0.074 | 0.000 | |
| 85 | | | | | | | 217-02-035 | Single | 1 | 0 | 0 | 18 | 0.083 | 0.000 | 0.000 | |
| 86 | | | | | | | 217-02-031 | Single | 0 | 0 | 1 | 14 | 0.000 | 0.000 | 0.065 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 87 | | | | | | | 217-02-032 | Single | 0 | 1 | 0 | 53 | 0.000 | 0.245 | 0.000 | |
| 88 | | | | | | | 217-02-036 | Single | 1 | 0 | 0 | 35 | 0.162 | 0.000 | 0.000 | |
| 89 | | | | 25 | n | 85 | 217-02-043KA | Single | 0 | 0 | 1 | 16 | 0.000 | 0.000 | 0.074 | |
| 90 | | | | | | | 217-02-042 | Single | 0 | 0 | 1 | 14 | 0.000 | 0.000 | 0.065 | |
| 91 | | | | | | | 217-02-044 | Single | 0 | 0 | 1 | 51 | 0.000 | 0.000 | 0.236 | |
| 92 | | | | | | | 217-02-028DUP1 | Single | 0 | 1 | 0 | 310 | 0.000 | 1.435 | 0.000 | |
| 93 | | | | | | | 217-01-046KA1 | Single | 1 | 0 | 0 | 481 | 2.227 | 0.000 | 0.000 | |
| 94 | M | P | 55 | 25 | o | 55 | 217-02-040 | Single | 0 | 1 | 0 | 358 | 0.000 | 1.657 | 0.000 | |
| 95 | | | | | | | 217-01-022 | Three | 0.33 | 0.33 | 0.33 | 2846 | 4.392 | 4.392 | 4.392 | |
| 96 | | | | | | | 217-02-037KA | Single | 1 | 0 | 0 | 197 | 0.912 | 0.000 | 0.000 | |
| 97 | | | | | | | 217-02-044 | Single | 0 | 0 | 1 | 494 | 0.000 | 0.000 | 2.287 | |
| 98 | | | | | | | 217-02-037KA1 | Single | 0 | 1 | 0 | 133 | 0.000 | 0.616 | 0.000 | |
| 99 | M | N | 65 | 25 | p | 65 | 217-02-036KA | Single | 0 | 1 | 0 | 394 | 0.000 | 1.824 | 0.000 | |
| 101 | | | | | | | 217-02-037KA | Single | 1 | 0 | 0 | 298 | 1.380 | 0.000 | 0.000 | |
| 102 | | | | | | | 217-02-037DUP1 | Single | 0 | 1 | 0 | 322 | 0.000 | 1.491 | 0.000 | |
| 103 | | | | | | | 217-02-039 | Three | 0.33 | 0.33 | 0.33 | 4452 | 6.870 | 6.870 | 6.870 | |
| 104 | | | | | | | 217-02-034 | Single | 1 | 0 | 0 | 64 | 0.296 | 0.000 | 0.000 | |
| 105 | | | | | | | 217-02-033 | Single | 0 | 0 | 1 | 55 | 0.000 | 0.000 | 0.255 | |
| 106 | J | K | 50 | 25 | q | 50 | 217-02-022 | Single | 0 | 0 | 1 | 14 | 0.000 | 0.000 | 0.065 | |
| 107 | | | | | | | 217-02-024 | Single | 0 | 1 | 0 | 13 | 0.000 | 0.060 | 0.000 | |
| 108 | | | | | | | 217-02-016 | Single | 0 | 1 | 0 | 18 | 0.000 | 0.083 | 0.000 | |
| 109 | | | | | | | 217-02-022A | Single | 0 | 1 | 0 | 12 | 0.000 | 0.056 | 0.000 | |
| 110 | O | Q | 155 | 50 | r | 155 | 217-02-024KA | Single | 1 | 0 | 0 | 16 | 0.074 | 0.000 | 0.000 | |
| 112 | | | | | | | 217-03-080 | Single | 1 | 0 | 0 | 14 | 0.065 | 0.000 | 0.000 | |
| 113 | | | | | | | 217-03-020 | Single | 0 | 0 | 1 | 25 | 0.000 | 0.000 | 0.116 | |
| 114 | Q | S | 55 | 25 | s | 55 | 217-03-022 | Single | 0 | 0 | 1 | 16 | 0.000 | 0.000 | 0.074 | |
| 115 | | | | | | | 217-03-023 | Single | 0 | 1 | 0 | 31 | 0.000 | 0.144 | 0.000 | |
| 116 | | | | | | | 217-03-019 | Single | 1 | 0 | 0 | 20 | 0.093 | 0.000 | 0.000 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 117 | | | | | | | 217-03-026 | Single | 0 | 0 | 1 | 22 | 0.000 | 0.000 | 0.102 | |
| 118 | | | | | | | 217-03-028 | Single | 1 | 0 | 0 | 13 | 0.060 | 0.000 | 0.000 | |
| 119 | | | | | | | 217-04-027 | Single | 1 | 0 | 0 | 17 | 0.079 | 0.000 | 0.000 | |
| 120 | Q | T1 | 175 | 25 | t | 175 | 217-04-026 | Single | 0 | 0 | 1 | 14 | 0.000 | 0.000 | 0.065 | |
| 121 | | | | | | | 217-04-025 | Single | 0 | 0 | 1 | 11 | 0.000 | 0.000 | 0.051 | |
| 122 | | | | | | | 217-04-016KHA | Single | 0 | 1 | 0 | 15 | 0.000 | 0.069 | 0.000 | |
| 123 | | | | | | | 217-04-013 | Single | 1 | 0 | 0 | 17 | 0.079 | 0.000 | 0.000 | |
| 126 | | | | | | | 217-03-031 | Single | 0 | 1 | 0 | 22 | 0.000 | 0.102 | 0.000 | |
| 127 | | | | | | | 217-03-095 | Single | 1 | 0 | 0 | 22 | 0.102 | 0.000 | 0.000 | |
| 128 | | | | | | | 217-03-011KA | Single | 1 | 0 | 0 | 15 | 0.069 | 0.000 | 0.000 | |
| 129 | | | | | | | 217-04-016GA | Single | 1 | 0 | 0 | 14 | 0.065 | 0.000 | 0.000 | |
| 130 | T1 | U | 230 | 50 | u | 100 | 217-04-024 | Single | 0 | 1 | 0 | 17 | 0.000 | 0.079 | 0.000 | |
| 131 | | | | | | | 217-04-023 | Single | 0 | 0 | 1 | 9 | 0.000 | 0.000 | 0.042 | |
| 132 | | | | | | | 217-04-020 | Single | 0 | 1 | 0 | 16 | 0.000 | 0.074 | 0.000 | |
| 133 | | | | | | | 217-04-023A | Single | 1 | 0 | 0 | 6 | 0.028 | 0.000 | 0.000 | |
| 134 | | | | | | | 217-04-018 | Single | 0 | 1 | 0 | 12 | 0.000 | 0.056 | 0.000 | |
| 135 | | | | | | | 217-04-007 | Single | 0 | 1 | 0 | 22 | 0.000 | 0.102 | 0.000 | |
| 136 | | | | | | | 217-04-016GHA | Single | 1 | 0 | 0 | 15 | 0.069 | 0.000 | 0.000 | |
| 137 | | | | 50 | v | 130 | 217-04-017 | Single | 0 | 0 | 1 | 11 | 0.000 | 0.000 | 0.051 | |
| 138 | | | | | | | 217-04-009 | Single | 0 | 0 | 1 | 13 | 0.000 | 0.000 | 0.060 | |
| 139 | | | | | | | 217-04-012 | Single | 0 | 0 | 1 | 14 | 0.000 | 0.000 | 0.065 | |
| 140 | | | | | | | 217-04-010 | Single | 0 | 1 | 0 | 18 | 0.000 | 0.083 | 0.000 | |
| 141 | | | | | | | 217-04-010KA | Single | 0 | 1 | 0 | 17 | 0.000 | 0.079 | 0.000 | |
| 142 | | | | | | | 217-04-014 | Single | 1 | 0 | 0 | 14 | 0.065 | 0.000 | 0.000 | |
| 143 | | | | | | | 217-04-015 | Single | 1 | 0 | 0 | 21 | 0.097 | 0.000 | 0.000 | |
| 144 | U | V | 120 | 25 | w | 65 | 217-04-006KA | Single | 1 | 0 | 0 | 37 | 0.171 | 0.000 | 0.000 | |
| 145 | | | | | | | 217-04-005B | Single | 0 | 1 | 0 | 13 | 0.000 | 0.060 | 0.000 | |
| 146 | | | | | | | 217-04-005C | Single | 0 | 0 | 1 | 14 | 0.000 | 0.000 | 0.065 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 147 | | | | | | | 217-03-042 | Single | 1 | 0 | 0 | 57 | 0.264 | 0.000 | 0.000 | |
| 148 | | | | | | | 217-04-005H | Single | 1 | 0 | 0 | 35 | 0.162 | 0.000 | 0.000 | |
| 149 | | | | | | | 217-04-005F1 | Single | 0 | 1 | 0 | 22 | 0.000 | 0.102 | 0.000 | |
| 150 | | | | 25 | x | 55 | 217-04-002 | Single | 0 | 1 | 0 | 14 | 0.000 | 0.065 | 0.000 | |
| 151 | | | | | | | 217-04-001 | Single | 1 | 0 | 0 | 17 | 0.079 | 0.000 | 0.000 | |
| 152 | | | | | | | 217-04-005 | Single | 0 | 0 | 1 | 32 | 0.000 | 0.000 | 0.148 | |
| 153 | | | | | | | 217-04-005F1 | Single | 0 | 0 | 1 | 13 | 0.000 | 0.000 | 0.060 | |
| 154 | | | | | | | 217-04-005A | Single | 0 | 0 | 1 | 14 | 0.000 | 0.000 | 0.065 | |
| 155 | | | | | | | 217-04-006 | Single | 0 | 1 | 0 | 51 | 0.000 | 0.236 | 0.000 | |
| 156 | V | W | 100 | 50 | y | 100 | 217-04-033KHA | Single | 0 | 0 | 1 | 15 | 0.000 | 0.000 | 0.069 | |
| 157 | | | | | | | 217-04-033 | Single | 1 | 0 | 0 | 11 | 0.051 | 0.000 | 0.000 | |
| 158 | | | | | | | 217-04-035 | Single | 1 | 0 | 0 | 17 | 0.079 | 0.000 | 0.000 | |
| 159 | | | | | | | 217-04-038 | Single | 0 | 1 | 0 | 19 | 0.000 | 0.088 | 0.000 | |
| 160 | | | | | | | 217-04-040 | Single | 0 | 0 | 1 | 13 | 0.000 | 0.000 | 0.060 | |
| 161 | | | | | | | 217-04-041 | Single | 0 | 0 | 1 | 14 | 0.000 | 0.000 | 0.065 | |
| 162 | | | | | | | 217-04-032 | Single | 0 | 1 | 0 | 18 | 0.000 | 0.083 | 0.000 | |
| 164 | | | | | | | 217-04-031KA | Single | 1 | 0 | 0 | 13 | 0.060 | 0.000 | 0.000 | |
| 165 | T1 | T3 | 100 | 25 | z | 50 | 217-03-016 | Single | 0 | 1 | 0 | 13 | 0.000 | 0.060 | 0.000 | |
| 166 | | | | | | | 217-03-011 | Single | 0 | 1 | 0 | 25 | 0.000 | 0.116 | 0.000 | |
| 167 | | | | | | | 217-03-014 | Single | 1 | 0 | 0 | 12 | 0.056 | 0.000 | 0.000 | |
| 168 | | | | | | | 217-03-009 | Single | 0 | 0 | 1 | 18 | 0.000 | 0.000 | 0.083 | |
| 169 | | | | | | | 217-03-004 | Single | 0 | 0 | 1 | 20 | 0.000 | 0.000 | 0.093 | |
| 170 | | | | 25 | a1 | 50 | 217-03-008 | Single | 0 | 0 | 1 | 19 | 0.000 | 0.000 | 0.088 | |
| 171 | | | | | | | 217-03-006 | Single | 0 | 0 | 1 | 16 | 0.000 | 0.000 | 0.074 | |
| 172 | | | | | | | 217-03-002 | Single | 0 | 0 | 1 | 21 | 0.000 | 0.000 | 0.097 | |
| 173 | | | | | | | 217-03-001KA | Single | 1 | 0 | 0 | 14 | 0.065 | 0.000 | 0.000 | |
| 174 | | | | | | | 217-03-003 | Single | 1 | 0 | 0 | 23 | 0.106 | 0.000 | 0.000 | |
| 175 | T3 | T2 | 155 | 25 | b1 | 100 | 217-01-024c | Single | 1 | 0 | 0 | 14 | 0.065 | 0.000 | 0.000 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 176 | | | | | | | 217-01-024b | Single | 0 | 0 | 1 | 11 | 0.000 | 0.000 | 0.051 | |
| 177 | | | | | | | 216-01-024a | Single | 0 | 0 | 1 | 13 | 0.000 | 0.000 | 0.060 | |
| 178 | | | | | | | 217-03-043 | Single | 0 | 0 | 1 | 15 | 0.000 | 0.000 | 0.069 | |
| 179 | | | | | | | 217-01-025ka1 | Single | 0 | 1 | 0 | 19 | 0.000 | 0.088 | 0.000 | |
| 180 | | | | | | | 217-01-025ga | Single | 0 | 0 | 1 | 17 | 0.000 | 0.000 | 0.079 | |
| 181 | | | | | | | 217-01-025gha | Single | 1 | 0 | 0 | 13 | 0.060 | 0.000 | 0.000 | |
| 182 | | | | | | | 217-01-025gha1 | Single | 0 | 1 | 0 | 11 | 0.000 | 0.051 | 0.000 | |
| 183 | | | | | | | 217-01-025[a] | Single | 0 | 0 | 1 | 16 | 0.000 | 0.000 | 0.074 | |
| 184 | | | | | | | 217-01-025e | Single | 1 | 0 | 0 | 13 | 0.060 | 0.000 | 0.000 | |
| 185 | | | | | | | 217-01-025A | Single | 0 | 0 | 1 | 14 | 0.000 | 0.000 | 0.065 | |
| 186 | | | | | | | 217-01-025B | Single | 0 | 0 | 1 | 35 | 0.000 | 0.000 | 0.162 | |
| 187 | | | | 25 | c1 | 55 | 217-01-26 | Single | 0 | 0 | 1 | 42 | 0.000 | 0.000 | 0.194 | |
| 188 | | | | | | | 217-01-026ka | Single | 0 | 1 | 0 | 18 | 0.000 | 0.083 | 0.000 | |
| 189 | | | | | | | 217-01-026ka10 | Single | 0 | 1 | 0 | 11 | 0.000 | 0.051 | 0.000 | |
| 190 | | | | | | | 217-01-026ka11 | Single | 1 | 0 | 0 | 40 | 0.185 | 0.000 | 0.000 | |
| 191 | | | | | | | 217-01-026ka12 | Single | 1 | 0 | 0 | 9 | 0.042 | 0.000 | 0.000 | |
| 192 | | | | | | | 217-01-026ka13 | Single | 1 | 0 | 0 | 14 | 0.065 | 0.000 | 0.000 | |
| 193 | | | | 25 | d1 | 50 | 217-01-026ka14 | Single | 0 | 0 | 1 | 15 | 0.000 | 0.000 | 0.069 | |
| 194 | | | | | | | 217-01-026ka15 | Single | 0 | 0 | 1 | 17 | 0.000 | 0.000 | 0.079 | |
| 195 | | | | | | | 217-01-026b | Single | 0 | 1 | 0 | 14 | 0.000 | 0.065 | 0.000 | |
| 197 | T3 | T4 | 100 | | | | 217-01-026A | Single | 1 | 0 | 0 | 48 | 0.222 | 0.000 | 0.000 | |
| 198 | | | | | | | 217-01-026F | Single | 0 | 1 | 0 | 18 | 0.000 | 0.083 | 0.000 | |
| 199 | | | | 25 | e1 | 50 | 217-01-026B1 | Single | 0 | 1 | 0 | 42 | 0.000 | 0.194 | 0.000 | |
| 200 | | | | | | | 217-01-028 | Single | 1 | 0 | 0 | 16 | 0.074 | 0.000 | 0.000 | |
| 201 | | | | | | | 217-01-017E | Single | 0 | 0 | 1 | 61 | 0.000 | 0.000 | 0.282 | |

