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LOG OF MEETING

DIRECTORATE FOR ENGINEERING SCIENCES

2004 FEB 19 A. 9:55

SUBJECT: Flexible Lighting

DATE OF MEETING: February 12, 2002

DATE OF LOG ENTRY: February 14, 2002

SOURCE OF LOG ENTRY: Arthur Lee, ESEE *AL*

LOCATION: CPSC, room 518

CPSC ATTENDEES: Arthur Lee, Richard Stern, and Geri Smith.

NON-CPSC ATTENDEES: Dr. Vasu Kulkarni, BP Chemicals and Larry Connell, BP Chemicals

SUMMARY OF MEETING: The meeting discussed issues with the proposed Flexible Lighting Standard UL2388. Dr. Kulkarni expressed concerns with the proposed standard UL 2388 as outlined in the letter sent to UL (see attachment). His main concerns were with the low temperature rating and age testing of flexible lights. He expressed concern that the plastic housing for the flexible lights should be rated at 105°C and have long-term aging testing for 7 days at 135°C.

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FEB 14 2002



To: Mr. Dave Belt and Ms. Dixie Stevens (UL - Research Triangle Park).
From: Dr. Vasu Kulkarni, BP Chemicals.
Date: 02/01/02

Subject: Comments on proposed first edition of UL2388 regulations – (Standards for Flexible (Rope Lights) Lighting Products) – October 2001 Draft.

Background: I believe the formulation and issuance of UL standards for the subject decorative products is very important for the safety of the products and users in our country.

I also believe that UL standards have a critical role to play in maintaining the high level of standards for products manufactured and/or imported into this country for use by its citizens. There are two parts to formulation of a good regulation; 1) the formulation and promulgation of regulations and tests based on good technical and scientific standards and 2) compliance (implementation, governance, monitoring) in manufacturing and use of the products defined and intended by the standards. These two parts together brings safety to the consumer. Ignoring or disconnecting the two aspects would lead to deterioration of otherwise well intended efforts of either one of the parts in singularity.

The proposed UL2388 standard is a new standard for new products and not intended for products covered under UL588, which implies that these products are not intended for temporary (<90 days) seasonal use. It is true that these products will be used repeatedly over longer period of time in residential and commercial environments.

The use of these products especially in public places, such as malls, shops, limes, bars, restaurants, exposes the user and the public (not by choice) much more than other decorative lights. The contact with various surfaces and environments is eminent. In home interiors it is used in cabinetry, windows, ceilings, bathrooms, stairwells, railings etc.

A small sample survey of the use of current products available in the market reveals the following observations and facts:

- 1) To the consumer, these (rope light) products are more expensive in the retail market compared to other string type decorative lights. The "non holiday" character of these products allows the products to be used for many occasions and for longer term (>90 days) in residential and commercial environments. In addition, the products will be stored in places such as attic, basements, commercial storage centers, etc. where temperature changes over long period of times is highly probable before the next use.
- 2) These decorative light products are used in exterior and interior environment similar to other products covered under UL588. In-deed many of these products are also used in direct contact with wood poles (wound around), metal poles and painted wires, wood panels, other plastics and painted surfaces. Exterior use involves products in direct contact with sun, rain, snow, sleet, etc.

- 3) Many consumers are not attentive to designations like "for interior use only".
- 4) The results from tests conducted in a laboratory environment according to UL designated test procedures intended for rope light products indicate that the products can get hot, with temperatures varying from 120F (~50C)(single strand) to >210F (~99C) (multiple strands).
- 5) The amount of gases evolved and the composition of the gases evolved reveals that there will be considerable loss of plasticizers during usage and storage resulting in deterioration of the quality and properties of the product over time.
- 6) Most of these products are not manufactured in the US or Canada where higher standards of expertise, formulation experience and manufacturing ethics are prevalent.

Since, these products are primarily manufactured where it is cost effective and imported for use in our country, it is important to provide clear regulations and directives that are unambiguous and easily complied with to maintain the safety and integrity of the products used in our country.

Past history of abuse of UL regulations by off shore manufacturers for decorative lighting products, incidences involving wrongful labeling and indictment of some culprits should provide a warning of potential abuses. Formulation of standards based on technical merits alone is appropriate when adherence to them is unquestionable. In this case it is necessary and important to consider additional margin of safety, especially when certain level of abuse is plausible.

