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Feasibility analysis of household electricity installation in Klambir V village Hamparan Perak district Deli Serdang regency

Adi Sastra Pengalaman Tarigan[1] ,M.Rizki syahputra[2], Muhammad Fahreza[3]
[1,2,3] Department of Electrical Engineering,Universitas Pembangunan Panca Budi, Medan, Indonesia

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ABSTRACT

Household electrical installations over time experience change both in quality and quantity. The declining quality of electrical installations and changes in the number of load points greatly affect the feasibility of electrical installations and the safety of the users. This research was conducted to know the percentage level of feasibility of household electrical installations and the factors that cause the infeasibility of household electrical installations. This research is a qualitative research study using a descriptive approach which was carried out in Klambir V Village, Hamparan Perak District, Deli Serdang Regency. The objects studied were 20 houses with the sampling technique used in this study used a random sampling technique. The instruments used were observation, interviews, and documentation. The data obtained from this study is the Percentage Level of household electrical installations in Klambir V Village, Hamparan Peraak District, Deli Serdang RegencyGround resistance value is still quite large and categorized as "not feasible" for a grounding system used by a building. soil content or soil resistance is still 7.91 ohms and the electrode rod uses 1 rod.

Corresponding Author:

Adi Sastra Pengalaman Tarigan,
Department of Electrical Engineering,
Universitas Pembangunan Panca Budi,
Jl. Gatot Subroto Km 4,5, Sei Kambing, Medan, 20122, Indonesia.
Email: adisastra@dosen.pancabudi.ac.id

1. INTRODUCTION

As time has progressed and the community's need for electricity has increased, the electrical installations in customers' homes have also experienced changes both in quality and in quantity. Namely, the decreasing quality of the electrical installation, and the change in the quantity of the load point, the result of changes in both greatly affect the feasibility of the installation and the safety of the user(Ali, 2013), (Hidayat & Harlanu, 2015), (Alfith, 2013),(Imran et al., 2021), (Indra & Ikhsan, 2011), (Aryamantara et al., 2018),(Samin, 2019), (Sujito, 2009),(Sony, 2016). It can be estimated that in general customers are not experts in the electricity sector. As a result of improper installation can cause electrical accidents in his own garden by changes in load (Wibowo, 2011),(Budi Santoso, 2016),(Syah, 2021), (Saul B.P., 2021),(Tukiman, Khairul Handono, 2017),(Herdianto, 2020), (Wicaksono, 2016). Based on the Regulation of the Minister of Energy and Mineral Resources number: 0045 of 2005 article 15 paragraph 3, "Installations for the utilization of high-voltage, medium-voltage and low-voltage consumer electricity need to be retested eligibility once every 15 years" (Instalasi Ketenagalistrikan, 2006). The feasibility of household electrical installations is guided by PUIL 2011 regarding the safety and installation of low voltage electrical installations for households and applicable laws and regulations, namely Law Number 30 of 2009 concerning Electricity, along with its Implementing Regulations. Most of the land in Klambir V Village is a plantation area and the profession of the people of Klambir V Village, Hamparan Perak District, Deli Serdang Regency is farmers, it is not uncommon for some people to irrigate their plantation areas by using electricity to protect their plantations from attacks by wild pigs and other pests. The use of this electric current is also very dangerous for garden owners and residents around it. The proof is that there are several cases of garden owners being electrocuted by the electricity they installed themselves. In Nopember 2018, a farmer was stung (Apriyono, 2018). Based on what has been explained above, the authors are interested in conducting research with the title "Feasibility Analysis of Household Electrical Installations in Klambir V Village, Hamparan Perak District, Deli Serdang Regency".

2. RESEARCH METHOD

In this stage the research team made preparations in the form of theoretical studies related to the research being carried out, discussions, sharing knowledge and searching for literature were activities at this stage. Then analyzing, electrical hazards and how to protect them, how to read installation drawings in residential homes, measure voltage and the theory of installing lighting electrical installations using various kinds of switches and sockets in accordance with the standards and provisions in the General Electrical Installation Requirements (PUIL) then carrying out tests and measurements then taking data from the results of the tests carried out (Persyaratan Umum Instalasi Listrik 2000, 2000), (Pardi, 2022). Comparing measurement results with PUIL standards and analyzing the data obtained and discuss it, If the measurement results are appropriate, stop the measurement or the measurement is complete. If the measurement results are not in accordance with the standard, make repairs and re-measure the resistance. Steps for completion store work equipment and measuring tools in their place Pay attention to whether there are objects or tools left at the location check the ground wire bolts check the ground wire bolts and the feasibility of the wire in carrying the fault current to ground (Anggito & Setiawan, 2018).