**Line and load data of Mahankal LT feeder for etap**

| Specification | | | | | Peak Load, kW | | | Peak Current, A | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Points | Length, m | Size, sq. mm | Resistance, ohm/km | Reactance, ohm/km | R | Y | B | IR | IY | IB |
| a | 135 | 50 | 0.796 | 0.09 | 0.111 | 0.194 | 0.000 | 0.488 | 0.854 | 0.000 |
| b | 50 | 50 | 0.796 | 0.09 | 0.116 | 0.111 | 0.000 | 0.508 | 0.488 | 0.000 |
| c | 95 | 25 | 1.49 | 0.096 | 0.162 | 0.116 | 0.000 | 0.712 | 0.508 | 0.000 |
| d | 85 | 25 | 1.49 | 0.096 | 0.000 | 0.347 | 0.093 | 0.000 | 1.525 | 0.407 |
| e | 100 | 25 | 1.49 | 0.096 | 0.287 | 0.023 | 0.181 | 1.261 | 0.102 | 0.793 |
| f | 60 | 25 | 1.49 | 0.096 | 0.065 | 0.102 | 0.194 | 0.285 | 0.447 | 0.854 |
| g | 50 | 25 | 1.49 | 0.096 | 0.190 | 0.144 | 0.102 | 0.834 | 0.630 | 0.447 |
| h | 245 | 25 | 1.49 | 0.096 | 0.125 | 0.236 | 0.343 | 0.549 | 1.037 | 1.505 |
| i | 50 | 25 | 1.49 | 0.096 | 0.269 | 0.051 | 0.051 | 1.179 | 0.224 | 0.224 |
| j | 50 | 25 | 1.49 | 0.096 | 0.250 | 0.204 | 0.213 | 1.098 | 0.895 | 0.935 |
| k | 135 | 25 | 1.49 | 0.096 | 0.153 | 0.074 | 0.116 | 0.671 | 0.325 | 0.508 |
| l | 95 | 25 | 1.49 | 0.096 | 0.255 | 0.000 | 0.074 | 1.118 | 0.000 | 0.325 |
| m | 95 | 25 | 1.49 | 0.096 | 0.083 | 0.074 | 0.361 | 0.366 | 0.325 | 1.586 |
| n | 85 | 25 | 1.49 | 0.096 | 0.162 | 0.245 | 0.375 | 0.712 | 1.078 | 1.647 |
| o | 55 | 25 | 1.49 | 0.096 | 7.531 | 7.485 | 4.392 | 33.074 | 32.870 | 19.288 |
| p | 65 | 25 | 1.49 | 0.096 | 8.250 | 10.801 | 9.157 | 36.232 | 47.435 | 40.217 |
| q | 50 | 25 | 1.49 | 0.096 | 0.296 | 0.144 | 0.319 | 1.301 | 0.630 | 1.403 |
| r | 155 | 50 | 0.796 | 0.09 | 0.139 | 0.056 | 0.000 | 0.610 | 0.244 | 0.000 |
| s | 55 | 25 | 1.49 | 0.096 | 0.231 | 0.144 | 0.292 | 1.017 | 0.630 | 1.281 |
| t | 175 | 25 | 1.49 | 0.096 | 0.250 | 0.171 | 0.116 | 1.098 | 0.752 | 0.508 |
| u | 100 | 50 | 0.796 | 0.09 | 0.097 | 0.310 | 0.042 | 0.427 | 1.362 | 0.183 |
| v | 130 | 50 | 0.796 | 0.09 | 0.162 | 0.162 | 0.176 | 0.712 | 0.712 | 0.773 |
| w | 65 | 25 | 1.49 | 0.096 | 0.597 | 0.162 | 0.065 | 2.623 | 0.712 | 0.285 |
| x | 55 | 25 | 1.49 | 0.096 | 0.079 | 0.301 | 0.273 | 0.346 | 1.322 | 1.200 |
| y | 100 | 50 | 0.796 | 0.09 | 0.190 | 0.171 | 0.194 | 0.834 | 0.752 | 0.854 |
| z | 50 | 25 | 1.49 | 0.096 | 0.056 | 0.176 | 0.176 | 0.244 | 0.773 | 0.773 |
| a1 | 50 | 25 | 1.49 | 0.096 | 0.171 | 0.000 | 0.259 | 0.752 | 0.000 | 1.139 |
| b1 | 100 | 25 | 1.49 | 0.096 | 0.125 | 0.139 | 0.333 | 0.549 | 0.610 | 1.464 |
| c1 | 55 | 25 | 1.49 | 0.096 | 0.287 | 0.134 | 0.421 | 1.261 | 0.590 | 1.850 |
| d1 | 50 | 25 | 1.49 | 0.096 | 0.065 | 0.065 | 0.148 | 0.285 | 0.285 | 0.651 |
| e1 | 50 | 25 | 1.49 | 0.096 | 0.296 | 0.278 | 0.282 | 1.301 | 1.220 | 1.240 |

**Line and load data of Mahankal LT feeder for Matlab**

| Specification | | | | | Peak Load, kW | | | Peak Current, A | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Points | Length, m | Size, sq. mm | Resistance, ohm/km | Reactance, ohm/km | R | Y | B | IR | IY | IB |
| A | 135 | 50 | 0.796 | 0.09 | 0.111 | 0.194 | 0.000 | 0.488 | 0.854 | 0.000 |
| R | 50 | 50 | 0.796 | 0.09 | 0.116 | 0.111 | 0.000 | 0.508 | 0.488 | 0.000 |
| B | 95 | 25 | 1.49 | 0.096 | 0.162 | 0.116 | 0.000 | 0.712 | 0.508 | 0.000 |
| C | 85 | 25 | 1.49 | 0.096 | 0.000 | 0.347 | 0.093 | 0.000 | 1.525 | 0.407 |
| G | 100 | 25 | 1.49 | 0.096 | 0.287 | 0.023 | 0.181 | 1.261 | 0.102 | 0.793 |
| D | 60 | 25 | 1.49 | 0.096 | 0.065 | 0.102 | 0.194 | 0.285 | 0.447 | 0.854 |
| E | 50 | 25 | 1.49 | 0.096 | 0.190 | 0.144 | 0.102 | 0.834 | 0.630 | 0.447 |
| H | 245 | 25 | 1.49 | 0.096 | 0.125 | 0.236 | 0.343 | 0.549 | 1.037 | 1.505 |
| I | 100 | 25 | 1.49 | 0.096 | 0.519 | 0.255 | 0.264 | 2.277 | 1.118 | 1.159 |
| J | 135 | 25 | 1.49 | 0.096 | 0.153 | 0.074 | 0.116 | 0.671 | 0.325 | 0.508 |
| L | 95 | 25 | 1.49 | 0.096 | 0.255 | 0.000 | 0.074 | 1.118 | 0.000 | 0.325 |
| M | 180 | 25 | 1.49 | 0.096 | 0.245 | 0.319 | 0.736 | 1.078 | 1.403 | 3.233 |
| P | 55 | 25 | 1.49 | 0.096 | 7.531 | 7.485 | 4.392 | 33.074 | 32.870 | 19.288 |
| N | 65 | 25 | 1.49 | 0.096 | 8.250 | 10.801 | 9.157 | 36.232 | 47.435 | 40.217 |
| K | 50 | 25 | 1.49 | 0.096 | 0.296 | 0.144 | 0.319 | 1.301 | 0.630 | 1.403 |
| Q | 155 | 50 | 0.796 | 0.09 | 0.139 | 0.056 | 0.000 | 0.610 | 0.244 | 0.000 |
| S | 55 | 25 | 1.49 | 0.096 | 0.231 | 0.144 | 0.292 | 1.017 | 0.630 | 1.281 |
| T1 | 175 | 25 | 1.49 | 0.096 | 0.250 | 0.171 | 0.116 | 1.098 | 0.752 | 0.508 |
| U | 230 | 50 | 0.796 | 0.09 | 0.259 | 0.472 | 0.218 | 1.139 | 2.074 | 0.956 |
| V | 120 | 25 | 1.49 | 0.096 | 0.676 | 0.463 | 0.338 | 2.968 | 2.033 | 1.484 |
| W | 100 | 50 | 0.796 | 0.09 | 0.190 | 0.171 | 0.194 | 0.834 | 0.752 | 0.854 |
| T3 | 100 | 25 | 1.49 | 0.096 | 0.227 | 0.176 | 0.435 | 0.996 | 0.773 | 1.911 |
| T2 | 155 | 25 | 1.49 | 0.096 | 0.412 | 0.273 | 0.755 | 1.810 | 1.200 | 3.314 |
| T4 | 100 | 25 | 1.49 | 0.096 | 0.361 | 0.343 | 0.431 | 1.586 | 1.505 | 1.891 |

