

# DEVELOPMENT OF LED CONE FOR ROAD USERS

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## ABSTRACT

**Abstract:** Traffic cones are device used to divert traffic temporarily. Normally, the cones are bright in colour such as red, yellow and orange to attract road user attention so that they will be more cautious. Nevertheless, the cones are deemed slightly ineffective due to two major reasons. Firstly, the colour does not effectively catch the road user's attention such that they are unaware of the cones' presence. The problem worsens during night time when vision is limited and causes the road user to accidentally hit the cones. During heavy rain, visibility is also poor such that similar incident might happen. Secondly, the cones may easily move from its original position due to strong wind and heavy rain. Further improvement needs to be done to enhance the functionality of the cones. The use of LED lights and the addition of rubberise base are possible enhancement to the cones. This study examines the effectiveness of LED lights and rubberise base in addressing the above problems. The modified cones (also known as Supermoon cones) with the LED lights and the rubberise base were tested at several sites. A survey was conducted to assess the effectiveness of the Supermoon cones. A total of 60 respondents gave the feedbacks. Results indicated that the cones are effective in attracting the road user's attention even at a very far distance. The cones are found to be stationary and not easily displaced from the original position.

### **Keywords:**

*Visibility traffic cone, LED Lights, rubberise base*

## 1. INTRODUCTION

Traffic cones are usually used during road work for the purpose of diverting the traffic flow or providing traffic caution or traffic prevention. At times, safety cones are placed around the work area to prevent public vehicles from entering the work area. These cones also act as road guides and markers. It will be arranged in accordance with the instructions set by the local authorities [1]. Among the numerous traffic signs, traffic cone is a very important mark used to guide cars where to go [2]

Traffic cones was invented by Charles D. Scanlon, an American citizen who first came up with ideas while working as a painter for the Street Painting Department of the City of Los Angeles. The cones was used at that time to indicate if a child is playing or if there is an object blocking the path [3].

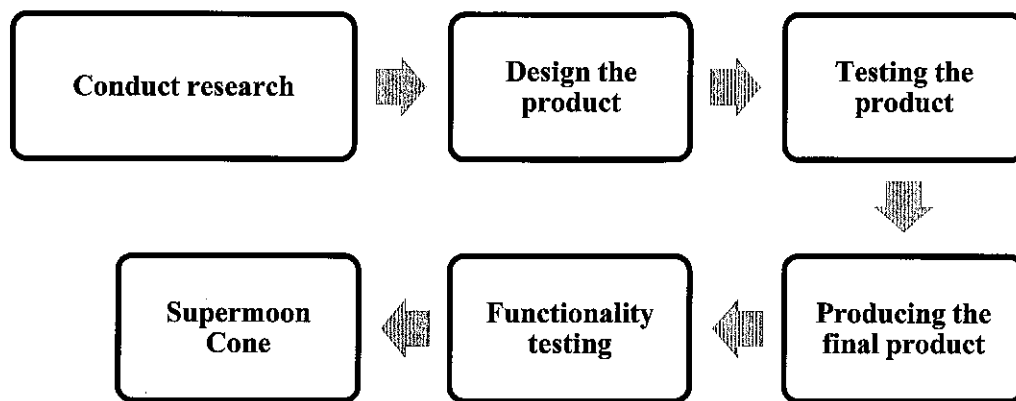
Traffic cones, also known as poles, road cones, safety cones, or construction cones, are of conical shape. They are usually placed on highways or pedestrian areas as markers to redirect road users to safer lanes during maintenance or road work in progress. The design of a road cones vehicle is targeted to be simple, efficient and reliable. It is able to be isolated quickly from the incident scenes to avoid harsh traffic jams, decrease traffic injuries, and it has played a key role that prevents the traffic situation from getting worse [6]. Some cones may be placed to warn of significant hazards, and others for non-hazardous purposes [7]

