

LED LIGHTING INSTALLATION MANUAL AND FRAMEWORK



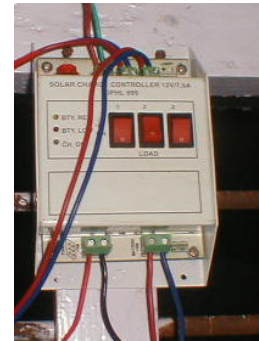
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Main components of the LED LIGHTINGS SYSTEM

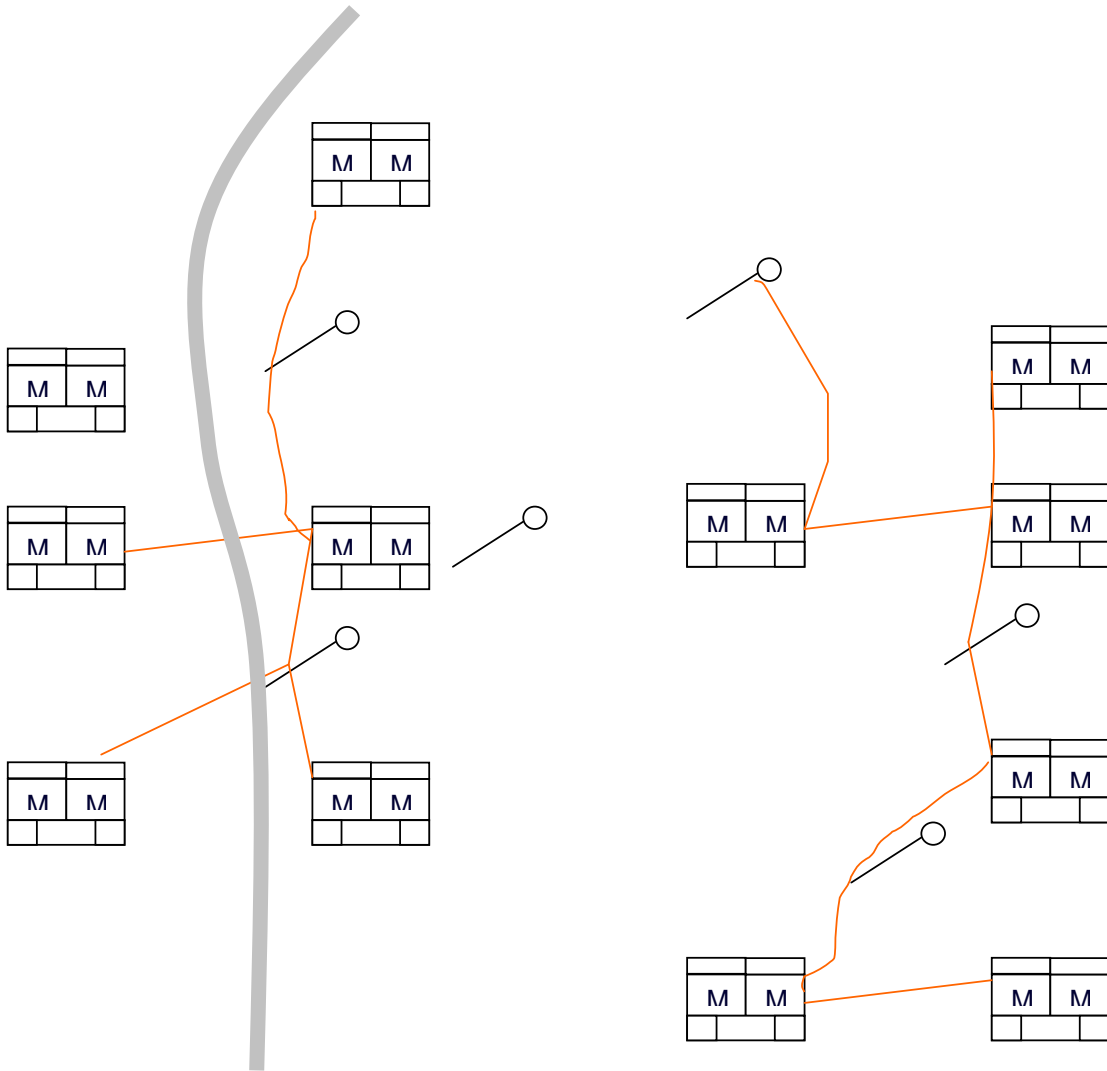
1. LED light units (available in 12/15/24/36 clusters) LED lighting features and properties and photos are available in annex I.
2. 12 volts DC battery of different amperes based on the requirement 7/9/20/40. the battery is sealed and maintenance free. In case the village is quite aware with the maintenance issue, tubular long life battery can be used. Tubular battery needs distill water taping once in 6 months.
3. Solar panel: Solar panel converts the solar radiation into DC voltage. Usually 12 volts panels are used. Different sizes of panels based on the requirement can be used. They vary from 10 watt to 70 watt power output.
4. Charge control units: this unit stays between the solar panel and the battery. It regulates the charging to the battery and cuts of the charge once the battery is fully charged. Different types of CCUs are available in the market. The main supply to the lighting is provide through sockets from the CCU. Upto 4 sockets are available and each can be connected to one house. The CCU has a built in fuse to protect over voltage or accidental short circuit. some of them have built in mechanism to switch of the power load once the battery reaches 20% of the power storage. This is to help the battery not to get fully discharged. Some of the CCUs have built in day and night switch which works automatically.
5. Wires, switches, fuse boxes



