



The minutes of the Division 4 meeting in San Diego, USA, on the 30th in June 2003, 8.15 - 9.45, and on the 2nd in July 2003, 13.00 - 16.55

13 NC's were represented: Finland, Netherlands, Hungary, Italy, France, Germany, Turkey, USA, Israel, Australia, Japan, Belgium and Slovenia; altogether over 60 persons attended the meetings (appendix 1).

Monday 30.6.2003

1. Opening of the meeting

Division director, Pentti Hautala, opened the Division meeting and welcomed everyone present. On behalf of the US National Committee of CIE Richard Stark welcomed all to the states. Division director also thanked our hosts and pointed out some housekeeping items.

2. Approval of Draft agenda

Draft agenda, which had been published in our web-pages and sent to some members earlier, was accepted as the agenda of the meeting. Some minor changes were made: Item 5 was divided in two parts and item 14 is to be discussed shortly on Monday, but final discussion is still on Wednesday. Also Division director told that Wout Van Bommel, the new president of CIE will give a presentation in the end of our meeting.

3. Apologies for the absence

Division secretary had received nine messages of the absence: Pieter Walraven, Duco Schreuder, Stuart Yerrell, Robbie Yates, Jaroslav Kotek, Dave Coatham, Elvo Calixto Burini(Junior), Arve Augdal and Sandor Almasi.

4. Approval of the executive summary of the minutes of the last division meeting in Turin

The last meeting was held on the 28th in September and 2nd in October 2002 in Turin, Italy. DD noticed that this summary has been published very soon after the meeting in the Division's web-pages. The summary was approved.

5. Announcements

a) Division Officers

Division director told that the BA has nominated him to continue second quadrennial as Division Director. He also suggested that Tapani Nurmi should continue as a secretary and Ad de Visser continue as an associate director. DD also told that Werner Riemenschneider has had healthy problems and he can not continue as associate director. DD will send a letter to Werner with thanks for the professional work he has contributed to DIV 4 and its TC:s. Finally DD suggested Patrick Baldrey should continue as the editor.

Division directors suggestions was approved by general consent.

b) General announcements

Division director told about other division directors:

DIV 1 has a new chairwoman, Sharon McFadden (CA)

DIV 2; Teresa Goodman (UK) continues as DD

DIV 3; Marc Fontoynt (F) continues as DD

DIV 5 has a new DD: Nigel Pollard(UK)

DIV 6 has also a new director: Ann Webb (UK)

DIV 8; Todd Newman(USA) continues as DD

6. Report by the Division director

Division director told the quadrennial report of DIV 4 activities has been sent to CB, it will also be published in our webpages (www.tut.fi/cie4). He mentioned that DIV 4 has published 5 reports and one standard and four meetings has been held. Div 4 has now 17 TC:s, but some of them are “sleeping”.

Division director made a short summary of items that has been discussed in board meeting:

- CIE has had for a long time “International Lighting Vocabulary” workgroup, but it has been inactive for some while. Now board meeting decided that the paper should be ready by 1.7.2004. Division editors are responsible for that work; they receive papers from CIECB and forward them to division members and to all TC chair, they send their remarks to editor.
- BA thinks more symposia should be held
- BA has discussed about the situation of inactive TC:s; those TC:s should be dissolved.

Division director told he has prepared a letter concerning future strategy to be sent after comments to all division members. He shortly presented the letter asking other suggestions or comments by the end of this year.

7. Secretary’s announcements

The division secretary had some announcements:

-He said he hopes all TC-chairs give the report of their TC meeting before leaving San Diego, so that the minutes can be published as soon as possible. He also said he is happy this hope was fulfilled in Turin. The division members agreed this policy by general consent. He also mentioned he wants a short report of the real situation of TC:s, not the complete minutes.

- DS told that the information about DIV 4 email-list (“email reflector”) which has been in use more than one year has apparently not gone to TC members. He asked TC chairs to tell about this list to their TC members. This list is open to all TC members and also other persons interested of the activities of DIV 4; they can join to the list and quit from the list by themselves. Precise instructions of the usage of the email list is in divisions web-pages.

-DS told he has received some questions about the update-rate of divisions webpages; he pointed out that TC-chairs should be more active to send information to be placed in the webpages.

- DS told he is going to send in August a letter to all TC-chair asking some statistical questions about every TC: List of official members, last meetings, etc. This information will be placed in (password protected) webpages and published as a part of annual report.

- DS also pointed out that the aim of TC:s is to make a report (or a standard) and only published reports are “cash” for CIE.

8 a Editors report

Patric Paldrey gave his report:

There have been no new publications, from Division 4, since our last meeting in Turin. Members may be interested to know that Division 5 have published CIE Publication No.150:2003 'Guide on the Limitation of the Effects of Obtrusive Light from Outdoor Lighting Installations' (TC 5.12 'Obtrusive Light').

14 a Planning future meetings

Mr Jose Louiz Pimenta gave a PowerPoint presentation about São Paulo, Brazil. He said it would be a perfect place for the next meeting of DIV 4&5. the powerpoint-presentation can be downloaded from DIV 4 webpages.

Message from the new CIE president

Wout Van Bommel, the new president of CIE gave a presentation concerning the situation of CIE. The whole presentation (as powerpointfile) can be downloaded from the CIE web-site. Here a short summary:

- CIE consists of 40 National Committees (country members), but many countries still missing
- 7 Technical Divisions; 135 Technical Committees; 120 Standards, Guides and Technical Reports (up to date)
- CIE has to think also about the “outside world”
- To increase the number of supportive members of CIE every DIV member should point out at least one company name (basic member:500Euro/y) and send it in the Central Bureau, so they can contact the company.
- Communication within TC's and Divisions is important
- Divisions and TC:s should be active; so we should dissolve inactive TC's and be critical in starting new TC's.
- Remember: It's an honour to work for CIE, so act like active member. The Board will do its utmost to get the result of the work of TC members, that is: their publication, more worldwide spread as is done today.