I therefore believe that the proposed standards UL2388 as defined and issued on October 31, 2001 are not adequate.

The specific areas that need to be modified are listed below. There may be other areas in the standards that may have to be harmonized with the following suggestions.

Scope (1)

The scope should be clarified with distinctive differences of the lightening systems covered in UL588 vs. those covered in UL2388. The special distinction to be recognized is that these lights are not for just temporary use (<90 days); they could be used repeatedly over a longer period of time in residential and commercial environments. Therefore the standards required for these products need to be more stringent than current recommended as of October 31, 2001. Specifically, the temperature and flammability standards need to be enhanced to meet at a minimum UL588 i.e. 105C with long term heat aging and V0 ratings.

Temperature ratings (5.6) and oven conditioning tests (27.1 and 27.2)

I strongly disagree with lowering the temperature rating requirements for these products. The test results of the laboratory study and the user environment of semi permanent nature do not support the logic to de-rate the standards. The temperature and heat aging

tests for the products under UL2388 should be at a minimum rated similar to ones covered for other Christmas and decorative lighting products and I suggest almost as stringent as 105C rated wires with long term heat aging requirements.

My suggestions are to rate the wires at a minimum of 105C with requirements for long-term heat aging – 7 days at 135C. The reasons are the following:

- 1) The temperature of the material observed during these tests of commercial products varied from 120F (~50C) to >210F (~99C). Laboratory tests conducted with current products in the market place and likely formulation of products that will be used with the passage of proposed regulations indicate that there will be significant evolution and loss of plasticizer material leading to loss of essential properties such as elongation with a potential for breach of integrity due to embrittlement and development of cracks. These products are already widely popular and in the coming years will be even more popular with use and reuse on multiple occasions and over longer period of time.
- 2) The products are generally thicker in diameter compared to regular decorative wires. Therefore when wound during decoration or creation of sculptures it is more likely that stress shall develop during use resulting in cracks and embrittlement. Technically as the diameter of wire increases there is more stress on materials when subjected to bending, compared to thinner wires. This is due to the fact that the outer surface of the insulation has to negotiate a greater curvature while the inner surface is under higher compression in order to conform to shape in use.
- 3) It is also a likely fact that in future rope light products will have more lights per unit length, with brighter lights (potentially higher voltage) and longer lengths. This implies that the products are likely to attain higher temperature in use.

Therefore, I strongly recommend that UL committee reconsider the current proposed regulation and at a minimum modify to the following:

- 1) Higher rating of temperature than currently suggested, 10C higher than maximum measured temperature or more appropriately 105C.
- 2) Have longer (7 days @ 115 C) heat aging requirements with elongations after aging retained at a minimum of 75% of the original.

I agree with most other changes and have no strong objections.

In addition I believe that it is prudent to have a certain margin of safety especially with imported products where manufacturing quality and standards are lax and compliance is questionable. Starting with a stronger regulation with potential for relaxation in the future if necessary is a better strategy rather than trying to rectify to a stronger regulation in the future.

I also recommend that a field study be conducted by UL so as to modify the regulations in the future as warranted from the results of the field study.

I again believe, a good regulation is the one that is clear, easy to follow, connected to reality and needs little enforcement challenge. Promulgating standards disconnected to compliance issue will result in weaker standards.

If you would like to discuss these suggestions further please feel free to contact me at your convenience.