Size of the village

Technically LED lighting can be installed in any size of the village. But an interior village which has no other source of power and where it is difficult to supply the grid power is preferred. Tribal hamlets located in deep forests are the first choice. The hamlets can be any size from 5 units of house to 100 or more.

Before commencing the installation proper village social map can be prepared and the lighting clusters can be planned.



Lighting:

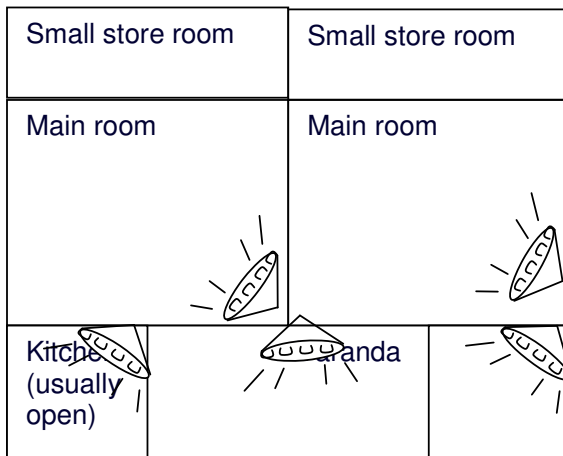
Usually the tribal houses are small and generally consist of one big room and one varanda in some cases one ante room also. 2 to 3 lights are sufficient for each house. 24 LED is used in the main room and 15 led is used in the small rooms and in the varanda. A proper house may be made so that wiring plan becomes easy and wire runs for lesser length thus protecting the proper voltage.



24 LED unit consume 2 watts of power, 15 LED unit consumes 1.3 watts of power. Theoretically 40 amp battery has around 480 watts of storage power. It can supply power to 20 numbers of 24 leds for nearly 24 hrs. but generally at least one day back power has to be built in to the system so that the lighting goes unaffected in the cloudy day.



Sample house plan



Batteries:

Different types of battery systems both branded and unbranded are available in the market. It is preferred to use the batteries from the main suppliers like EXIDE, SF, Panasonic and others.

Lead acid low maintenance battery (LALM) is one of the option. In the LALM again tubular battery is the most preferred option. This battery needs taping once in 4/6 months. It is said that Maintenance free battey is the best option.

Wiring

Wiring is done inside the house as well as outside. Inside wiring can be regular two core 1/2 mm. Outside wiring has to be 2 core 1 mm is used. Distance from the CCU to the houses is the main factor that effects the luminosity. DC voltage generally drops over distances, there can be one volt drop for every 10 meter. If the voltage drops more than 2 voltage, the lighting is effected. THRIVE is making efforts now to make lights that can be boost up the voltage by 2 volts.

Care has to be taken to put the wiring very neatly and at a height (over 10 feet) so that it cannot be accidentally cut or tampered. When pulling the wire for more than 7 meters it is better to use some pole support (strong bamboo or locally available pole post) in case the wire is cut it is better to replace the entire length than attaching/jointing the wires in the open. Any joints have to be inside the house/casing. DC voltage gets affected by rain and other weather factors.

