Natchitoches underground power supply (Substation group)

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Abstract

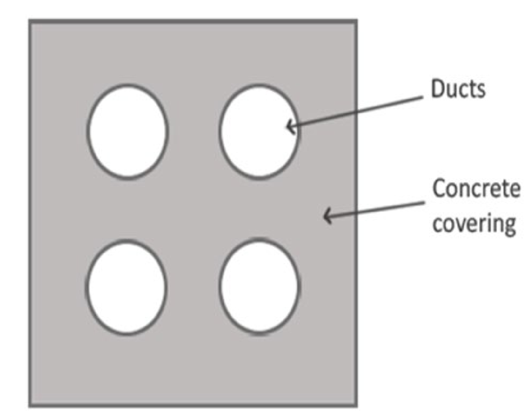
This report will discuss the benefits of underground power distribution, cost benefits of converting overhead power distribution to underground distribution, a design for the cul-de-sac's underground power grid, a loop system and voltage behavior, while defining a substation, cul-de-sac and fault detection for underground power cables. The report will also give insight about what is needed to understand the process of designing an underground power grid, converting the overhead configuration to underground, and reducing power outages due to environment and weather-related problems.

Introduction

A substation is a facility that receives high voltage from a local power plant then distributes this voltage to homes and other buildings at a lower voltage level. Along with increasing and decreasing voltages, a transformer is used to increase or decrease the amount of voltage being distributed. Substations might be depicted by their voltage class, their applications inside the power framework, the technique used to protect most associations, and by the style and materials of the structures utilized. Research by (U.S. Energy Information Administration - EIA - Independent Statistics and Analysis. 2019, October 2) "In 2018, the average annual electricity consumption for a U.S. residential utility customer was 10,972 kilowatt hours (kWh), an average of about 914 kWh per month." A cul-de-sac researched by "Cul-de-sac," Merriam-Webster. [Online]. Available: https://www.merriam-webster.com/dictionary/cul-de-sac. [Accessed: 17-Nov-2019]. "It is a type of subdivision that is a street or passage closed at one end."

Method

In this method, cast iron or concrete pipes or ducts are laid underground with manholes at suitable positions along the cable route. The cables are then pulled into the pipes from the manholes. Usually, an additional pipe/duct is also provided along with the three cable ducts for carrying relay protection connections and pilot wires. Distance between the manholes should be such that pulling in the cables is easier. At corners or while changing the direction of route, radius of the corners must be longer. The cables that are to be laid in this way need not be armored but must be provided with the serving of hessian and jute in order to protect them when being pulled.



Results

The results of our project, we find a reasonable budget. The budget that we came up was a total of $92,736.54. In the budget, it included: Transformers, Conduit, Pot Heads, Duck bank, Laborers, Electrical, conductors, and distribution systems. The total for the 4 transformers cost $2,500. The total for the conduit cost $7,000. The total 2 Pot Heads cost $180. Laborer cost $33,600. The total for the electrical cost $29,400. The total for the 1/0 stranded aluminum conductor cost $10,740. The total cost for 2 power distribution system (two-way transformer) cost $9,316.54. Which all total up at $92,736.54 for this project. This budget is a cheap for an underground power grid. It includes how much power a transformer can withstand, which is 15 kVA. Also, from the primary transformer the power goes to a secondary power source. It then receives a 2-phase voltage of 220 VAC, for a normal size household it receives about a single phase 120 VAC. We also learned from the research of (Xu and Brown 2009) "implications of converting overhead electric distribution systems to underground by comparing the system performance before and after the conversion." The information from this source is helpful to our project because it shows us how people would react to having underground powerlines rather than overhead powerlines and allows us to understand how much power would be necessary of other states to have underground lines rather than overhead lines to prepare us for disasters that is likely to come. In addition, this project helps us with building teamwork skills and gives us an understanding of how to make sure that we do your parts of the project so that we can all come together with a great outcome of the project.