## APPENDIX K: LINE AND LOAD DATA FOR BIHANI CHOWK DISTRIBUTION TRANSFORMER

**Transformer Location: Bihani Chowk**

**Transformer Capacity: 100 kVA**

| S.N | Specification | | | | | | Consumers | | Connected phase | | | Energy, kWh | PEAK LOAD, kW | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | From | To | Total distance, m | size, sq. mm | Load point | Distance between Load point | consumers ID | No. of phases | R | Y | B | Billing of one month | R | Y | B | |
| 1 | 0 | A | 330 | 95 | a | 195 | 220-23-016 | 1 | 1 | 0 | 0 | 128 | 0.593 | 0.000 | 0.000 | |
| 2 | | | | | | | 220-23-016Kha | 1 | 0 | 1 | 0 | 24 | 0.000 | 0.111 | 0.000 | |
| 3 | | | | | | | 220-23-016B | 1 | 0 | 0 | 1 | 94 | 0.000 | 0.000 | 0.435 | |
| 4 | | | | | | | 220-23-017 | 1 | 0 | 0 | 1 | 16 | 0.000 | 0.000 | 0.074 | |
| 5 | | | | | | | 220-23-015A | 1 | 0 | 1 | 0 | 14 | 0.000 | 0.065 | 0.000 | |
| 6 | | | | | | | 220-23-016Ka | 1 | 0 | 0 | 1 | 18 | 0.000 | 0.000 | 0.083 | |
| 7 | | | | 95 | b | 135 | 220-23-013ka | 1 | 0 | 0 | 1 | 17 | 0.000 | 0.000 | 0.079 | |
| 8 | | | | | | | 220-23-013 | 1 | 1 | 0 | 0 | 15 | 0.069 | 0.000 | 0.000 | |
| 9 | | | | | | | 220-23-015 | 1 | 0 | 0 | 1 | 14 | 0.000 | 0.000 | 0.065 | |
| 10 | | | | | | | 220-23-502 | 1 | 0 | 1 | 0 | 11 | 0.000 | 0.051 | 0.000 | |
| 11 | | | | | | | 220-23-014 | 1 | 0 | 1 | 0 | 16 | 0.000 | 0.074 | 0.000 | |
| 12 | A | B | 220 | 95 | c | 125 | 220-27-013Ka4 | 1 | 1 | 0 | 0 | 21 | 0.097 | 0.000 | 0.000 | |
| 13 | | | | | | | 220-27-009 | 1 | 0 | 0 | 1 | 20 | 0.000 | 0.000 | 0.093 | |
| 14 | | | | | | | 220-27-013Ga | 1 | 1 | 0 | 0 | 12 | 0.056 | 0.000 | 0.000 | |
| 15 | | | | | | | 220-27-008 | 1 | 1 | 0 | 0 | 14 | 0.065 | 0.000 | 0.000 | |
| 16 | | | | | | | 220-23-011 | 1 | 1 | 0 | 0 | 16 | 0.074 | 0.000 | 0.000 | |
| 17 | | | | | | | 220-27-016Dudl | 1 | 1 | 0 | 0 | 22 | 0.102 | 0.000 | 0.000 | |
| 18 | | | | | | | 220-27-016A | 1 | 0 | 0 | 1 | 40 | 0.000 | 0.000 | 0.185 | |
| 19 | | | | 95 | d | 95 | 220-27-015 | 1 | 0 | 0 | 1 | 14 | 0.000 | 0.000 | 0.065 | |
| 20 | | | | | | | 220-27-015A | 1 | 0 | 0 | 1 | 24 | 0.000 | 0.000 | 0.111 | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21 | | | | | | | 220-27-013Ka | 1 | 0 | 1 | 0 | 13 | 0.000 | 0.060 | 0.000 | |
| 22 | | | | | | | 220-27-013Ka1 | 1 | 0 | 1 | 0 | 18 | 0.000 | 0.083 | 0.000 | |
| 23 | | | | | | | 220-27-013B | 1 | 1 | 0 | 0 | 19 | 0.088 | 0.000 | 0.000 | |
| 24 | | | | | | | 220-27-046Ka | 1 | 1 | 0 | 0 | 16 | 0.074 | 0.000 | 0.000 | |
| 25 | | | | | | | 220-23-009Ka | 1 | 0 | 0 | 1 | 17 | 0.000 | 0.000 | 0.079 | |
| 26 | | | | | | | 220-19-019 ka | 1 | 0 | 0 | 1 | 60 | 0.000 | 0.000 | 0.278 | |
| 27 | | | | | | | 220-19-019Gha1 | 1 | 0 | 0 | 1 | 28 | 0.000 | 0.000 | 0.130 | |
| 28 | | | | | | | 220-19-019Gha2 | 1 | 0 | 1 | 0 | 23 | 0.000 | 0.106 | 0.000 | |
| 29 | | | | 50 | e | 75 | 220-19-019Gha | 1 | 1 | 0 | 0 | 41 | 0.190 | 0.000 | 0.000 | |
| 30 | | | | | | | 220-20-022Ka | 1 | 0 | 1 | 0 | 144 | 0.000 | 0.667 | 0.000 | |
| 31 | | | | | | | 220-19-024 | 1 | 0 | 1 | 0 | 127 | 0.000 | 0.588 | 0.000 | |
| 32 | | | | | | | 220-19-019 | 1 | 1 | 0 | 0 | 63 | 0.292 | 0.000 | 0.000 | |
| 33 | | | | | | | 220-19-016Ka | 1 | 0 | 0 | 1 | 110 | 0.000 | 0.000 | 0.509 | |
| 34 | | | | | | | 220-19-021 | 1 | 0 | 0 | 1 | 57 | 0.000 | 0.000 | 0.264 | |
| 35 | | | | | | | 220-19-022 | 1 | 0 | 0 | 1 | 21 | 0.000 | 0.000 | 0.097 | |
| 36 | | | | 50 | f | 65 | 220-19-027 | 1 | 0 | 1 | 0 | 195 | 0.000 | 0.903 | 0.000 | |
| 37 | B | C | 695 | | | | 220-19-020Ka | 1 | 0 | 0 | 1 | 67 | 0.000 | 0.000 | 0.310 | |
| 38 | | | | | | | 220-19-020A | 1 | 1 | 0 | 0 | 18 | 0.083 | 0.000 | 0.000 | |
| 39 | | | | | | | 220-19-401 | 3 | 0.33 | 0.33 | 0.33 | 3509 | 5.361 | 5.361 | 5.361 | |
| 40 | | | | | | | 220-19-014 | 1 | 1 | 0 | 0 | 109 | 0.505 | 0.000 | 0.000 | |
| 41 | | | | | | | 220-19-012 | 1 | 0 | 1 | 0 | 229 | 0.000 | 1.060 | 0.000 | |
| 42 | | | | | | | 220-19-012Ka | 1 | 0 | 0 | 1 | 34 | 0.000 | 0.000 | 0.157 | |
| 43 | | | | 50 | g | 55 | 220-19-011 | 1 | 0 | 1 | 0 | 31 | 0.000 | 0.144 | 0.000 | |
| 44 | | | | | | | 220-19-013 | 1 | 1 | 0 | 0 | 192 | 0.889 | 0.000 | 0.000 | |
| 45 | | | | | | | 220-19-010Ka | 1 | 0 | 1 | 0 | 184 | 0.000 | 0.852 | 0.000 | |
| 46 | | | | | | | 220-19-009 | 1 | 0 | 1 | 0 | 36 | 0.000 | 0.167 | 0.000 | |
| 47 | | | | 50 | h | 60 | 220-19-054 | 1 | 1 | 0 | 0 | 129 | 0.597 | 0.000 | 0.000 | |
| 48 | | | | | | | 220-19-051 | 1 | 0 | 0 | 1 | 33 | 0.000 | 0.000 | 0.153 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 49 | | | | | | | 220-19-019A | 1 | 0 | 0 | 1 | 49 | 0.000 | 0.000 | 0.227 | |
| 50 | | | | | | | 220-19-021A | 1 | 0 | 0 | 1 | 81 | 0.000 | 0.000 | 0.375 | |
| 51 | | | | | | | 220-19-013Ka | 1 | 0 | 1 | 0 | 113 | 0.000 | 0.523 | 0.000 | |
| 52 | | | | | | | 220-19-013Ka3 | 1 | 0 | 0 | 1 | 207 | 0.000 | 0.000 | 0.958 | |
| 53 | | | | | | | 220-19-013Kha | 1 | 1 | 0 | 0 | 30 | 0.139 | 0.000 | 0.000 | |
| 54 | | | | | | | 220-23-018 | 1 | 1 | 0 | 0 | 81 | 0.375 | 0.000 | 0.000 | |
| 55 | | | | | | | 220-23-015Ka | 1 | 0 | 1 | 0 | 367 | 0.000 | 1.699 | 0.000 | |
| 56 | | | | | | | 220-23-020 | 1 | 0 | 0 | 1 | 61 | 0.000 | 0.000 | 0.282 | |
| 57 | | | | 50 | i | 75 | 220-23-019 | 1 | 0 | 1 | 0 | 221 | 0.000 | 1.023 | 0.000 | |
| 58 | | | | | | | 220-23-021 | 1 | 0 | 0 | 1 | 143 | 0.000 | 0.000 | 0.662 | |
| 59 | | | | | | | 220-23-022Ga | 1 | 0 | 0 | 1 | 65 | 0.000 | 0.000 | 0.301 | |
| 60 | | | | | | | 220-23-019Ka | 1 | 1 | 0 | 0 | 75 | 0.347 | 0.000 | 0.000 | |
| 61 | | | | | | | 220-23-018Ka | 1 | 0 | 0 | 1 | 67 | 0.000 | 0.000 | 0.310 | |
| 62 | | | | | | | 220-23-501DuDI | 3 | 0.33 | 0.33 | 0.33 | 4815 | 7.356 | 7.356 | 7.356 | |
| 63 | | | | | | | 220-23-026 | 1 | 0 | 0 | 1 | 44 | 0.000 | 0.000 | 0.204 | |
| 64 | | | | | | | 220-23-026A | 1 | 0 | 1 | 0 | 28 | 0.000 | 0.130 | 0.000 | |
| 65 | | | | 50 | j | 70 | 220-23-024 | 1 | 1 | 0 | 0 | 51 | 0.236 | 0.000 | 0.000 | |
| 66 | | | | | | | 220-23-027 | 1 | 1 | 0 | 0 | 47 | 0.218 | 0.000 | 0.000 | |
| 67 | | | | | | | 220-23-036 | 1 | 1 | 0 | 0 | 35 | 0.162 | 0.000 | 0.000 | |
| 68 | | | | | | | 220-23-034 | 1 | 1 | 0 | 0 | 117 | 0.542 | 0.000 | 0.000 | |
| 69 | | | | | | | 220-23-028 | 1 | 0 | 0 | 1 | 32 | 0.000 | 0.000 | 0.148 | |
| 70 | | | | | | | 220-23-029Ka | 1 | 0 | 0 | 1 | 73 | 0.000 | 0.000 | 0.338 | |
| 71 | | | | | | | 220-23-032 | 1 | 0 | 1 | 0 | 80 | 0.000 | 0.370 | 0.000 | |
| 72 | | | | | | | 220-23-202 | 1 | 1 | 0 | 0 | 29 | 0.134 | 0.000 | 0.000 | |
| 73 | | | | 50 | k | 65 | 220-23-201 | 1 | 0 | 1 | 0 | 409 | 0.000 | 1.894 | 0.000 | |
| 74 | | | | | | | 220-23-040 | 1 | 1 | 0 | 0 | 22 | 0.102 | 0.000 | 0.000 | |
| 75 | | | | | | | 220-23-046 | 1 | 0 | 0 | 1 | 96 | 0.000 | 0.000 | 0.444 | |
| 76 | | | | | | | 220-23-048 | 1 | 0 | 0 | 1 | 73 | 0.000 | 0.000 | 0.338 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 77 | | | | 50 | l | 95 | 220-23-049 | 1 | 0 | 1 | 0 | 38 | 0.000 | 0.176 | 0.000 | |
| 78 | | | | | | | 220-23-054 | 1 | 1 | 0 | 0 | 70 | 0.324 | 0.000 | 0.000 | |
| 79 | | | | | | | 220-27-023 | 1 | 1 | 0 | 0 | 35 | 0.162 | 0.000 | 0.000 | |
| 80 | | | | | | | 220-27-003 | 1 | 1 | 0 | 0 | 65 | 0.301 | 0.000 | 0.000 | |
| 81 | | | | | | | 220-27-020 | 1 | 1 | 0 | 0 | 90 | 0.417 | 0.000 | 0.000 | |
| 82 | | | | | | | 220-27-004 | 1 | 0 | 0 | 1 | 17 | 0.000 | 0.000 | 0.079 | |
| 83 | | | | | | | 220-27-040 | 1 | 0 | 1 | 0 | 38 | 0.000 | 0.176 | 0.000 | |
| 84 | | | | | | | 220-27-018Ka | 1 | 0 | 0 | 1 | 60 | 0.000 | 0.000 | 0.278 | |
| 85 | | | | 50 | m | 85 | 220-27-018A | 1 | 1 | 0 | 0 | 25 | 0.116 | 0.000 | 0.000 | |
| 86 | | | | | | | 220-27-019Ka | 1 | 0 | 0 | 1 | 15 | 0.000 | 0.000 | 0.069 | |
| 87 | | | | | | | 220-27-019 | 1 | 0 | 0 | 1 | 17 | 0.000 | 0.000 | 0.079 | |
| 88 | | | | | | | 220-27-011 | 1 | 0 | 0 | 1 | 61 | 0.000 | 0.000 | 0.282 | |
| 89 | | | | | | | 220-27-036 | 1 | 1 | 0 | 0 | 92 | 0.426 | 0.000 | 0.000 | |
| 90 | | | | | | | 220-27-037 | 1 | 0 | 1 | 0 | 370 | 0.000 | 1.713 | 0.000 | |
| 91 | | | | | | | 220-27-027 | 1 | 1 | 0 | 0 | 52 | 0.241 | 0.000 | 0.000 | |
| 92 | | | | | | | 220-27-028 | 1 | 1 | 0 | 0 | 20 | 0.093 | 0.000 | 0.000 | |
| 93 | | | | | | | 220-27-035Kha | 1 | 1 | 0 | 0 | 74 | 0.343 | 0.000 | 0.000 | |
| 94 | | | | 50 | n | 50 | 220-27-035Ka | 1 | 0 | 0 | 1 | 80 | 0.000 | 0.000 | 0.370 | |
| 95 | | | | | | | 220-23-019GaDDPI | 1 | 1 | 0 | 0 | 180 | 0.833 | 0.000 | 0.000 | |
| 96 | | | | | | | 220-27-010A | 1 | 1 | 0 | 0 | 130 | 0.602 | 0.000 | 0.000 | |
| 97 | | | | | | | 220-27-010 | 1 | 0 | 1 | 0 | 19 | 0.000 | 0.088 | 0.000 | |
| 98 | | | | | | | 220-27-001 | 1 | 1 | 0 | 0 | 10 | 0.046 | 0.000 | 0.000 | |
| 99 | | | | | | | 220-27-001Ka | 1 | 0 | 0 | 1 | 28 | 0.000 | 0.000 | 0.130 | |
| 100 | | | | | | | 220-27-001Kha | 1 | 0 | 0 | 1 | 63 | 0.000 | 0.000 | 0.292 | |
| 101 | | | | | | | 220-27-005 | 1 | 0 | 1 | 0 | 120 | 0.000 | 0.556 | 0.000 | |
| 102 | | | | | | | 220-27-006KA1 | 1 | 0 | 1 | 0 | 22 | 0.000 | 0.102 | 0.000 | |
| 103 | A | E | 225 | 50 | o | 55 | 220-23-010 | 1 | 1 | 0 | 0 | 19 | 0.088 | 0.000 | 0.000 | |
| 104 | | | | | | | 220-23-013Ka | 1 | 1 | 0 | 0 | 63 | 0.292 | 0.000 | 0.000 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 105 | | | | | | | 220-23-009Ka1 | 1 | 0 | 0 | 1 | 15 | 0.000 | 0.000 | 0.069 | |
| 106 | | | | | | | 220-23-501 | 3 | 0 | 1 | 0 | 22 | 0.000 | 0.102 | 0.000 | |
| 107 | | | | | | | 220-23-009 | 1 | 1 | 0 | 0 | 40 | 0.185 | 0.000 | 0.000 | |
| 108 | | | | | | | 220-23-009A | 1 | 0 | 1 | 0 | 47 | 0.000 | 0.218 | 0.000 | |
| 109 | | | | | | | 220-23-012Ka | 1 | 0 | 1 | 0 | 23 | 0.000 | 0.106 | 0.000 | |
| 110 | | | | | | | 220-23-012 | 1 | 1 | 0 | 0 | 58 | 0.269 | 0.000 | 0.000 | |
| 111 | | | | | | | 220-23-008B | 1 | 0 | 0 | 1 | 14 | 0.000 | 0.000 | 0.065 | |
| 112 | | | | 50 | p | 40 | 220-23-006Ka | 1 | 0 | 0 | 1 | 17 | 0.000 | 0.000 | 0.079 | |
| 113 | | | | | | | 220-23-012A | 1 | 0 | 0 | 1 | 15 | 0.000 | 0.000 | 0.069 | |
| 114 | | | | | | | 220-23-007 | 1 | 0 | 1 | 0 | 16 | 0.000 | 0.074 | 0.000 | |
| 115 | | | | | | | 220-23-007Ka | 1 | 0 | 0 | 1 | 15 | 0.000 | 0.000 | 0.069 | |
| 116 | | | | | | | 220-23-007Ka1 | 1 | 1 | 0 | 0 | 11 | 0.051 | 0.000 | 0.000 | |
| 117 | | | | | | | 220-23-005Ka | 1 | 1 | 0 | 0 | 27 | 0.125 | 0.000 | 0.000 | |
| 118 | | | | | | | 220-23-006 | 1 | 0 | 0 | 1 | 69 | 0.000 | 0.000 | 0.319 | |
| 119 | | | | | | | 220-17-004 | 1 | 0 | 0 | 1 | 13 | 0.000 | 0.000 | 0.060 | |
| 120 | | | | 50 | q | 75 | 220-17-004A | 1 | 0 | 1 | 0 | 109 | 0.000 | 0.505 | 0.000 | |
| 121 | | | | | | | 220-17-003 | 1 | 1 | 0 | 0 | 30 | 0.139 | 0.000 | 0.000 | |
| 122 | | | | | | | 220-17-012 | 1 | 0 | 1 | 0 | 14 | 0.000 | 0.065 | 0.000 | |
| 123 | | | | | | | 220-17-012A | 1 | 0 | 1 | 0 | 100 | 0.000 | 0.463 | 0.000 | |
| 124 | | | | | | | 220-17-009 | 1 | 1 | 0 | 0 | 59 | 0.273 | 0.000 | 0.000 | |
| 125 | | | | | | | 220-17-002 | 1 | 0 | 0 | 1 | 16 | 0.000 | 0.000 | 0.074 | |
| 126 | | | | | | | 220-17-001 | 1 | 0 | 0 | 1 | 63 | 0.000 | 0.000 | 0.292 | |
| 127 | | | | | | | 220-17-003A | 1 | 0 | 0 | 1 | 131 | 0.000 | 0.000 | 0.606 | |
| 128 | | | | 50 | r | 55 | 220-17-017 | 1 | 0 | 1 | 0 | 58 | 0.000 | 0.269 | 0.000 | |
| 129 | | | | | | | 220-17-018 | 1 | 0 | 0 | 1 | 45 | 0.000 | 0.000 | 0.208 | |
| 130 | | | | | | | 220-17-022 | 1 | 0 | 1 | 0 | 100 | 0.000 | 0.463 | 0.000 | |
| 131 | | | | | | | 220-17-025 | 1 | 0 | 1 | 0 | 18 | 0.000 | 0.083 | 0.000 | |
| 132 | | | | | | | 220-17-034 | 1 | 1 | 0 | 0 | 17 | 0.079 | 0.000 | 0.000 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 133 | B | D | 260 | 95 | s | 50 | 220-23-014Ka | 1 | 0 | 0 | 1 | 94 | 0.000 | 0.000 | 0.435 | |
| 134 | | | | | | | 220-23-023DUDI | 1 | 0 | 0 | 1 | 17 | 0.000 | 0.000 | 0.079 | |
| 135 | | | | | | | 220-17-036 | 1 | 0 | 1 | 0 | 36 | 0.000 | 0.167 | 0.000 | |
| 136 | | | | | | | 220-17-037 | 1 | 1 | 0 | 0 | 83 | 0.384 | 0.000 | 0.000 | |
| 137 | | | | | | | 220-17-044 | 1 | 0 | 0 | 1 | 23 | 0.000 | 0.000 | 0.106 | |
| 138 | | | | | | | 220-17-043 | 1 | 0 | 0 | 1 | 196 | 0.000 | 0.000 | 0.907 | |
| 139 | | | | | | | 220-17-060 | 1 | 1 | 0 | 0 | 40 | 0.185 | 0.000 | 0.000 | |
| 140 | | | | | | | 220-17-045 | 1 | 0 | 0 | 1 | 71 | 0.000 | 0.000 | 0.329 | |
| 141 | | | | 95 | t | 50 | 220-17-043 | 1 | 0 | 0 | 1 | 11 | 0.000 | 0.000 | 0.051 | |
| 142 | | | | | | | 220-17-041 | 1 | 0 | 0 | 1 | 93 | 0.000 | 0.000 | 0.431 | |
| 143 | | | | | | | 220-17-038Ka | 1 | 0 | 1 | 0 | 122 | 0.000 | 0.565 | 0.000 | |
| 144 | | | | | | | 220-17-035 | 1 | 1 | 0 | 0 | 48 | 0.222 | 0.000 | 0.000 | |
| 145 | | | | | | | 220-17-046 | 1 | 1 | 0 | 0 | 156 | 0.722 | 0.000 | 0.000 | |
| 147 | | | | | | | 220-17-033 | 1 | 1 | 0 | 0 | 295 | 1.366 | 0.000 | 0.000 | |
| 148 | | | | 95 | u | 85 | 220-17-054 | 1 | 0 | 0 | 1 | 62 | 0.000 | 0.000 | 0.287 | |
| 149 | | | | | | | 220-17-053 | 1 | 0 | 1 | 0 | 39 | 0.000 | 0.181 | 0.000 | |
| 150 | | | | | | | 220-17-048 | 1 | 1 | 0 | 0 | 93 | 0.431 | 0.000 | 0.000 | |
| 151 | | | | | | | 220-17-033A | 1 | 0 | 0 | 1 | 82 | 0.000 | 0.000 | 0.380 | |
| 152 | | | | | | | 220-17-030 | 1 | 0 | 1 | 0 | 129 | 0.000 | 0.597 | 0.000 | |
| 153 | | | | | | | 220-17-047 | 1 | 1 | 0 | 0 | 88 | 0.407 | 0.000 | 0.000 | |
| 154 | | | | | | | 220-17-047A | 1 | 0 | 0 | 1 | 147 | 0.000 | 0.000 | 0.681 | |
| 155 | | | | | | | 220-17-047B | 1 | 0 | 0 | 1 | 57 | 0.000 | 0.000 | 0.264 | |
| 156 | | | | 95 | v | 75 | 220-17-049 | 1 | 0 | 0 | 1 | 55 | 0.000 | 0.000 | 0.255 | |
| 157 | | | | | | | 220-17-050 | 1 | 0 | 1 | 0 | 8 | 0.000 | 0.037 | 0.000 | |
| 158 | | | | | | | 220-17-051 | 3 | 0.33 | 0.33 | 0.33 | 2698 | 4.164 | 4.164 | 4.164 | |
| 159 | | | | | | | 220-17-048A | 1 | 1 | 0 | 0 | 201 | 0.931 | 0.000 | 0.000 | |
| 160 | | | | | | | 220-17-048A1 | 1 | 1 | 0 | 0 | 14 | 0.065 | 0.000 | 0.000 | |
| 161 | | | | | | | 220-17-044A | 1 | 1 | 0 | 0 | 20 | 0.093 | 0.000 | 0.000 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 162 | | | | | | | 220-17-046A | 1 | 1 | 0 | 0 | 83 | 0.384 | 0.000 | 0.000 | |
| 163 | A | F | 195 | 50 | w | 40 | 220-18-024 | 1 | 0 | 1 | 0 | 211 | 0.000 | 0.977 | 0.000 | |
| 164 | | | | | | | 220-18-025 | 1 | 0 | 0 | 1 | 98 | 0.000 | 0.000 | 0.454 | |
| 165 | | | | | | | 220-18-025Ka | 1 | 1 | 0 | 0 | 6 | 0.028 | 0.000 | 0.000 | |
| 166 | | | | | | | 220-18-018 | 1 | 0 | 0 | 1 | 62 | 0.000 | 0.000 | 0.287 | |
| 167 | | | | | | | 220-18-017 | 1 | 0 | 0 | 1 | 39 | 0.000 | 0.000 | 0.181 | |
| 168 | | | | | | | 220-18-001 | 1 | 1 | 0 | 0 | 40 | 0.185 | 0.000 | 0.000 | |
| 169 | | | | | | | 220-18-005 | 1 | 0 | 1 | 0 | 56 | 0.000 | 0.259 | 0.000 | |
| 170 | | | | 50 | x | 55 | 220-18-007 | 1 | 1 | 0 | 0 | 38 | 0.176 | 0.000 | 0.000 | |
| 171 | | | | | | | 220-18-009 | 1 | 1 | 0 | 0 | 67 | 0.310 | 0.000 | 0.000 | |
| 172 | | | | | | | 220-18-011 | 1 | 1 | 0 | 0 | 94 | 0.435 | 0.000 | 0.000 | |
| 173 | | | | | | | 220-18-012 | 1 | 0 | 0 | 1 | 143 | 0.000 | 0.000 | 0.662 | |
| 174 | | | | | | | 220-18-026 | 1 | 1 | 0 | 0 | 28 | 0.130 | 0.000 | 0.000 | |
| 175 | | | | | | | 220-18-032 | 1 | 1 | 0 | 0 | 98 | 0.454 | 0.000 | 0.000 | |
| 176 | | | | | | | 220-18-030 | 1 | 0 | 1 | 0 | 66 | 0.000 | 0.306 | 0.000 | |
| 177 | | | | | | | 220-18-027 | 1 | 1 | 0 | 0 | 33 | 0.153 | 0.000 | 0.000 | |
| 178 | | | | 50 | y | 50 | 220-18-061 | 1 | 0 | 0 | 1 | 95 | 0.000 | 0.000 | 0.440 | |
| 179 | | | | | | | 220-18-062 | 1 | 0 | 0 | 1 | 60 | 0.000 | 0.000 | 0.278 | |
| 180 | | | | | | | 220-18-040 | 1 | 0 | 0 | 1 | 113 | 0.000 | 0.000 | 0.523 | |
| 181 | | | | | | | 220-18-045 | 1 | 0 | 1 | 0 | 20 | 0.000 | 0.093 | 0.000 | |
| 182 | | | | | | | 220-18-043 | 1 | 0 | 1 | 0 | 13 | 0.000 | 0.060 | 0.000 | |
| 183 | | | | | | | 220-18-063 | 1 | 1 | 0 | 0 | 58 | 0.269 | 0.000 | 0.000 | |
| 184 | | | | | | | 220-18-059 | 1 | 1 | 0 | 0 | 63 | 0.292 | 0.000 | 0.000 | |
| 185 | | | | 50 | z | 50 | 220-18-055 | 1 | 0 | 0 | 1 | 27 | 0.000 | 0.000 | 0.125 | |
| 186 | | | | | | | 220-18-070 | 1 | 1 | 0 | 0 | 129 | 0.597 | 0.000 | 0.000 | |
| 187 | | | | | | | 220-18-075 | 1 | 0 | 1 | 0 | 47 | 0.000 | 0.218 | 0.000 | |
| 188 | | | | | | | 220-18-078 | 1 | 0 | 1 | 0 | 72 | 0.000 | 0.333 | 0.000 | |
| 189 | | | | | | | 220-18-080 | 1 | 1 | 0 | 0 | 327 | 1.514 | 0.000 | 0.000 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 190 | | | | | | | 220-18-085 | 1 | 0 | 0 | 1 | 53 | 0.000 | 0.000 | 0.245 | |
| 191 | | | | | | | 220-18-076 | 1 | 0 | 0 | 1 | 19 | 0.000 | 0.000 | 0.088 | |