With Best Regards,

Vasu Kulkarni

January 17, 2002

Testing of Rope Lights

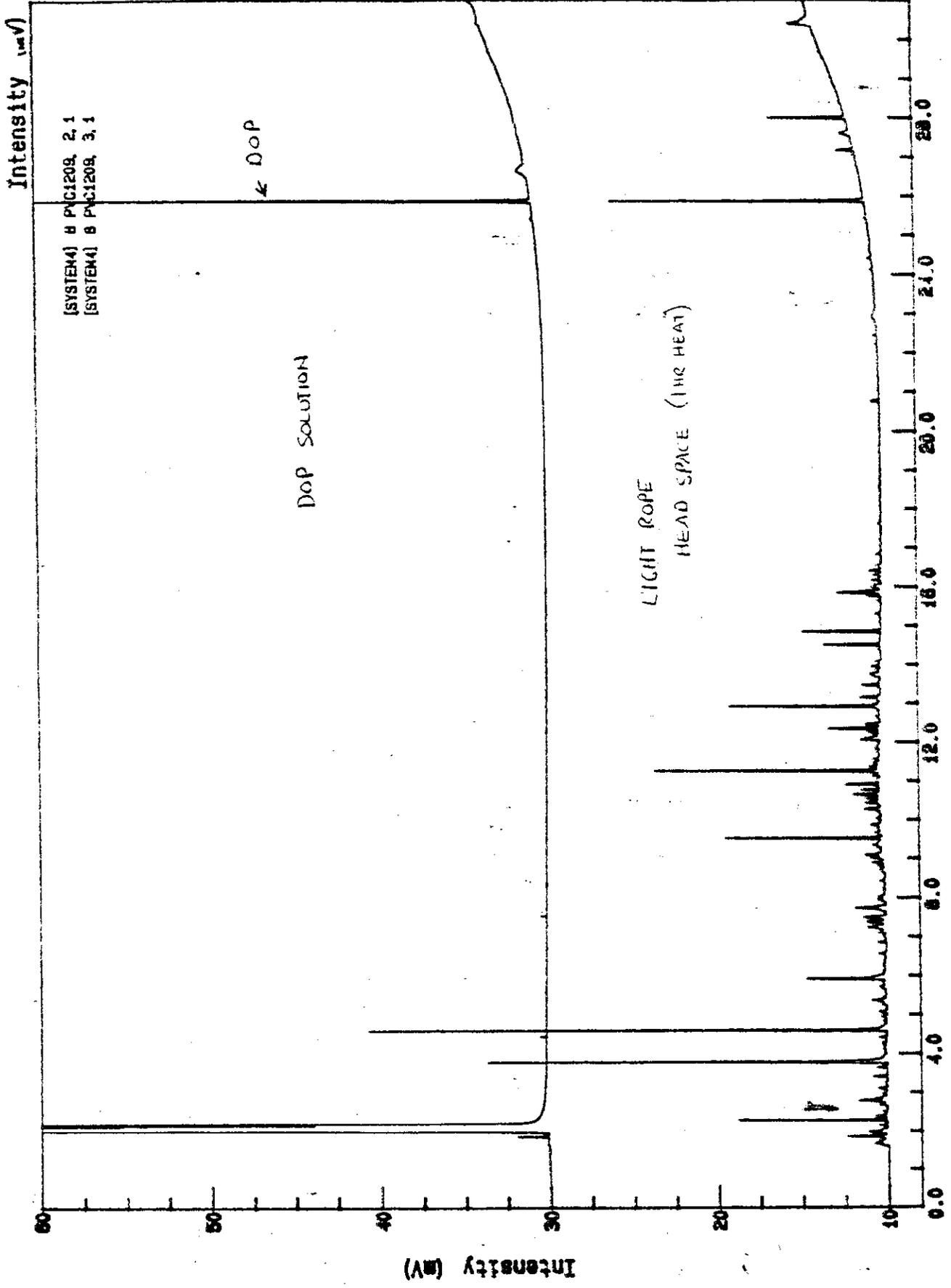
We evaluated the temperature of a set of rope lights. Six strings of lights were connected to get to the maximum length of 105 feet, suggested by the light manufacturer. This set of rope lights were then wrapped to 10 strands side by side over a sheet of plywood, 10 wide is max set by the light manufacturer and is also mentioned in UL 2388 as a testing arrangement.

When we began evaluating the temperature rise on the rope lighting we found that the temperatures were higher between the lights rather than on the lights so we always measured between the lights in the rope.

Time	Outside Strand	Middle Strand	Single strand
1 Hour	140°F	186°F	105°C
3 Hours	142°F	193°F	120°
5 Hours	141°F	192°F	118°F
7 Hours	150°F	198°F	117°F

We had seen up to 215°F during our different evaluations. The single strand was always the coolest.

Rich Adams



Time (minutes)
Reported on 11-DEC-2001 at 08:16

Acquired on 9-DEC-2001 at 11:55