Switches:

Main switch is provided in the CCU. Again DC switches with built in fuses are used in each house. At present one switch is provided to each use. THRIVE is now developing a dimmer so that in the night instead of the whole 24 LEDs lighting 4 or 6 can be used for dimming (a kind of night bulb)

Fuses:

Usage of fuses increases the safety of the system prevents the damages from any short circuit. Main fuse is provided in the CCU and every house is provided with one more fuse.

Installation notes

Based on the type of the houses and distances from each other, total load has to be calculated. Generally 40 amp battery can provide lighting for 20 light units or 10 houses. But if the houses are apart, 15 or less light units can be used.

It is preferred to put the solar panel on top of any concrete roof. Proper care has to be taken to remove any debris, dry grass or any flammable material from that roof. It mounted on a wooden post, the post has to be erected very strong. Termites may work on the wooden post and GE pipe can be used to mount the panel. The clams and others have to be heavy gauge.



The wiring has to be supported by bamboo posts and should not be hanging low. At least they have to be over 10 feet height.

CCU has to be properly protected from weather factors. It has to be mounted inside in one of the beneficiary house. CCU, main fuses and wiring may be put in one big wall mounted base and one lock be employed for further safety.

Light units have to be properly fixed to the wall using the right type of screw/nail. Pegs have to be used in case of cement construction wall. It has to be seen that there are no water leakages from the roof or on the wall directly falling on the light unit.

Other services

Television and Tape recorder

It is possible to connect Television and regular Tape recorders to the DC power line. Many of the black and white televisions have 12 volts DC inlet provided. Color TVs work at a different voltage and THRIVE is now making an adaptor (power booster) to supply power to a color television. Many tape recorders that run in the automobiles use 12 volts DC. Regular amplifiers and mike systems also use 12 volts DC and it is safe and easy to power them from the CCU load. As a thumb rule a 40 AMP battery can power a television for nearly 25 hrs and an amplifier for 20 hrs. the lighting load on that particular battery has to be utilized keeping this point in view. If the village is big a separate battery and panel can be used for this purpose.

Computer

THRIVE has made a power booster/adaptor to supply power to a laptop computer. Usually a laptop works at 14/16/19 dc volts. There is a need for a power booster from the 12 volts of the battery. A general laptop consumes 10 to 15 watts of power. This way the laptop can work nearly 40 hrs on a 12 volts 40 amp battery (the battery that is used in the small cars) If the laptop is used on the DC power, there is no need for having the laptop built in battery and charging it.

Cell phone charging

Usually mobiles get charged at 6 volts DC. Simple adaptors are available that can charge any mobile phones from the 12 volts battery. A socket can be provided in one of the battery for charging the mobile.

ANNEX I

TECHNICAL FEATURES OF LEDs



White LEDs are 'Light Emitting Diodes', a type of semiconductor. They are the newest item in today's lighting technology. Unlike other light sources, these WHITE LEDs can take a lot of punishment from vibration, heat and severe cold. WHITE LEDs can be made waterproof, and put into a lighting package with 2 to 1000 WHITE LEDs. They can be used for street lights, sign lighting, spot lighting or anything else.

WHITE LEDs need 3.6VDC and use approximately 30 milliamps of current, a power dissipation of 110 milliwatts. The positive power is applied to one side of the LED semiconductor through a lead and a whisker. The other side of the semiconductor is attached to the top of the anvil that is the negative power lead. It is the chemical makeup of the LED semiconductor that determines the color of the light that the LED produces. The plastic housing has three functions: it is designed to allow the most light to escape from the semiconductor; it focuses the light, and it protects the semiconductor from the elements.

Some Basic Facts About White LEDs

White LEDs can be placed in abusive environments.

White LEDs can be "AC" or "DC" powered depending on the model.

White LEDs are the newest lighting device on the market today.

White LEDs do not produce "RF" to interfere with radio equipment.

White LEDs are a proven technology.

White LEDs last about 100, 000 hours of continuous use.

White LEDs radiate light at a 15 to 45 degree angle depending on the model.

White LEDs can be made completely waterproof for use in many marine applications.

White LEDs are polarity protected, so it is hard to make an installation mistake.