**Line and load data of Bihani Chowk LT feeder for etap**

| Specification | | | | | Peak Load, kW | | | Peak Current, A | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Points** | **Length, m** | **Size, sq. mm** | **Resistance, ohm/km** | **Reactance, ohm/km** | **R** | **Y** | **B** | **IR** | **IY** | **IB** |
| a | 195 | 95 | 0.397 | 0.086 | 0.593 | 0.176 | 0.593 | 2.603 | 0.773 | 2.603 |
| b | 135 | 95 | 0.397 | 0.086 | 0.069 | 0.125 | 0.144 | 0.305 | 0.549 | 0.630 |
| c | 125 | 95 | 0.397 | 0.086 | 0.394 | 0.000 | 0.278 | 1.728 | 0.000 | 1.220 |
| d | 95 | 95 | 0.397 | 0.086 | 0.162 | 0.144 | 0.255 | 0.712 | 0.630 | 1.118 |
| e | 75 | 50 | 0.796 | 0.09 | 0.481 | 1.361 | 0.407 | 2.115 | 5.978 | 1.789 |
| f | 65 | 50 | 0.796 | 0.09 | 5.444 | 6.264 | 6.542 | 23.910 | 27.509 | 28.729 |
| g | 55 | 50 | 0.796 | 0.09 | 1.394 | 2.222 | 0.157 | 6.120 | 9.759 | 0.691 |
| h | 60 | 50 | 0.796 | 0.09 | 0.736 | 0.523 | 1.713 | 3.233 | 2.298 | 7.523 |
| i | 75 | 50 | 0.796 | 0.09 | 0.722 | 2.722 | 1.245 | 3.172 | 11.955 | 5.469 |
| j | 70 | 50 | 0.796 | 0.09 | 8.514 | 7.486 | 8.018 | 37.390 | 32.876 | 35.214 |
| k | 65 | 50 | 0.796 | 0.09 | 0.236 | 2.264 | 1.120 | 1.037 | 9.942 | 4.920 |
| l | 95 | 50 | 0.796 | 0.09 | 1.204 | 0.352 | 0.356 | 5.286 | 1.545 | 1.566 |
| m | 85 | 50 | 0.796 | 0.09 | 1.218 | 1.713 | 0.431 | 5.347 | 7.523 | 1.891 |
| n | 50 | 50 | 0.796 | 0.09 | 1.481 | 0.745 | 0.792 | 6.506 | 3.273 | 3.477 |
| o | 55 | 50 | 0.796 | 0.09 | 0.565 | 0.319 | 0.069 | 2.481 | 1.403 | 0.305 |
| p | 40 | 50 | 0.796 | 0.09 | 0.319 | 0.181 | 0.282 | 1.403 | 0.793 | 1.240 |
| q | 75 | 50 | 0.796 | 0.09 | 0.264 | 1.032 | 0.380 | 1.159 | 4.534 | 1.667 |
| r | 55 | 50 | 0.796 | 0.09 | 0.352 | 0.815 | 1.181 | 1.545 | 3.578 | 5.185 |
| s | 50 | 95 | 0.397 | 0.086 | 0.569 | 0.167 | 1.856 | 2.501 | 0.732 | 8.153 |
| t | 50 | 95 | 0.397 | 0.086 | 2.310 | 0.565 | 0.481 | 10.146 | 2.481 | 2.115 |
| u | 85 | 95 | 0.397 | 0.086 | 0.838 | 0.778 | 1.611 | 3.680 | 3.416 | 7.076 |
| v | 75 | 95 | 0.397 | 0.086 | 5.636 | 4.201 | 4.418 | 24.751 | 18.448 | 19.404 |
| w | 40 | 50 | 0.796 | 0.09 | 0.213 | 1.236 | 0.921 | 0.935 | 5.429 | 4.046 |
| x | 55 | 50 | 0.796 | 0.09 | 1.657 | 0.306 | 0.662 | 7.279 | 1.342 | 2.907 |
| y | 50 | 50 | 0.796 | 0.09 | 0.560 | 0.153 | 1.241 | 2.460 | 0.671 | 5.449 |
| z | 50 | 50 | 0.796 | 0.09 | 2.111 | 0.551 | 0.458 | 9.271 | 2.420 | 2.013 |

**Line and load data of Bihani Chowk LT feeder for Matlab**

| Specification | | | | | Peak Load, kW | | | Peak Current, A | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Points | Length, m | Size, sq. mm | Resistance, ohm/km | Reactance, ohm/km | R | Y | B | IR | IY | IB |
| A | 330 | 95 | 0.397 | 0.086 | 0.662 | 0.301 | 0.736 | 2.907 | 1.322 | 3.233 |
| B | 220 | 95 | 0.397 | 0.086 | 0.556 | 0.144 | 0.532 | 2.440 | 0.630 | 2.338 |
| C | 695 | 50 | 0.796 | 0.09 | 21.430 | 25.652 | 20.782 | 94.116 | 112.659 | 91.269 |
| E | 225 | 50 | 0.796 | 0.09 | 1.500 | 2.347 | 1.912 | 6.588 | 10.308 | 8.397 |
| D | 260 | 95 | 0.397 | 0.086 | 9.353 | 5.710 | 8.367 | 41.078 | 25.076 | 36.747 |
| F | 195 | 50 | 0.796 | 0.09 | 4.542 | 2.245 | 3.282 | 19.946 | 9.861 | 14.415 |