Traffic cones are also commonly used to separate or connect route during road construction or road accidents for the safety of road users. Traffic cones are designed to be highly visible and portable. Road users understand that safety cone is a warn of a hazard of some kind, which was to be avoided [8]. Cone sizes varies ranging from about 30 cm (11.8 in) to over 1 m (39.4 in). The cones are designed with several colours, such as orange, yellow, red and others. However, orange, yellow and red are the most commonly used colours due to their brightness and high visibility. Despite these bright colours, the cones fail to attract or catch the attention of road users, thus making them unaware of the cones' existence [8]. The situation worsen at night where the vision is limited such that the road users may accidentally hit the cones [9]. During windy heavy rain, traffic cones may easily move by the strong wind whilst the visibility is also poor due to the rain. Thus, the tendency of road users to accidentally hit the cones is high. Traffic signs recognition is a basic task for autonomous vehicle [10].

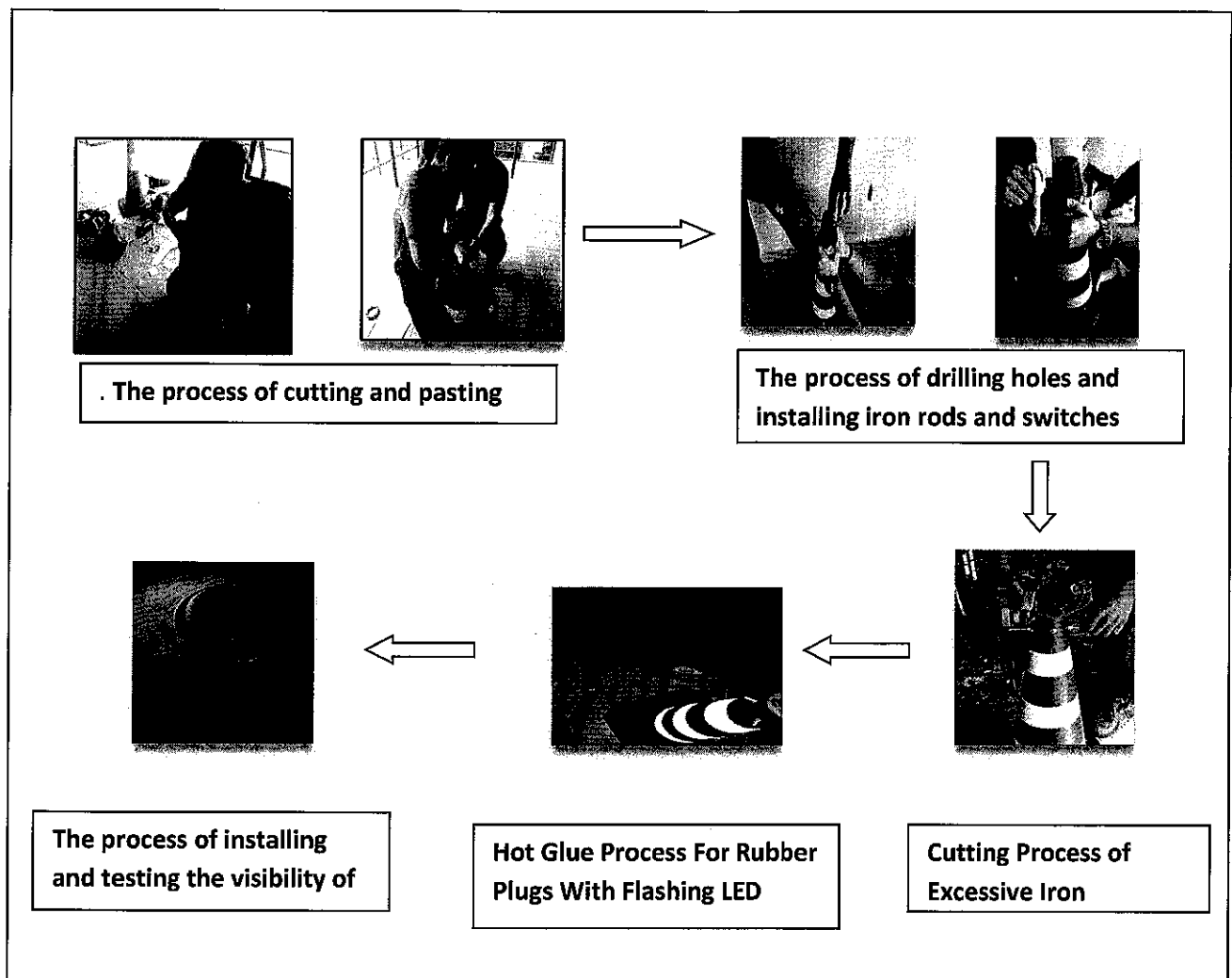
As mentioned earlier, the current cones has several weaknesses, i.e. (i) visibility impairment during night time and heavy rain, and (ii) the cone movement due to wind. Therefore the existing cones need to be improved to address the problems. Light-Emitting Diode (LED) was introduced to enhance the cone visibility during night time as well as during heavy rain. The LED attached to the cones (known as Supermoon cones) will lit to glow in the dark. In addition, the LED has a rubber mix that is waterproof and can be used during heavy rain. The LED cones will be arranged in the extended position by connecting all cones with the same wire. The cones were also added with rubberise base to prevent from slipping. It will be tested with conventional traffic cones in terms of visibility. From the results, it was found that LED lights can be used as a warning signal traffic control and can function to prevent accidents.