3. RESULTS AND DISCUSSIONS

Based on the CRC Table (Current Carrying Capability) in PUIL 2000, for cables of the NYA, NYM and NYY types are as follows Cable cross-sectional area 2.5 mm2 = 25 A and Cable cross-sectional area 4 mm2 = 34 A. If as a protection against touch voltage, the maximum grounding resistance is 5 Ohms. If to minimize the risk due to lightning strikes: < 1 Ohm (same as the specifications for grounding lightning rods). Grounding Resistance is the value of a Grounding Resistance that we plug into the earth. If the soil is porous and loose, as in locations where the water is salty or brackish, by plugging a pipe 1 m deep, you can get a 5 Ohm Grounding Resistance in the dry season and 1 Ohm in the rainy season. If the soil is sandy) or non-porous clay (or from rock (), then to get a 5 Ohm Grounding Resistance requires 5 grounding points with a depth of 5 meters each and a minimum distance of 10 meters between points. The iron that is in the concrete column, at the bottom always touches the ground, so that the grounding resistance ranges from < 1 Ohm and a maximum of 5 Ohms, depending on the depth of the foundation, the number of columns and the type of soil. In every house, the concrete column will be slightly open at the top of the ceiling so that the concrete is visible. So, we can use the concrete iron for grounding. To be safe, the neutral wire is combined with the Grounding. In the PLN Installation, this Neutral cable is already grounded. But to increase security against touch voltage (meaning if there is an electrical equipment whose insulation is leaking and touched by hands), we ground the Neutral cable again. Safe Touch Voltage < 50 Volt Table 2 Resistance based on soil type depending on the depth of the foundation, the number of columns and the type of soil. In every house, the concrete column will be slightly open at the top of the ceiling so that the concrete is visible. So, we can use the concrete iron for grounding.

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Table 1. Resistance based on soil type

No	Type of soil	Soil type resistance (ohm meter)
1	Soil containing salt water	5 - 6
2	Swamp	30
3	Clay	100
4	Wet Sand	200
5	Wet pebbles	500
6	Sand stones and dry	1000
7	pebbles rock	3000

The following is an analysis of the data using manual summation by knowing the grounding character:

$$R = \frac{\rho}{\pi L}\left(In\frac{4L}{d}\right) - 1$$

$$R = \frac{100}{2x3{,}14x15}\left(In\frac{4x\ 15}{0{,}015875}\right) - 1$$

$$R = \frac{100}{94{,}2}\left(In\frac{60}{0{,}015875}\right) - 1$$

R = 1.0615 x 7.2372

R = 7.6822 Ω

The resistance value in this residence is still quite high because the electrode used is only one rod with a depth of 15 meters. According to the researchers, if a house uses more than 2 electrodes, the previously high soil resistance value can be obtained with smaller results
We can see in the following 2 calculations:

$$\frac{1}{Rtotal} = \frac{1}{R1} + \frac{1}{R2} =$$
$$\frac{1}{Rtotal} = \frac{1}{0{,}9\Omega} + \frac{1}{0{,}9\Omega}$$
$$\frac{1}{Rtotal} = \frac{2}{0{,}9\Omega}$$

$$Rtotal = \frac{0{,}9\Omega}{2}$$

Rtotal = 0.45Ω

So from the following results using 2 electrodes in 1 cubicel, the results obtained by manual calculation are 0.45Ω.

4. CONCLUSION

(a). Provide Earth resistance values from measurements using the Earth Tester atKlambir V Village, Hamparan Perak District, Deli Serdang Regency,is still quite large and categorized as "not feasible" for a grounding system used by a building, (b). soil content or soil resistance also greatly affects, if the lower the soil resistance, the greater the soil's ability to absorb electric current connected to a grounded device or object, (c). According to PUIL 2000 provisions, a good earthing system produces a soil resistance value below 5 Ω in the main connecting substation building with 8 20kV cubicles to obtain results of more than 5 Ω. What is measured directly obtains a value of 0.9 Ω and if you know the specifications of the electrode also do not meet the standard which obtains a value of 7.6822 Ω, this value is not in accordance with the provisions stipulated in PUIL 2000 for a grounding system. Our advice is to choose to use a parallel grounding rod or multi grounding system to lower the resistance. use a parallel grounding rod or multi grounding system to lower the resistance.

REFERENCES

Alfith. (2013). Kelayakan instalasi listrik rumah tangga dengan pemakaian lebih dari 10 tahun di kanagarian nanggalo kecamatan koto xi tarusan kabupaten pesisir selatan. *Jurnal Teknik Eletro ITP, Vol. 2 No.*(2), 67.

Ali, muhamad hasan. (2013). Studi Kelayakan Instalasi Penerangan Rumah Di Atas Umur 15 Tahun Terhadap Puil 2000 Di Desa Pancur Kecamatan Pancur Kabupaten Rembang. *Jurnal Teknik Elektro*, *5*(1), 49–52.