## APPENDIX L: LINE AND LOAD DATA FOR CHIAUNE GAUN DISTRIBUTION TRANSFORMER

**Transformer Location: Chilaune Gau**
**Transformer Capacity: 50kVA**

| S.N | Specification | | | | | | Consumers | | Connected phase | | | Energy, kWh | Peak load, kW | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | From | To | Total distance, m | size, sq. mm | Load point | Distance between Load point | consumers ID | No. of phases | R | Y | B | Billing of one month | R | Y | B | |
| 1 | O | A | 70 | 50 | a | 70 | 220-05-021 | 1 | 1 | | | 16 | 0.074 | 0.000 | 0.000 | |
| 2 | | | | | | | 220-05-025 | 1 | | 1 | | 5 | 0.000 | 0.023 | 0.000 | |
| 3 | | | | | | | 220-05-019 | 1 | | 1 | | 3 | 0.000 | 0.014 | 0.000 | |
| 4 | O | C | 95 | 50 | b | 55 | 220-05-015 | 1 | | | 1 | 9 | 0.000 | 0.000 | 0.042 | |
| 5 | | | | | | | 220-05-016 | 1 | | | 1 | 3 | 0.000 | 0.000 | 0.014 | |
| 6 | | | | | | | 220-04-019 | 1 | 1 | | | 16 | 0.074 | 0.000 | 0.000 | |
| 7 | | | | | | | 220-04-019Ka | 1 | 1 | | | 4 | 0.019 | 0.000 | 0.000 | |
| 8 | | | | | | | 220-04-020 | 1 | 1 | | | 20 | 0.093 | 0.000 | 0.000 | |
| 9 | | | | | | | 220-04-021 | 1 | 1 | | | 20 | 0.093 | 0.000 | 0.000 | |
| 10 | | | | 50 | c | 40 | 220-04-022 | 1 | 1 | | | 2 | 0.009 | 0.000 | 0.000 | |
| 11 | | | | | | | 220-04-023 | 1 | | 1 | | 12 | 0.000 | 0.056 | 0.000 | |
| 12 | | | | | | | 220-04-027 | 1 | | 1 | | 20 | 0.000 | 0.093 | 0.000 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | | | | | | | 220-04-025 | 1 | | 1 | | 20 | 0.000 | 0.093 | 0.000 | |
| 14 | | | | | | | 220-04-027 | 1 | | 1 | | 20 | 0.000 | 0.093 | 0.000 | |
| 15 | | | | | | | 220-04-020A | 1 | | 1 | | 20 | 0.000 | 0.093 | 0.000 | |
| 16 | | | | | | | 220-04-015 | 1 | 1 | 0 | | 20 | 0.093 | 0.000 | 0.000 | |
| 17 | | | | | | | 220-04-017 | 1 | | | 1 | 40 | 0.000 | 0.000 | 0.185 | |
| 18 | | | | 50 | d | 75 | 220-03-032 | 1 | | 1 | | 5 | 0.000 | 0.023 | 0.000 | |
| 19 | | | | | | | 220-03-026 | 1 | | | 1 | 9 | 0.000 | 0.000 | 0.042 | |
| 20 | | | | | | | 220-03-024 | 1 | | | 1 | 4 | 0.000 | 0.000 | 0.019 | |
| 21 | | | | | | | 220-03-021 | 1 | 1 | | | 5 | 0.023 | 0.000 | 0.000 | |
| 22 | O | D | 160 | | | | 220-03-009 | 1 | | | 1 | 2 | 0.000 | 0.000 | 0.009 | |
| 23 | | | | | | | 220-03-013 | 1 | 1 | | | 4 | 0.019 | 0.000 | 0.000 | |
| 24 | | | | | | | 220-03-015 | 1 | | | 1 | 2 | 0.000 | 0.000 | 0.009 | |
| 25 | | | | 50 | e | 85 | 220-03-016 | 1 | | | 1 | 20 | 0.000 | 0.000 | 0.093 | |
| 26 | | | | | | | 220-03-017 | 1 | | 1 | | 18 | 0.000 | 0.083 | 0.000 | |
| 27 | | | | | | | 220-03-017DUP1 | 1 | 1 | | | 14 | 0.065 | 0.000 | 0.000 | |
| 28 | | | | | | | 220-03-011 | 1 | | 1 | | 13 | 0.000 | 0.060 | 0.000 | |
| 29 | | | | | | | 220-04-001 | 1 | | 1 | | 10 | 0.000 | 0.046 | 0.000 | |
| 30 | | | | | | | 220-04-003 | 1 | 1 | | | 8 | 0.037 | 0.000 | 0.000 | |
| 31 | | | | | | | 220-04-005 | 1 | 1 | | | 5 | 0.023 | 0.000 | 0.000 | |
| 32 | | | | | | | 220-04-006 | 1 | | | 1 | 48 | 0.000 | 0.000 | 0.222 | |
| 33 | D | G | 80 | 25 | f | 80 | 220-04-008 | 1 | | 1 | 0 | 22 | 0.000 | 0.102 | 0.000 | |
| 34 | | | | | | | 220-04-009 | 1 | 1 | | | 9 | 0.042 | 0.000 | 0.000 | |
| 35 | | | | | | | 220-04-010 | 1 | 1 | | | 16 | 0.074 | 0.000 | 0.000 | |
| 36 | | | | | | | 220-04-011 | 1 | | 1 | | 20 | 0.000 | 0.093 | 0.000 | |
| 37 | | | | | | | 220-04-013DUP1 | 1 | | 1 | | 14 | 0.000 | 0.065 | 0.000 | |
| 38 | | | | | | | 220-04-024 | 1 | | 1 | | 4 | 0.000 | 0.019 | 0.000 | |
| 39 | D | H | 45 | 25 | g | 45 | 220-03-034A | 1 | | | 1 | 11 | 0.000 | 0.000 | 0.051 | |
| 40 | | | | | | | 220-03-034 | 1 | | | 1 | 30 | 0.000 | 0.000 | 0.139 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 41 | | | | | | | 220-03-028 | 1 | | 1 | 0 | 16 | 0.000 | 0.074 | 0.000 | |
| 42 | | | | | | | 220-03-020 | 1 | | | 1 | 20 | 0.000 | 0.000 | 0.093 | |
| 43 | D | E | 95 | 50 | h | 95 | 220-03-005 | 1 | | 1 | | 2 | 0.000 | 0.009 | 0.000 | |
| 44 | | | | | | | 220-03-006 | 1 | | | 1 | 14 | 0.000 | 0.000 | 0.065 | |
| 45 | | | | | | | 220-03-010 | 1 | | | 1 | 20 | 0.000 | 0.000 | 0.093 | |
| 46 | E | F | 160 | 25 | i | 85 | 220-02-011 | 1 | 1 | | | 9 | 0.042 | 0.000 | 0.000 | |
| 47 | | | | | | | 220-02-011KA | 1 | | | 1 | 19 | 0.000 | 0.000 | 0.088 | |
| 48 | | | | | | | 220-02-013 | 1 | | | 1 | 4 | 0.000 | 0.000 | 0.019 | |
| 49 | | | | | | | 220-02-015 | 1 | 1 | | | 20 | 0.093 | 0.000 | 0.000 | |
| 50 | | | | | | | 220-02-016 | 1 | 1 | | | 15 | 0.069 | 0.000 | 0.000 | |
| 51 | | | | | | | 220-02-018 | 1 | 1 | | | 11 | 0.051 | 0.000 | 0.000 | |
| 52 | | | | | | | 220-02-20 | 1 | 1 | | | 16 | 0.074 | 0.000 | 0.000 | |
| 53 | | | | | | | 220-02-021 | 1 | 1 | | | 14 | 0.065 | 0.000 | 0.000 | |
| 54 | | | | 25 | j | 75 | 220-02-023 | 1 | 1 | | | 30 | 0.139 | 0.000 | 0.000 | |
| 55 | | | | | | | 220-02-030 | 1 | | 1 | | 10 | 0.000 | 0.046 | 0.000 | |
| 56 | | | | | | | 220-03-003 | 1 | | 1 | | 13 | 0.000 | 0.060 | 0.000 | |
| 57 | E | T | 135 | 25 | k | 60 | 220-02-001 | 1 | | | 1 | 4 | 0.000 | 0.000 | 0.019 | |
| 58 | | | | | | | 220-02-002 | 1 | | 1 | | 20 | 0.000 | 0.093 | 0.000 | |
| 59 | | | | | | | 220-02-003 | 1 | | 1 | | 18 | 0.000 | 0.083 | 0.000 | |
| 60 | | | | | | | 220-02-004 | 1 | | 1 | | 16 | 0.000 | 0.074 | 0.000 | |
| 61 | | | | | | | 220-02-005 | 1 | | | 1 | 2 | 0.000 | 0.000 | 0.009 | |
| 62 | | | | | | | 220-02-006 | 1 | | | 1 | 19 | 0.000 | 0.000 | 0.088 | |
| 63 | | | | | | | 220-02-007 | 1 | | | 1 | 22 | 0.000 | 0.000 | 0.102 | |
| 64 | | | | 25 | l | 75 | 220-02-009 | 1 | | | 1 | 20 | 0.000 | 0.000 | 0.093 | |
| 65 | | | | | | | 220-02-010 | 1 | | | 1 | 3 | 0.000 | 0.000 | 0.014 | |
| 66 | | | | | | | 220-01-042 | 1 | | | 1 | 5 | 0.000 | 0.000 | 0.023 | |
| 67 | | | | | | | 220-03-001 | 1 | | | 1 | 6 | 0.000 | 0.000 | 0.028 | |
| 68 | | | | | | | 220-03-002 | 1 | | | 1 | 4 | 0.000 | 0.000 | 0.019 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 69 | | | | | | | 220-03-007 | 1 | 1 | | | 6 | 0.028 | 0.000 | 0.000 | |
| 70 | | | | | | | 220-03-009 | 1 | 1 | | | 2 | 0.009 | 0.000 | 0.000 | |
| 71 | O | J | 300 | 50 | m | 300 | 220-04-014 | 1 | 1 | | | 20 | 0.093 | 0.000 | 0.000 | |
| 72 | J | K | 55 | 25 | n | 55 | 220-01-030DUP-1 | 1 | | 1 | | 18 | 0.000 | 0.083 | 0.000 | |
| 73 | | | | | | | 220-01-33 | 1 | | | 1 | 14 | 0.000 | 0.000 | 0.065 | |
| 74 | | | | | | | 220-01-039 | 1 | | | 1 | 10 | 0.000 | 0.000 | 0.046 | |
| 75 | | | | | | | 220-01-036 | 1 | 1 | | | 15 | 0.069 | 0.000 | 0.000 | |
| 76 | J | L | 135 | 25 | o | 135 | 220-01-032 | 1 | 1 | | | 17 | 0.079 | 0.000 | 0.000 | |
| 77 | | | | | | | 220-01-035 | 1 | 1 | | | 3 | 0.014 | 0.000 | 0.000 | |
| 78 | | | | | | | 220-01-030 | 1 | 1 | | | 20 | 0.093 | 0.000 | 0.000 | |
| 79 | | | | | | | 220-01-034 | 1 | 1 | | | 10 | 0.046 | 0.000 | 0.000 | |
| 80 | | | | | | | 220-01-033B | 1 | | 1 | | 16 | 0.000 | 0.074 | 0.000 | |
| 81 | L | M | 45 | 25 | p | 45 | 220-01-021 | 1 | | 1 | | 6 | 0.000 | 0.028 | 0.000 | |
| 82 | L | Q | 55 | 25 | q | 55 | 220-02-041 | 1 | | 1 | | 30 | 0.000 | 0.139 | 0.000 | |
| 83 | | | | | | | 220-01-018 | 1 | | 1 | | 20 | 0.000 | 0.093 | 0.000 | |
| 84 | | | | | | | 220-01-039A | 1 | | 1 | | 14 | 0.000 | 0.065 | 0.000 | |
| 85 | L | R | 145 | 25 | r | 145 | 220-01-015 | 1 | 1 | 0 | | 33 | 0.153 | 0.000 | 0.000 | |
| 86 | | | | | | | 220-01-012 | 1 | | 1 | | 15 | 0.000 | 0.069 | 0.000 | |
| 87 | | | | | | | 220-01-016 | 1 | | | 1 | 66 | 0.000 | 0.000 | 0.306 | |
| 88 | | | | | | | 220-01-017 | 1 | | 1 | | 20 | 0.000 | 0.093 | 0.000 | |
| 89 | R | S | 65 | 25 | s | 65 | 220-01-014 | 1 | | | 1 | 10 | 0.000 | 0.000 | 0.046 | |
| 90 | | | | | | | 220-01-013 | 1 | | | 1 | 20 | 0.000 | 0.000 | 0.093 | |
| 91 | | | | | | | 220-01-012 | 1 | | 1 | | 15 | 0.000 | 0.069 | 0.000 | |
| 92 | | | | | | | 220-01-009 | 1 | | | 1 | 28 | 0.000 | 0.000 | 0.130 | |
| 93 | | | | | | | 220-01-004 | 1 | | 1 | | 56 | 0.000 | 0.259 | 0.000 | |
| 94 | | | | | | | 220-01-008 | 1 | 1 | | | 1 | 0.005 | 0.000 | 0.000 | |
| 95 | | | | | | | 220-01-030 | 1 | 1 | | | 20 | 0.093 | 0.000 | 0.000 | |
| 96 | | | | | | | 220-01-007 | 1 | | | 1 | 3 | 0.000 | 0.000 | 0.014 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 97 | | | | | | | 220-08-gofF | | | | 1 | 5 | 0.000 | 0.000 | 0.023 | |
| 98 | R | V | 290 | 25 | t | 85 | 220-01-034 | 1 | | 1 | | 10 | 0.000 | 0.046 | 0.000 | |
| 99 | | | | 25 | u | 110 | 220-01-002C | 1 | 1 | | | 14 | 0.065 | 0.000 | 0.000 | |
| 100 | | | | | | | 220-01-004 | 1 | | 1 | | 56 | 0.000 | 0.259 | 0.000 | |
| 101 | | | | 25 | v | 95 | 220-01-011 | 1 | | 1 | | 85 | 0.000 | 0.394 | 0.000 | |
| 102 | V | W | 115 | 25 | w | 115 | 220-01-002F | 1 | 1 | | | 76 | 0.352 | 0.000 | 0.000 | |
| 103 | | | | | | | 220-01-002k | 1 | 1 | | | 88 | 0.407 | 0.000 | 0.000 | |
| 104 | | | | | | | 220-01-002E | 1 | | | 1 | 35 | 0.000 | 0.000 | 0.162 | |
| 105 | | | | | | | 220-01-002D | 1 | | | 1 | 60 | 0.000 | 0.000 | 0.278 | |
| 106 | | | | | | | 220-01-006 | 3 | 0.33 | 0.33 | 0.33 | 4314 | 6.657 | 6.657 | 6.657 | |
| 107 | | | | | | | 220-01-010 | 1 | 1 | | | 30 | 0.139 | 0.000 | 0.000 | |
| 108 | V | X | 210 | 25 | x | 95 | 220-01-002 | 1 | | 1 | | 44 | 0.000 | 0.204 | 0.000 | |
| 109 | | | | | | | 220-01-002H | 1 | | 1 | | 59 | 0.000 | 0.273 | 0.000 | |
| 110 | | | | | | | 220-01-004 | 1 | | 1 | | 56 | 0.000 | 0.259 | 0.000 | |
| 111 | | | | | | | 220-02-002 | 1 | | 1 | | 240 | 0.000 | 1.111 | 0.000 | |
| 112 | | | | | | | 220-02-003 | 1 | | 1 | | 80 | 0.000 | 0.370 | 0.000 | |
| 113 | | | | | | | 220-02-004 | 1 | | 1 | | 250 | 0.000 | 1.157 | 0.000 | |
| 114 | | | | | | | 220-01-002A | 1 | | 1 | | 93 | 0.000 | 0.431 | 0.000 | |
| 115 | | | | | | | 220-01-002B | 1 | | | 1 | 50 | 0.000 | 0.000 | 0.231 | |
| 116 | | | | | | | 220-01-002G | 1 | | | 1 | 190 | 0.000 | 0.000 | 0.880 | |
| 117 | | | | 25 | y | 115 | 220-01-003 | 1 | | | 1 | 32 | 0.000 | 0.000 | 0.148 | |
| 118 | | | | | | | 220-01-005KA | 1 | | | 1 | 122 | 0.000 | 0.000 | 0.565 | |
| 119 | | | | | | | 220-01-020 | 1 | 1 | 1 | 1 | 20 | 0.093 | 0.093 | 0.093 | |
| 120 | | | | | | | 220-01-038 | 1 | | | 1 | 120 | 0.000 | 0.000 | 0.556 | |
| 121 | | | | | | | 220-01-037 | 1 | | | 1 | 124 | 0.000 | 0.000 | 0.574 | |
| 122 | C | Y | 100 | 25 | z | 50 | 220-05-003 | 1 | 1 | | | 15 | 0.069 | 0.000 | 0.000 | |
| 123 | | | | | | | 220-05-006 | 1 | | | 1 | 55 | 0.000 | 0.000 | 0.255 | |
| 124 | | | | | | | 220-05-010 | 1 | | | 1 | 13 | 0.000 | 0.000 | 0.060 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 125 | | | | | | | 220-05-011 | 1 | 1 | | | 3 | 0.014 | 0.000 | 0.000 | |
| 126 | | | | 25 | a1 | 50 | 220-05-013 | 1 | 1 | | | 2 | 0.009 | 0.000 | 0.000 | |
| 127 | | | | | | | 220-05-014 | 1 | 1 | | | 11 | 0.051 | 0.000 | 0.000 | |
| 128 | | | | | | | 220-05-014A | 1 | 1 | | | 77 | 0.356 | 0.000 | 0.000 | |
| 129 | | | | | | | 220-01-002B | 1 | | | 1 | 50 | 0.000 | 0.000 | 0.231 | |
| 130 | | | | | | | 220-05-013A | 1 | 1 | | | 44 | 0.204 | 0.000 | 0.000 | |
| 131 | C | Z | 85 | 25 | b1 | 85 | 220-05-001 | 1 | 1 | | | 10 | 0.046 | 0.000 | 0.000 | |
| 132 | | | | | | | 220-05-003KA | 1 | | | | 22 | 0.000 | 0.000 | 0.000 | |