## 2. METHODOLOGY

In general, the methods used to complete the project are divided into several stages, starting from the design process of the Supermoon cones to testing of product usability. A survey was conducted to collect information on the functionality of the Supermoon Cones and normal cones.



**Fig. 1 :** Flowchart of producing the LED Cones



**Fig. 2 : Production process**

### **3. RESULTS AND DISCUSSIONS**

This chapter reports on the findings of the survey. The data analyzed in response to the survey were conducted to road users and construction workers. A total of 60 sets of questionnaires were distributed and answered by respondents. Respondents were expected to answer the questionnaires based on the Likert scale set in Table 1. The effectiveness of the cones were measured according to score set in Table 2. The data collected from the respondents will be quantitatively processed using Statistical Packages for The Social Science (SPSS) software. The results of the analysis performed on the questionnaire are presented in the form of bar graphs and tables.

**Table 1 : Minimum Score**

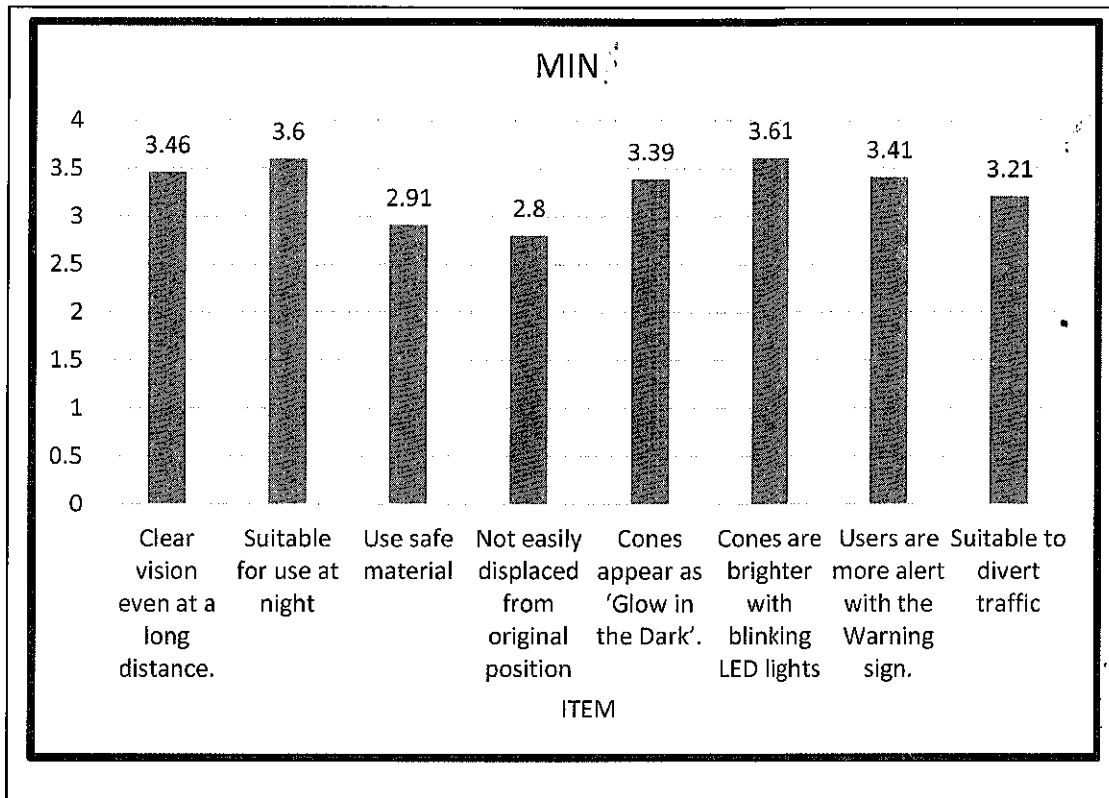
<b>Likert Scale</b>	<b>Category</b>
1	Strongly disagree
2	Disagree
3	Agree
4	Strongly agree

**Table 2 : LED Cone's effectiveness and safety**

<b>Minimum score range</b>	<b>Category</b>
3.00-4.00	High
1.50-2.99	Moderate
0.00-1.49	Low

### **Analysis of the Results**

The data from the questionnaires was analyzed based on two sections. Section A covers on the demographic of the respondents which consisted of sex, race, age and types of vehicle used. Section B focuses on the functionality of the cones addressing 8 items of the questionnaire, i.e. visibility distance, suitability for night use, safe material, not easily displaced from position, LED appearance as glowing in the dark, the products brightness when LED flashing, road user's alertness to the cones, and the appropriateness of the cones usage. Section B was analyzed based on the mean score ranging from low, medium and high rating.