Anggito, A., & Setiawan, J. (2018). *Metodologi Penelitian Kualitatif*. CV. Jejak.

Apriyono, A. (2018). *Tragis, Petani Tewas Tersengat Listrik Jebakan Tikus yang Dipasangnya Sendiri*. Liputan6.Com. https://www.liputan6.com/regional/read/3690362/tragis-petani-tewas-tersengat-listrik-jebakan-tikus-yang-dipasangnya-sendiri

Aryamantara, K. J., Giriantari, I. A. ., & Sukerayasa, I. . (2018). Analisis Hubung Singkat Pada Jaringan Tegangan Menengah 20 kV Penyulang Kedonganan. *Majalah Ilmiah Teknologi Elektro*, *17*(2), 213. https://doi.org/10.24843/mite.2018.v17i02.p08

Budi Santoso, D. H. (2016). *Evaluasi Kelayakan Instalasi Listrik Rumah Tangga Dengan Pemakaian Lebih Dari 15 Tahun Berdasarkan Puil 2000 Di Desa Cipaku Kecamatan Cibogo Kabupaten Subang Jawa Barat*. Program Stuniversitas Muhammadiyah Surakarta.

Herdianto, H. (2020). Deteksi Pencurian Arus Listrik pada Rumah Tangga Menggunakan Arduino Uno. *InfoTekJar : Jurnal Nasional Informatika Dan Teknologi Jaringan*, *4*(2), 227–232. https://jurnal.uisu.ac.id/index.php/infotekjar/article/view/2421

Hidayat, A., & Harlanu, M. (2015). Kelayakan Instalasi Listrik Rumah Tangga Berdaya 900 VA Berumur di Atas 15 Tahun di Desa Bojonggede Kecamatan Ngampel Kabupaten Kendal. *Jurnal Teknik Elektro Unnes*, *7*(1), 11–14.

Imran, A., Ruslan, & Syamsurijal. (2021). Analisis Gangguan Hubung Singkat pada Sistem Distribusi Tenaga Listrik UP3 Makassar Utara dengan Menggunakan Aplikasi Etap 12.6. *Seminar Nasional Hasil Penelitian 2021*, 1369–1377. https://www.etap.com

Indra, Z., & Ikhsan, K. (2011). *Analisis Sistem Instalasi Listrik Rumah Tinggal dan Gedung untuk Mencegah Bahaya Kebakaran*. Politeknik Negri Jakarta.

Instalasi Ketenagalistrikan, (2006).

Persyaratan Umum Instalasi Listrik 2000, 562 (2000).

Pardi, D. (2022). Analisis Load Flow dan Short Circuit serta Pengaruh Peletakan photovoltaic (PV) pada GI Kentungan Feeder KTN07. *Electrices*, *4*(1), 12–17. https://doi.org/10.32722/ees.v4i1.4434

Samin, T. (2019). Analisa Gangguan Hubung Singkat Satu Fasa ke Tanah pada Jaringan Distribusi 20 KV PT. PLN (PERSERO) Sebatik menggunakan Software ETAP Power Station 12.6.0. *Elektrika Borneo*, *5*(1), 19–24. https://doi.org/10.35334/jeb.v5i1.590

Saul B.P., O. (2021). Penentuan Arus Gangguan Hubung Singkat Sistem Khatulistiwa Pada Pt.Pln (Persero) Up3B Kalimantan Barat. *Jurnal Teknik Elektro Universitas Tanjungpura*, *2*(1), 1–11.

Sony, A. (2016). Rumusan Metode Deteksi Pencurian Listrik Memanfaatkan Perangkat WSN. *MIPA*, *39*(2), 107–114.

Sujito, S. (2009). Sistem Deteksi Hilang Daya Pada Gardu Trafo Tiang Jaringan Tegangan Rendah Pelanggan Pln. *Tekno*, *12*(1), 62–75.

Syah, F. R. (2021). Analisis Hubung Singkat Pada Sistem Distribusi 20 Kv Pt. Pertamina Ep Asset 4 Field Cepu Distrik Ledok Menggunakan Etap 12.6.0. *Jurnal Teknik Elektro*, *10*(3), 699–706.

Tukiman, Khairul Handono, A. S. (2017). *Analisis arus hubung singkat pada sistem catu daya listrik iradiator gamma* (Vol. 1).

Wibowo, Y. C. (2011). *Tahanan Grounding Rumah Tinggal Di Kecamatan Gunungpati Kota Semarang*. Universitas Negeri Semarang.

Wicaksono, P. (2016). *Ini Cara PLN Deteksi Pencurian Listrik*. Liputan6.Com. https://www.liputan6.com/bisnis/read/2453718/ini-cara-pln-deteksi-pencurian-listrik