**Line and load data of Baisdhara LT feeder for etap**

| Specification | | | | | Peak Load, kW | | | Peak Current, A | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Points | Length, m | Size, sq. mm | Resistance, ohm/km | Reactance, ohm/km | R | Y | B | IR | IY | IB |
| a | 70 | 50 | 0.796 | 0.09 | 0.074 | 0.037 | 0.000 | 0.325 | 0.163 | 0.000 |
| b | 55 | 50 | 0.796 | 0.09 | 0.287 | 0.426 | 0.056 | 1.261 | 1.871 | 0.244 |
| c | 40 | 50 | 0.796 | 0.09 | 0.009 | 0.426 | 0.000 | 0.041 | 1.871 | 0.000 |
| d | 75 | 50 | 0.796 | 0.09 | 0.199 | 0.167 | 0.356 | 0.874 | 0.732 | 1.566 |
| e | 85 | 50 | 0.796 | 0.09 | 0.106 | 0.144 | 0.111 | 0.468 | 0.630 | 0.488 |
| f | 80 | 25 | 1.49 | 0.096 | 0.176 | 0.306 | 0.222 | 0.773 | 1.342 | 0.976 |
| g | 45 | 25 | 1.49 | 0.096 | 0.000 | 0.093 | 0.282 | 0.000 | 0.407 | 1.240 |
| h | 95 | 50 | 0.796 | 0.09 | 0.000 | 0.009 | 0.157 | 0.000 | 0.041 | 0.691 |
| i | 85 | 25 | 1.49 | 0.096 | 0.532 | 0.106 | 0.106 | 2.338 | 0.468 | 0.468 |
| j | 75 | 25 | 1.49 | 0.096 | 0.139 | 0.106 | 0.000 | 0.610 | 0.468 | 0.000 |
| k | 60 | 25 | 1.49 | 0.096 | 0.037 | 0.250 | 0.394 | 0.163 | 1.098 | 1.728 |
| l | 75 | 25 | 1.49 | 0.096 | 0.037 | 0.000 | 0.176 | 0.163 | 0.000 | 0.773 |
| m | 300 | 50 | 0.796 | 0.09 | 0.093 | 0.000 | 0.000 | 0.407 | 0.000 | 0.000 |
| n | 55 | 25 | 1.49 | 0.096 | 0.069 | 0.083 | 0.111 | 0.305 | 0.366 | 0.488 |
| o | 135 | 25 | 1.49 | 0.096 | 0.231 | 0.074 | 0.000 | 1.017 | 0.325 | 0.000 |
| p | 45 | 25 | 1.49 | 0.096 | 0.000 | 0.028 | 0.000 | 0.000 | 0.122 | 0.000 |
| q | 55 | 25 | 1.49 | 0.096 | 0.000 | 0.296 | 0.000 | 0.000 | 1.301 | 0.000 |
| r | 145 | 25 | 1.49 | 0.096 | 0.153 | 0.162 | 0.306 | 0.671 | 0.712 | 1.342 |
| s | 65 | 25 | 1.49 | 0.096 | 0.097 | 0.329 | 0.306 | 0.427 | 1.444 | 1.342 |
| t | 85 | 25 | 1.49 | 0.096 | 0.000 | 0.046 | 0.000 | 0.000 | 0.203 | 0.000 |
| u | 110 | 25 | 1.49 | 0.096 | 0.065 | 0.259 | 0.000 | 0.285 | 1.139 | 0.000 |
| v | 95 | 25 | 1.49 | 0.096 | 0.000 | 0.394 | 0.000 | 0.000 | 1.728 | 0.000 |
| w | 115 | 25 | 1.49 | 0.096 | 7.556 | 6.657 | 7.097 | 33.182 | 29.238 | 31.169 |
| x | 95 | 25 | 1.49 | 0.096 | 0.000 | 3.806 | 1.111 | 0.000 | 16.713 | 4.880 |
| y | 115 | 25 | 1.49 | 0.096 | 0.093 | 0.093 | 1.935 | 0.407 | 0.407 | 8.499 |
| z | 50 | 25 | 1.49 | 0.096 | 0.704 | 0.000 | 0.546 | 3.090 | 0.000 | 2.399 |
| a1 | 50 | 25 | 1.49 | 0.096 | 0.620 | 0.000 | 0.231 | 2.725 | 0.000 | 1.017 |
| b1 | 85 | 25 | 1.49 | 0.096 | 0.046 | 0.000 | 0.000 | 0.203 | 0.000 | 0.000 |

**Line and load data of Baisdhara LT feeder for Matlab**

| Specification | | | | | Peak Load, kW | | | Peak Current, A | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Points | Length, m | Size, sq. mm | Resistance, ohm/km | Reactance, ohm/km | R | Y | B | IR | IY | IB |
| A | 70 | 50 | 0.796 | 0.09 | 0.074 | 0.037 | 0.000 | 0.325 | 0.163 | 0.000 |
| C | 95 | 50 | 0.796 | 0.09 | 0.296 | 0.852 | 0.056 | 1.301 | 3.741 | 0.244 |
| D | 160 | 50 | 0.796 | 0.09 | 0.306 | 0.310 | 0.468 | 1.342 | 1.362 | 2.054 |
| G | 80 | 25 | 1.49 | 0.096 | 0.176 | 0.306 | 0.222 | 0.773 | 1.342 | 0.976 |
| H | 45 | 25 | 1.49 | 0.096 | 0.000 | 0.093 | 0.282 | 0.000 | 0.407 | 1.240 |
| E | 95 | 50 | 0.796 | 0.09 | 0.000 | 0.009 | 0.157 | 0.000 | 0.041 | 0.691 |
| F | 160 | 25 | 1.49 | 0.096 | 0.671 | 0.213 | 0.106 | 2.948 | 0.935 | 0.468 |
| T | 135 | 25 | 1.49 | 0.096 | 0.074 | 0.250 | 0.569 | 0.325 | 1.098 | 2.501 |
| J | 300 | 50 | 0.796 | 0.09 | 0.093 | 0.000 | 0.000 | 0.407 | 0.000 | 0.000 |
| K | 55 | 25 | 1.49 | 0.096 | 0.069 | 0.083 | 0.111 | 0.305 | 0.366 | 0.488 |
| L | 135 | 25 | 1.49 | 0.096 | 0.231 | 0.074 | 0.000 | 1.017 | 0.325 | 0.000 |
| M | 45 | 25 | 1.49 | 0.096 | 0.000 | 0.028 | 0.000 | 0.000 | 0.122 | 0.000 |
| Q | 55 | 25 | 1.49 | 0.096 | 0.000 | 0.296 | 0.000 | 0.000 | 1.301 | 0.000 |
| R | 145 | 25 | 1.49 | 0.096 | 0.153 | 0.162 | 0.306 | 0.671 | 0.712 | 1.342 |
| S | 65 | 25 | 1.49 | 0.096 | 0.097 | 0.329 | 0.306 | 0.427 | 1.444 | 1.342 |
| V | 290 | 25 | 1.49 | 0.096 | 0.065 | 0.306 | 0.000 | 0.285 | 1.342 | 0.000 |
| W | 115 | 25 | 1.49 | 0.096 | 7.556 | 6.657 | 7.097 | 33.182 | 29.238 | 31.169 |
| X | 210 | 25 | 1.49 | 0.096 | 0.093 | 3.898 | 3.046 | 0.407 | 17.120 | 13.379 |
| Y | 100 | 25 | 1.49 | 0.096 | 1.324 | 0.000 | 0.778 | 5.815 | 0.000 | 3.416 |