Figure 1. Blueprint of our Example cul-de-sac

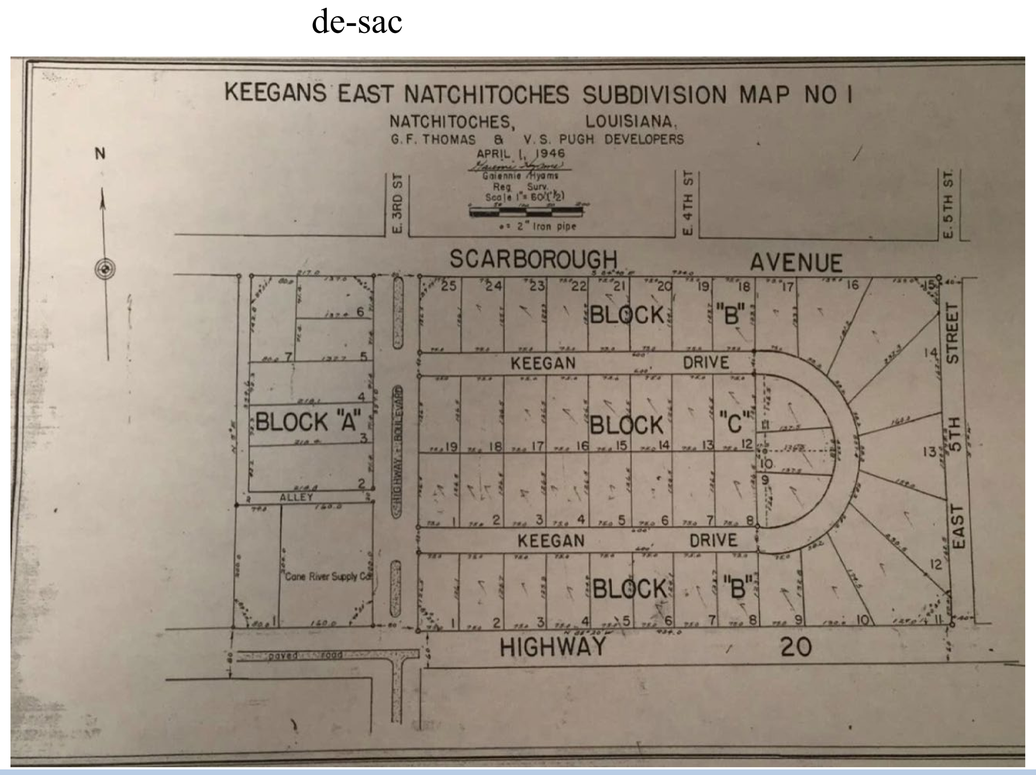
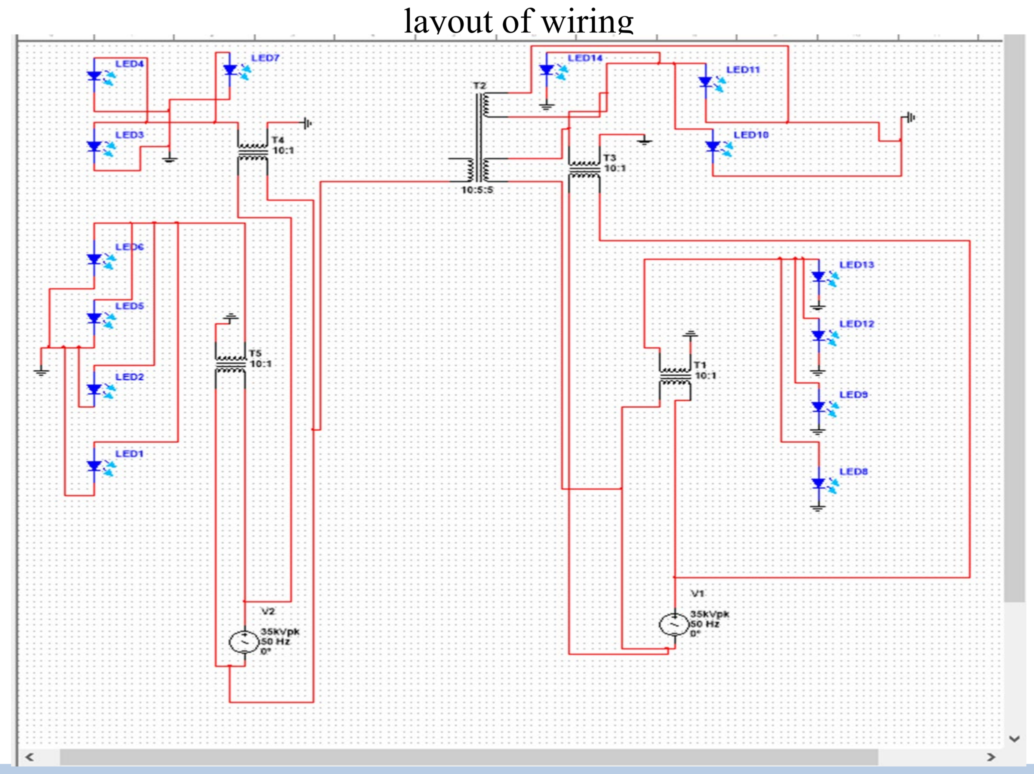


Figure 2. Our Multisim Design of the layout of wiring



Discussion

In our project we are discussing how we are going to change an overhead powerline grid in a cul-de-sac neighborhood to an underground powerline grid. We then went to the substation in Natchitoches and we talked about with type of power supply that we should use and how we should lay out the design for the cul-de sac. We also talked about what group member would oversee the step toward a great project in the Gannet chart it will show you the follow that our groups members did. We also as a group went to the City Hall building in Natchitoches to get plans for a cul-de sac in the Natchitoches subdivision areas so that we can design the right layout of our underground power grid. We then finalized the budget for this project and materials we will need to make this project a successful project and to make this a great investment for the city of Natchitoches so they can save money in the future.

Conclusions

The project that we have worked on this whole school year was a great project it has taught us a lot about how to adapt and overcome challenges. It has also taught us how to budget and try to save money not only for the city of Natchitoches but for the people in Natchitoches that are using the power supply that Natchitoches supplies. The project that we was assigned taught us how to look for new and unique ways of developing different ideas it has also taught us that we can still us the old method of doing things but have a new trick that will help the old method look new.

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