**Bar Chart 1 : LED Cone Rating**

**Table 3 : Section B Minimum Score**

No	Item	Rating	Level
1	Clear vision even at a long distance.	3.46	High
2	Suitable for use at night.	3.60	High
3	Use safe material.	2.91	Moderate
4	Not easily displaced from original position.	2.80	Moderate
5	Cones appear as 'Glow in the Dark'.	3.39	High
6	Cones are brighter with blinking LED lights.	3.61	High
7	Users are more alert with the Warning sign.	3.41	High
8	Suitable to divert traffic	3.21	High
Average		3.30	High

Based on Bar Chart 1, the average overall mean score reached 3.30. The highest score started with item 6: brighter with blinking LED lights (3.61), followed by item 2: suitable for night use (3.60), then item 1: by clear vision at long distance (3.46), item 7: users are more alert (3.41), item 5: glow in the dark (3.39), item 8: suitable to divert traffic, item 3: use safe material (2.91), and lastly item 4: not easily displaced (2.80). Six of the items are having high scores (above 3.0) whilst the remaining items having moderate scores (1.50-2.99). The results indicated that all items in the questionnaire are above the mean score of 2.0, and thus meeting the two objectives.

#### **4. CONCLUSIONS**

In conclusion, the LED Cones (Supermoon Cones) can be considered as effective traffic cones capable of catching the road user's attention as well as not easily displaceable. The cones are suitable to divert traffic, made from safe material, can be seen at far distance, are brighter when blinking, users will be more alert, and function as glow in the dark, thus give many more benefits to road users.

#### **ACKNOWLEDGEMENT**

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