## APPENDIX M: LINE AND LOAD DATA FOR SIMKHADA GAUN DISTRIBUTION TRANFORMER

**Transformer Location: Simkhada Gau**
**Transformer Capacity: 50 kVA**

| S.N | Specification | | | | | | consumers | | Connected phase | | | Energy, kWh | Peak load in kW | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | From | To | Total distance, m | size, sq. mm | Load point | Distance between Load point | consumers ID | No of Phases | R | Y | B | Billing of one month | R | Y | B | |
| 1 | O | A | 80 | 95 | a | 80 | 220-09-004A | 1 | 1 | 0 | 0 | 4 | 0.019 | 0.000 | 0.000 | |
| 2 | | | | | | | 220-09-010 | 1 | 0 | 1 | 0 | 30 | 0.000 | 0.139 | 0.000 | |
| 3 | | | | | | | 220-09-001 | 1 | 0 | 0 | 1 | 13 | 0.000 | 0.000 | 0.060 | |
| 4 | A | C | 630 | 25 | b | 220 | 220-09-701 | 1 | 1 | 0 | 0 | 15 | 0.069 | 0.000 | 0.000 | |
| 5 | | | | | | | 220-10-001 | 1 | 0 | 0 | 1 | 2 | 0.000 | 0.000 | 0.009 | |
| 6 | | | | | | | 220-10-002 | 1 | 0 | 0 | 1 | 20 | 0.000 | 0.000 | 0.093 | |
| 7 | | | | 25 | c | 210 | 220-10-003 | 1 | 0 | 0 | 1 | 11 | 0.000 | 0.000 | 0.051 | |
| 8 | | | | | | | 220-10-019 | 1 | 1 | 0 | 0 | 4 | 0.019 | 0.000 | 0.000 | |
| 9 | | | | | | | 220-10-001B | 1 | 0 | 1 | 0 | 7 | 0.000 | 0.032 | 0.000 | |
| 10 | | | | 25 | d | 200 | 220-10-001A | 1 | 1 | 0 | 0 | 4 | 0.019 | 0.000 | 0.000 | |
| 11 | | | | | | | 220-09-501 | 1 | 0 | 1 | 0 | 14 | 0.000 | 0.065 | 0.000 | |
| 12 | | | | | | | 220-09-022A | 1 | 1 | 0 | 0 | 4 | 0.019 | 0.000 | 0.000 | |
| 13 | | | | | | | 220-09-022B | 1 | 0 | 0 | 1 | 4 | 0.000 | 0.000 | 0.019 | |
| 14 | A | B | 80 | 25 | e | 80 | 220-09-002 | 1 | 0 | 0 | 1 | 34 | 0.000 | 0.000 | 0.157 | |
| 15 | | | | | | | 220-09-003 | 1 | 0 | 1 | 0 | 6 | 0.000 | 0.028 | 0.000 | |
| 16 | | | | | | | 220-09-004 | 1 | 1 | 0 | 0 | 15 | 0.069 | 0.000 | 0.000 | |
| 17 | | | | | | | 220-09-005 | 1 | 1 | 0 | 0 | 48 | 0.222 | 0.000 | 0.000 | |
| 18 | | | | | | | 220-09-006 | 1 | 0 | 1 | 0 | 21 | 0.000 | 0.097 | 0.000 | |
| 19 | | | | | | | 220-09-012A | 1 | 1 | 0 | 0 | 13 | 0.060 | 0.000 | 0.000 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | B | E | 100 | 25 | f | 100 | 220-09-008 | 1 | 0 | 0 | 1 | 22 | 0.000 | 0.000 | 0.102 | |
| 21 | | | | | | | 220-09-011 | 1 | 0 | 0 | 1 | 17 | 0.000 | 0.000 | 0.079 | |
| 22 | | | | | | | 220-09-012 | 1 | 0 | 0 | 1 | 10 | 0.000 | 0.000 | 0.046 | |
| 23 | | | | | | | 220-09-014 | 1 | 0 | 1 | 0 | 13 | 0.000 | 0.060 | 0.000 | |
| 24 | B | D | 290 | 25 | g | 70 | 220-09-007 | 1 | 0 | 1 | 0 | 11 | 0.000 | 0.051 | 0.000 | |
| 25 | | | | | | | 220-09-009 | 1 | 1 | 0 | 0 | 44 | 0.204 | 0.000 | 0.000 | |
| 26 | | | | | | | 220-09-013 | 1 | 1 | 0 | 0 | 25 | 0.116 | 0.000 | 0.000 | |
| 27 | | | | | | | 220-09-015 | 1 | 1 | 0 | 0 | 10 | 0.046 | 0.000 | 0.000 | |
| 28 | | | | 25 | h | 75 | 220-09-018 | 1 | 0 | 0 | 1 | 9 | 0.000 | 0.000 | 0.042 | |
| 29 | | | | | | | 220-09-019 | 1 | 0 | 0 | 1 | 51 | 0.000 | 0.000 | 0.236 | |
| 30 | | | | | | | 220-09-020 | 1 | 0 | 1 | 0 | 13 | 0.000 | 0.060 | 0.000 | |
| 31 | | | | | | | 220-09-021 | 1 | 1 | 0 | 0 | 3 | 0.014 | 0.000 | 0.000 | |
| 32 | | | | 25 | i | 110 | 220-09-022 | 1 | 0 | 1 | 0 | 10 | 0.000 | 0.046 | 0.000 | |
| 33 | | | | | | | 220-09-023 | 1 | 0 | 1 | 0 | 8 | 0.000 | 0.037 | 0.000 | |
| 34 | | | | | | | 220-09-024 | 1 | 1 | 0 | 0 | 14 | 0.065 | 0.000 | 0.000 | |
| 35 | | | | | | | 220-09-032 | 1 | 0 | 0 | 1 | 13 | 0.000 | 0.000 | 0.060 | |
| 36 | | | | | | | 220-09-038 | 1 | 0 | 0 | 1 | 5 | 0.000 | 0.000 | 0.023 | |
| 37 | | | | | | | 220-09-040 | 1 | 0 | 0 | 1 | 50 | 0.000 | 0.000 | 0.231 | |
| 38 | | | | | | | 220-09-001 | 1 | 0 | 1 | 0 | 11 | 0.000 | 0.051 | 0.000 | |
| 39 | | | | | | | 220-09-023A | 1 | 0 | 0 | 1 | 4 | 0.000 | 0.000 | 0.019 | |
| 40 | | | | 25 | j | 35 | 220-09-033 | 1 | 1 | 0 | 0 | 6 | 0.028 | 0.000 | 0.000 | |
| 41 | | | | | | | 220-09-021A | 1 | 1 | 0 | 0 | 9 | 0.042 | 0.000 | 0.000 | |
| 42 | | | | | | | 220-09-018A | 1 | 1 | 0 | 0 | 4 | 0.019 | 0.000 | 0.000 | |
| 43 | O | F | 80 | 50 | k | 80 | 220-11-002 | 1 | 1 | 0 | 0 | 11 | 0.051 | 0.000 | 0.000 | |
| 44 | F | G | 120 | 50 | l | 120 | 220-10-15 | 1 | 0 | 0 | 1 | 14 | 0.000 | 0.000 | 0.065 | |
| 45 | G | H | 260 | 25 | m | 150 | 220-08-009 | 1 | 0 | 1 | 0 | 5 | 0.000 | 0.023 | 0.000 | |
| 46 | | | | | | | 220-08-009KA | 1 | 1 | 0 | 0 | 30 | 0.139 | 0.000 | 0.000 | |
| 47 | | | | | | | 220-08-010 | 1 | 0 | 1 | 0 | 14 | 0.000 | 0.065 | 0.000 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 48 | | | | | | | 220-08-011 | 1 | 0 | 1 | 0 | 20 | 0.000 | 0.093 | 0.000 | |
| 49 | | | | 25 | n | 110 | 220-08-010 | 1 | 0 | 1 | 0 | 13 | 0.000 | 0.060 | 0.000 | |
| 50 | | | | | | | 220-08-008 | 1 | 0 | 0 | 1 | 6 | 0.000 | 0.000 | 0.028 | |
| 51 | | | | | | | 220-08-009Kha | 1 | 0 | 0 | 1 | 11 | 0.000 | 0.000 | 0.051 | |
| 52 | | | | | | | 220-08-011 kha | 1 | 0 | 0 | 1 | 8 | 0.000 | 0.000 | 0.037 | |
| 53 | G | L | 120 | 50 | o | 120 | 220-08-13 | 1 | 0 | 1 | 0 | 11 | 0.000 | 0.051 | 0.000 | |
| 54 | L | I | 180 | 25 | p | 180 | 220-08-012 | 1 | 0 | 0 | 1 | 17 | 0.000 | 0.000 | 0.079 | |
| 55 | | | | | | | 220-08-015 | 1 | 1 | 0 | 0 | 9 | 0.042 | 0.000 | 0.000 | |
| 56 | I | J | 120 | 25 | q | 120 | 220-11-001 | 1 | 1 | 0 | 0 | 9 | 0.042 | 0.000 | 0.000 | |
| 57 | | | | | | | 220-11-002 | 1 | 1 | 0 | 0 | 11 | 0.051 | 0.000 | 0.000 | |
| 58 | | | | | | | 220-11-003 | 1 | 0 | 0 | 1 | 2 | 0.000 | 0.000 | 0.009 | |
| 59 | | | | | | | 220-11-005 | 1 | 0 | 0 | 1 | 6 | 0.000 | 0.000 | 0.028 | |
| 60 | | | | | | | 220-11-006 | 1 | 0 | 1 | 0 | 4 | 0.000 | 0.019 | 0.000 | |
| 61 | | | | | | | 220-11-007 | 1 | 1 | 0 | 0 | 3 | 0.014 | 0.000 | 0.000 | |
| 62 | | | | | | | 220-11-008 | 1 | 0 | 0 | 1 | 2 | 0.000 | 0.000 | 0.009 | |
| 63 | | | | | | | 220-11-009 | 1 | 0 | 0 | 1 | 8 | 0.000 | 0.000 | 0.037 | |
| 64 | | | | | | | 220-11-010 | 1 | 1 | 0 | 0 | 11 | 0.051 | 0.000 | 0.000 | |
| 65 | | | | | | | 220-10-018 | 1 | 0 | 0 | 1 | 5 | 0.000 | 0.000 | 0.023 | |
| 66 | | | | | | | 220-10-017 | 1 | 0 | 0 | 1 | 14 | 0.000 | 0.000 | 0.065 | |
| 67 | I | K | 360 | 25 | r | 175 | 220-11-011 | 1 | 0 | 0 | 1 | 4 | 0.000 | 0.000 | 0.019 | |
| 68 | | | | | | | 220-11-012 | 1 | 0 | 1 | 0 | 1 | 0.000 | 0.005 | 0.000 | |
| 69 | | | | | | | 220-11-014 | 1 | 1 | 0 | 0 | 11 | 0.051 | 0.000 | 0.000 | |
| 70 | | | | | | | 220-11-015 | 1 | 1 | 0 | 0 | 6 | 0.028 | 0.000 | 0.000 | |
| 71 | | | | | | | 220-11-016 | 1 | 1 | 0 | 0 | 6 | 0.028 | 0.000 | 0.000 | |
| 72 | | | | | | | 220-11-017 | 1 | 1 | 0 | 0 | 13 | 0.060 | 0.000 | 0.000 | |
| 73 | | | | | | | 220-11-018 | 1 | 0 | 0 | 1 | 5 | 0.000 | 0.000 | 0.023 | |
| 74 | | | | | | | 220-11-019 | 1 | 0 | 0 | 1 | 2 | 0.000 | 0.000 | 0.009 | |
| 75 | | | | | | | 220-11-022 | 1 | 0 | 1 | 0 | 11 | 0.000 | 0.051 | 0.000 | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 76 | | | | | | | 220-11-023 | 1 | 1 | 0 | 0 | 5 | 0.023 | 0.000 | 0.000 | |
| 77 | | | | 25 | s | 185 | 220-11-024 | 1 | 0 | 0 | 1 | 93 | 0.000 | 0.000 | 0.431 | |
| 78 | | | | | | | 220-11-025 | 1 | 0 | 1 | 0 | 3 | 0.000 | 0.014 | 0.000 | |
| 79 | | | | | | | 220-11-026 | 1 | 1 | 0 | 0 | 14 | 0.065 | 0.000 | 0.000 | |
| 80 | | | | | | | 220-11-027 | 1 | 0 | 0 | 1 | 16 | 0.000 | 0.000 | 0.074 | |
| 81 | | | | | | | 220-11-028 | 1 | 0 | 0 | 1 | 40 | 0.000 | 0.000 | 0.185 | |
| 82 | | | | | | | 220-11-029 | 1 | 0 | 0 | 1 | 17 | 0.000 | 0.000 | 0.079 | |
| 83 | | | | | | | 220-11-030 | 1 | 0 | 1 | 0 | 11 | 0.000 | 0.051 | 0.000 | |
| 84 | | | | | | | 220-11-034 | 1 | 1 | 0 | 0 | 4 | 0.019 | 0.000 | 0.000 | |
| 85 | | | | | | | 220-11-201Ka | 3 | 0.33 | 0.33 | 0.33 | 181 | 0.277 | 0.277 | 0.277 | |
| 86 | | | | | | | 220-11-028 | 1 | 0 | 0 | 1 | 40 | 0.000 | 0.000 | 0.185 | |
| 87 | L | N | 160 | 25 | t | 160 | 220-08-005 | 1 | 1 | 0 | 0 | 30 | 0.139 | 0.000 | 0.000 | |
| 88 | | | | | | | 220-08-006 | 1 | 0 | 0 | 1 | 22 | 0.000 | 0.000 | 0.102 | |
| 89 | | | | | | | 220-08-007 | 1 | 0 | 0 | 1 | 0 | 0.000 | 0.000 | 0.000 | |
| 90 | L | P | 300 | 25 | u | 300 | 220-06-010 | 1 | 0 | 1 | 0 | 41 | 0.000 | 0.190 | 0.000 | |
| 91 | | | | | | | 220-08-003 | 1 | 1 | 0 | 0 | 10 | 0.046 | 0.000 | 0.000 | |
| 92 | | | | | | | 220-08-002A | 1 | 0 | 1 | 0 | 24 | 0.000 | 0.111 | 0.000 | |
| 93 | | | | | | | 220-06-014 | 1 | 0 | 1 | 0 | 16 | 0.000 | 0.074 | 0.000 | |
| 94 | | | | | | | 220-06-025 | 1 | 1 | 0 | 0 | 12 | 0.056 | 0.000 | 0.000 | |
| 95 | | | | | | | 220-06-020 | 1 | 0 | 0 | 1 | 50 | 0.000 | 0.000 | 0.231 | |
| 96 | P | Q | 200 | 25 | v | 200 | 220-06-023KA | 1 | 0 | 0 | 1 | 10 | 0.000 | 0.000 | 0.046 | |
| 97 | | | | | | | 220-06-026 | 1 | 0 | 0 | 1 | 14 | 0.000 | 0.000 | 0.065 | |
| 98 | | | | | | | 220-06-025 | 1 | 1 | 0 | 0 | 12 | 0.056 | 0.000 | 0.000 | |
| 99 | | | | | | | 220-08-001 | 1 | 0 | 1 | 0 | 20 | 0.000 | 0.093 | 0.000 | |
| 100 | P | R | 200 | 25 | w | 200 | 220-06-023 | 1 | 1 | 0 | 0 | 13 | 0.060 | 0.000 | 0.000 | |
| 101 | | | | | | | 220-06-021 | 1 | 1 | 0 | 0 | 15 | 0.069 | 0.000 | 0.000 | |
| 102 | | | | | | | 220-06-021A | 1 | 1 | 0 | 0 | 4 | 0.019 | 0.000 | 0.000 | |
| 103 | | | | | | | 220-06-024 | 1 | 0 | 0 | 1 | 4 | 0.000 | 0.000 | 0.019 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 104 | P | S | 250 | 25 | x | 250 | 220-06-005 | 1 | 0 | 0 | 1 | 20 | 0.000 | 0.000 | 0.093 | |
| 105 | | | | | | | 220-06-006 | 1 | 0 | 1 | 0 | 6 | 0.000 | 0.028 | 0.000 | |
| 106 | | | | | | | 220-06-013 | 1 | 1 | 0 | 0 | 15 | 0.069 | 0.000 | 0.000 | |
| 107 | | | | | | | 220-08-002 | 1 | 0 | 0 | 1 | 10 | 0.000 | 0.000 | 0.046 | |
| 108 | | | | | | | 220-06-012 | 1 | 1 | 0 | 0 | 14 | 0.065 | 0.000 | 0.000 | |
| 109 | S | T | 65 | 25 | y | 65 | 220-06-013 | 1 | 1 | 0 | 0 | 83 | 0.384 | 0.000 | 0.000 | |
| 110 | | | | | | | 220-08-004 | 1 | 0 | 0 | 1 | 50 | 0.000 | 0.000 | 0.231 | |
| 111 | | | | | | | 220-06-015 | 1 | 0 | 0 | 1 | 93 | 0.000 | 0.000 | 0.431 | |
| 112 | | | | | | | 220-06-015C | 1 | 0 | 0 | 1 | 79 | 0.000 | 0.000 | 0.366 | |
| 113 | | | | | | | 220-06-015B | 1 | 1 | 0 | 0 | 32 | 0.148 | 0.000 | 0.000 | |
| 114 | | | | | | | 220-06-016 | 1 | 0 | 1 | 0 | 92 | 0.000 | 0.426 | 0.000 | |
| 115 | | | | | | | 220-06-017 | 1 | 1 | 0 | 0 | 19 | 0.088 | 0.000 | 0.000 | |
| 116 | | | | | | | 220-06-018 | 1 | 1 | 0 | 0 | 66 | 0.306 | 0.000 | 0.000 | |
| 117 | | | | | | | 220-08-019 | 1 | 1 | 0 | 0 | 75 | 0.347 | 0.000 | 0.000 | |
| 118 | S | V | 240 | 25 | z | 115 | 220-06-001 | 1 | 0 | 0 | 1 | 50 | 0.000 | 0.000 | 0.231 | |
| 119 | | | | | | | 220-06-002 | 1 | 1 | 0 | 0 | 93 | 0.431 | 0.000 | 0.000 | |
| 120 | | | | | | | 220-06-007 | 1 | 0 | 1 | 0 | 22 | 0.000 | 0.102 | 0.000 | |
| 121 | | | | | | | 220-06-009 | 1 | 0 | 0 | 1 | 78 | 0.000 | 0.000 | 0.361 | |
| 122 | | | | | | | 220-06-010 | 1 | 1 | 0 | 0 | 41 | 0.190 | 0.000 | 0.000 | |
| 123 | | | | | | | 220-06-011 | 1 | 0 | 0 | 1 | 85 | 0.000 | 0.000 | 0.394 | |
| 124 | | | | 25 | a1 | 125 | 220-05-026 | 1 | 0 | 0 | 1 | 39 | 0.000 | 0.000 | 0.181 | |
| 125 | | | | | | | 220-05-030 | 1 | 0 | 0 | 1 | 15 | 0.000 | 0.000 | 0.069 | |
| 126 | | | | | | | 220-05-29 | 1 | 1 | 0 | 0 | 96 | 0.444 | 0.000 | 0.000 | |
| 127 | | | | | | | 220-05-028 | 3 | 0.33 | 0.33 | 0.33 | 2553 | 3.940 | 3.940 | 3.940 | |
| 128 | | | | | | | 220-05-027 | 1 | 1 | 0 | 0 | 82 | 0.380 | 0.000 | 0.000 | |
| 129 | | | | | | | 220-06-014 | 1 | 1 | 0 | 0 | 16 | 0.074 | 0.000 | 0.000 | |
| 130 | O | W | 180 | 50 | b1 | 180 | 220-10-013 | 1 | 1 | 0 | 0 | 16 | 0.074 | 0.000 | 0.000 | |
| 131 | | | | | | | 220-10-016 | 1 | 0 | 0 | 1 | 7 | 0.000 | 0.000 | 0.032 | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 132 | W | X | 100 | 25 | c1 | 100 | 220-10-014 DLPI | 1 | 0 | 0 | 1 | 13 | 0.000 | 0.000 | 0.060 | |
| 133 | | | | | | | 220-10-014 DLP2 | 1 | 0 | 1 | 0 | 18 | 0.000 | 0.083 | 0.000 | |
| 134 | W | Y | 420 | 50 | d1 | 420 | 220-10-004 | 1 | 1 | 0 | 0 | 12 | 0.056 | 0.000 | 0.000 | |
| 135 | | | | | | | 220-10-004KA | 1 | 1 | 0 | 0 | 14 | 0.065 | 0.000 | 0.000 | |
| 136 | | | | | | | 220-10-009 | 1 | 0 | 1 | 0 | 13 | 0.000 | 0.060 | 0.000 | |
| 137 | | | | | | | 220-10-008 | 1 | 1 | 0 | 0 | 30 | 0.139 | 0.000 | 0.000 | |
| 138 | | | | | | | 220-10-008A | 1 | 0 | 0 | 1 | 18 | 0.000 | 0.000 | 0.083 | |
| 139 | Y | Z | 170 | 25 | e1 | 170 | 220-10-005 | 1 | 0 | 0 | 1 | 5 | 0.000 | 0.000 | 0.023 | |
| 140 | | | | | | | 220-10-006 | 1 | 0 | 0 | 1 | 11 | 0.000 | 0.000 | 0.051 | |
| 141 | | | | | | | 220-10-007 | 1 | 0 | 1 | 0 | 10 | 0.000 | 0.046 | 0.000 | |
| 142 | | | | | | | 220-10-006Kha | 1 | 0 | 1 | 0 | 9 | 0.000 | 0.042 | 0.000 | |
| 143 | Y | **a** | 110 | 25 | f1 | 110 | 220-10-004KA | 1 | 1 | 0 | 0 | 40 | 0.185 | 0.000 | 0.000 | |
| 144 | **a** | **b** | 100 | 25 | g1 | 100 | 220-10-014A | 1 | 1 | 0 | 0 | 30 | 0.139 | 0.000 | 0.000 | |
| 145 | | | | | | | 220-10-014B | 1 | 1 | 0 | 0 | 88 | 0.407 | 0.000 | 0.000 | |
| 146 | **a** | **d** | 80 | 25 | h1 | 80 | 220-10-011 | 1 | 0 | 0 | 1 | 92 | 0.000 | 0.000 | 0.426 | |
| 147 | **d** | **e** | 80 | 25 | i1 | 80 | 220-10-014 | 1 | 0 | 0 | 1 | 14 | 0.000 | 0.000 | 0.065 | |
| 148 | **d** | **f** | 130 | 25 | j1 | 130 | 220-10-007 | 1 | 0 | 1 | 0 | 97 | 0.000 | 0.449 | 0.000 | |
| 149 | | | | | | | 220-10-012 | 1 | 1 | 0 | 0 | 30 | 0.139 | 0.000 | 0.000 | |
| 150 | | | | | | | 220-10-012A | 1 | 0 | 1 | 0 | 85 | 0.000 | 0.394 | 0.000 | |

**Line and load data of Simkhada Gau LT feeder for etap**

| Specification | | | | | Peak Load, kW | | | Peak Current, A | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Points | Length, m | Size, sq. mm | Resistance, ohm/km | Reactance, ohm/km | R | Y | B | IR | IY | IB |
| a | 80 | 95 | 0.397 | 0.086 | 0.019 | 0.139 | 0.060 | 0.081 | 0.610 | 0.264 |
| b | 220 | 25 | 1.49 | 0.096 | 0.069 | 0.000 | 0.102 | 0.305 | 0.000 | 0.447 |
| c | 210 | 25 | 1.49 | 0.096 | 0.019 | 0.032 | 0.051 | 0.081 | 0.142 | 0.224 |
| d | 200 | 25 | 1.49 | 0.096 | 0.037 | 0.065 | 0.019 | 0.163 | 0.285 | 0.081 |
| e | 80 | 25 | 1.49 | 0.096 | 0.352 | 0.125 | 0.157 | 1.545 | 0.549 | 0.691 |
| f | 100 | 25 | 1.49 | 0.096 | 0.000 | 0.060 | 0.227 | 0.000 | 0.264 | 0.996 |
| g | 70 | 25 | 1.49 | 0.096 | 0.366 | 0.051 | 0.000 | 1.606 | 0.224 | 0.000 |
| h | 75 | 25 | 1.49 | 0.096 | 0.014 | 0.060 | 0.278 | 0.061 | 0.264 | 1.220 |
| i | 110 | 25 | 1.49 | 0.096 | 0.065 | 0.134 | 0.333 | 0.285 | 0.590 | 1.464 |
| j | 35 | 25 | 1.49 | 0.096 | 0.088 | 0.000 | 0.000 | 0.386 | 0.000 | 0.000 |
| k | 80 | 50 | 0.796 | 0.09 | 0.051 | 0.000 | 0.000 | 0.224 | 0.000 | 0.000 |
| l | 120 | 50 | 0.796 | 0.09 | 0.000 | 0.000 | 0.065 | 0.000 | 0.000 | 0.285 |
| m | 150 | 25 | 1.49 | 0.096 | 0.139 | 0.181 | 0.000 | 0.610 | 0.793 | 0.000 |
| n | 110 | 25 | 1.49 | 0.096 | 0.000 | 0.060 | 0.116 | 0.000 | 0.264 | 0.508 |
| o | 120 | 50 | 0.796 | 0.09 | 0.000 | 0.051 | 0.000 | 0.000 | 0.224 | 0.000 |
| p | 180 | 25 | 1.49 | 0.096 | 0.042 | 0.051 | 0.194 | 0.183 | 0.224 | 0.854 |
| q | 120 | 25 | 1.49 | 0.096 | 0.157 | 0.019 | 0.171 | 0.691 | 0.081 | 0.752 |
| r | 175 | 25 | 1.49 | 0.096 | 0.190 | 0.056 | 0.051 | 0.834 | 0.244 | 0.224 |
| s | 185 | 25 | 1.49 | 0.096 | 0.360 | 0.341 | 1.230 | 1.580 | 1.499 | 5.403 |
| t | 160 | 25 | 1.49 | 0.096 | 0.139 | 0.000 | 0.102 | 0.610 | 0.000 | 0.447 |
| u | 300 | 25 | 1.49 | 0.096 | 0.102 | 0.375 | 0.231 | 0.447 | 1.647 | 1.017 |
| v | 200 | 25 | 1.49 | 0.096 | 0.056 | 0.093 | 0.111 | 0.244 | 0.407 | 0.488 |
| w | 200 | 25 | 1.49 | 0.096 | 0.148 | 0.000 | 0.019 | 0.651 | 0.000 | 0.081 |
| x | 250 | 25 | 1.49 | 0.096 | 0.134 | 0.028 | 0.139 | 0.590 | 0.122 | 0.610 |
| y | 65 | 25 | 1.49 | 0.096 | 1.273 | 0.426 | 1.028 | 5.591 | 1.871 | 4.514 |
| z | 115 | 25 | 1.49 | 0.096 | 0.620 | 0.102 | 0.986 | 2.725 | 0.447 | 4.331 |
| a1 | 125 | 25 | 1.49 | 0.096 | 4.838 | 3.940 | 4.190 | 21.247 | 17.303 | 18.401 |
| b1 | 180 | 50 | 0.796 | 0.09 | 0.074 | 0.000 | 0.032 | 0.325 | 0.000 | 0.142 |
| c1 | 100 | 25 | 1.49 | 0.096 | 0.000 | 0.083 | 0.060 | 0.000 | 0.366 | 0.264 |
| d1 | 420 | 50 | 0.796 | 0.09 | 0.259 | 0.060 | 0.083 | 1.139 | 0.264 | 0.366 |
| e1 | 170 | 25 | 1.49 | 0.096 | 0.000 | 0.088 | 0.074 | 0.000 | 0.386 | 0.325 |
| f1 | 110 | 25 | 1.49 | 0.096 | 0.185 | 0.000 | 0.000 | 0.813 | 0.000 | 0.000 |
| g1 | 100 | 25 | 1.49 | 0.096 | 0.546 | 0.000 | 0.000 | 2.399 | 0.000 | 0.000 |
| h1 | 80 | 25 | 1.49 | 0.096 | 0.000 | 0.000 | 0.426 | 0.000 | 0.000 | 1.871 |
| i1 | 80 | 25 | 1.49 | 0.096 | 0.000 | 0.000 | 0.065 | 0.000 | 0.000 | 0.285 |
| j1 | 130 | 25 | 1.49 | 0.096 | 0.139 | 0.843 | 0.000 | 0.610 | 3.700 | 0.000 |

**Line and load data of Simkhada Gau LT feeder for Matlab**

| Specification | | | | | Peak Load, kW | | | Peak Current, A | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Points | Length, m | Size, sq. mm | Resistance, ohm/km | Reactance, ohm/km | R | Y | B | IR | IY | IB |
| A | 80 | 95 | 0.397 | 0.086 | 0.019 | 0.139 | 0.060 | 0.081 | 0.610 | 0.264 |
| C | 630 | 25 | 1.49 | 0.096 | 0.125 | 0.097 | 0.171 | 0.549 | 0.427 | 0.752 |
| B | 80 | 25 | 1.49 | 0.096 | 0.352 | 0.125 | 0.157 | 1.545 | 0.549 | 0.691 |
| E | 100 | 25 | 1.49 | 0.096 | 0.000 | 0.060 | 0.227 | 0.000 | 0.264 | 0.996 |
| D | 290 | 25 | 1.49 | 0.096 | 0.532 | 0.245 | 0.611 | 2.338 | 1.078 | 2.684 |
| F | 80 | 50 | 0.796 | 0.09 | 0.051 | 0.000 | 0.000 | 0.224 | 0.000 | 0.000 |
| G | 120 | 50 | 0.796 | 0.09 | 0.000 | 0.000 | 0.065 | 0.000 | 0.000 | 0.285 |
| H | 260 | 25 | 1.49 | 0.096 | 0.139 | 0.241 | 0.116 | 0.610 | 1.057 | 0.508 |
| L | 120 | 50 | 0.796 | 0.09 | 0.000 | 0.051 | 0.000 | 0.000 | 0.224 | 0.000 |
| I | 180 | 25 | 1.49 | 0.096 | 0.042 | 0.102 | 0.194 | 0.183 | 0.447 | 0.854 |
| J | 120 | 25 | 1.49 | 0.096 | 0.157 | 0.019 | 0.171 | 0.691 | 0.081 | 0.752 |
| K | 360 | 25 | 1.49 | 0.096 | 0.550 | 0.397 | 1.281 | 2.414 | 1.743 | 5.627 |
| N | 160 | 25 | 1.49 | 0.096 | 0.139 | 0.000 | 0.102 | 0.610 | 0.000 | 0.447 |
| P | 300 | 25 | 1.49 | 0.096 | 0.102 | 0.375 | 0.231 | 0.447 | 1.647 | 1.017 |
| Q | 200 | 25 | 1.49 | 0.096 | 0.056 | 0.093 | 0.111 | 0.244 | 0.407 | 0.488 |
| R | 200 | 25 | 1.49 | 0.096 | 0.148 | 0.000 | 0.019 | 0.651 | 0.000 | 0.081 |
| S | 250 | 25 | 1.49 | 0.096 | 0.134 | 0.028 | 0.139 | 0.590 | 0.122 | 0.610 |
| T | 65 | 25 | 1.49 | 0.096 | 1.273 | 0.426 | 1.028 | 5.591 | 1.871 | 4.514 |
| V | 240 | 25 | 1.49 | 0.096 | 5.458 | 4.042 | 5.176 | 23.972 | 17.750 | 22.731 |
| W | 180 | 50 | 0.796 | 0.09 | 0.074 | 0.000 | 0.032 | 0.325 | 0.000 | 0.142 |
| X | 100 | 25 | 1.49 | 0.096 | 0.000 | 0.083 | 0.060 | 0.000 | 0.366 | 0.264 |
| Y | 420 | 50 | 0.796 | 0.09 | 0.259 | 0.060 | 0.083 | 1.139 | 0.264 | 0.366 |
| Z | 170 | 25 | 1.49 | 0.096 | 0.000 | 0.088 | 0.074 | 0.000 | 0.386 | 0.325 |
| a | 110 | 25 | 1.49 | 0.096 | 0.185 | 0.000 | 0.000 | 0.813 | 0.000 | 0.000 |
| b | 100 | 25 | 1.49 | 0.096 | 0.546 | 0.000 | 0.000 | 2.399 | 0.000 | 0.000 |
| d | 80 | 25 | 1.49 | 0.096 | 0.000 | 0.000 | 0.426 | 0.000 | 0.000 | 1.871 |
| e | 80 | 25 | 1.49 | 0.096 | 0.000 | 0.000 | 0.065 | 0.000 | 0.000 | 0.285 |
| f | 130 | 25 | 1.49 | 0.096 | 0.139 | 0.843 | 0.000 | 0.610 | 3.700 | 0.000 |

# A Simple and Generalized Model to Compute LT Distribution Loss and Testing of its Applicability

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