Wednesday 2.10.2002

DD Pentti Hautala reopened the meeting Wednesday 2.7.2003 at 13.10.

9. Progress Reports by TC-chairmen

The next TC:s had a meeting in San Diego, and the progress reports were presented:
TC 4-24, TC 4-26, TC 4-35, TC 4-36, TC 4-38, TC 4-40 and TC 4-41

All these reports are as appendices of these minutes.

TC 4-21 had its meeting after the division meeting, so it's chair Elizabeth Alvarez del Castillo made only a short presentation; the report is included in the appendices.

The rest of TC:s did not have meeting in San Diego but there was a discussion about the situation of these TC:s.:

TC 4-10: Ad de Visser told: There are still two documents “nearly ready for publication” since many years within TC 4-10 “Automobile lighting systems”. Dr. Karl Manz is reviewing these documents. Suggestion is to allow for one more year and then to cancel this activity. The meeting agreed this suggestion.

TC 4-15: The first part of this TC:s report has been published as CIE publication 140-2000, but task still remaining(the test data and measurements). In Turin the meeting decided to try to find a new chairman; no success yet. There was a discussion about the situation of this TC and it's possible new chairman. After discussion the meeting decided Sermin Onaygil to be the new chairperson of this TC. There was also discussion wether the task should be ISO/CIE standard.

TC 4-16: DD told he has also got the foreword, so DD is sending it to CB to start voting.

TC 4-19: DS told he has got an email; Michele Colomb has sent the final version of the report of TC 4-19 to all TC-members in order to get their opinion.

TC 4-27: DS read the email he has received from Pieter Walraven in June: "No progress has been made during the last 4 years. After consulting Kai Sorensen, Vice-chairman of the TC, we concluded it is still worthwhile to pursue the matter, because the material is available, it is a matter of writing. The handicap was the lack of time. My proposal is to try for one other year. If no progress is made then, the work of the TC should be finished." The meeting decided to give one more year to this TC to finish it's work. Otherwise the TC will be dissolved or changed to be a reportership. DD will contact also Kai Sörensens.

TC 4-32: DS read the email he has received from Pieter Walraven in June: "Dear colleagues, Since our non-official meeting in Maastricht no progress has been made in the preparation of our report. This is due to inactivity on my side. This inactivity is due to a number of facts, but the latter are irrelevant as far as the progress of the TC is concerned. I did not prepare a meeting in San Diego. I unfortunately do not have the resources for such a trip. I am therefore considering resigning from the chair of TC 4-32. I would appreciate any comments on this consideration, and would appreciate receiving suggestions on how to improve the situation, because I think it is worthwhile to finish the work of TC 4-32." Also an email from Denniz Cousin was read, his opinion was that Pieter should continue as chair. It was pointed out that only three meetings are needed. After discussion the meeting decided Pieter should continue as chair and members of this TC decided that all of the rest meetings can be in Netherlands, Ton van den Brink promised to contact Pieter asking if this arrangement is ok.

TC 4-33: Prof. Schmidt-Clausen told about the situation of this TC: There has been a meeting for some time ago, but the problem is there is there is not too many people in this TC and there are also problems to receive response from national committees. Prof. Schmidt-Clausen also told he needs help with this TC. After his question Stark, Gillet, Narisada, Andersen, Voelker, Gibbons, Rossi and some others volunteered to help.

TC 4-37: DS read the email he got from Stuart Yerrell:"I do not intend to hold a meeting of TC 4-37 in San Diego. Unfortunately there has not been sufficient progress on our report to justify a meeting at this stage. I regret that I shall not be attending the event. I would be grateful if you could present my apologies to the relevant meeting(s) of the Division." DD contacts Stuart Yerrel asking about the real situation of this TC.

TC 4-42: Prof. Schmidt-Clausen told that they have collected a lot of data in this TC. He also told the report will be ready in the springtime next year.

11. Progress Reports by Reporters

R 4-14 Road Lighting and Accidents (Carl K. Andersen)

Carl told he has not so much to report, but he promised that for next years meeting he will prepare a report.

R 4-21 300 mm Traffic Lights (Carl K. Andersen)

Carl gave a short PowerPoint-presentation and promised to make a formal proposal for the next meeting.

R 4-22 Use of LEDs in Visual Signalling (Steve Jenkins)

Steve had made a detailed report which can be found in the appendices of these minutes. As his recommendation he said:

The development of LEDs has provided a wealth of opportunities for their use as an advantageous replacement of incandescent lamps. Their development as a useful and practical source has been remarkable over the last decade and the development shows no sign of abating.

There are many issues to be resolved concerning their use and characterization both as individual LEDs, as arrays of LEDs and as the light source for finished products of signal, signs and illumination systems.

At this stage, the recommendation is that no Technical Committee be formed for the reasons:

There has been little work carried out that directly impinges on the known shortcomings of using LEDs in various roles that come under the scope of Division 4.

The development of LEDs is rapid and continuing, whatever report a TC would write over the next four years would likely be overtaken by technological developments.

The recommendation is also that a Reporter be maintained in this area as a TC Report will be necessary in the foreseeable future.

The meeting decided to keep the reportership; no TC at this meeting.

R 4-23 Management and Maintenance of Road Lighting Eirik Bjelland gave presentation: Intelligent Road Lighting – “Light – on the road”

Viken Nett, who is owned by Hafslund ASA, is Norway’s largest distribution company with 575 000 customers. Viken, together with the daughter company Østnett, are in addition responsible for the running and maintenance of 250 000 street lighting points in the greater Oslo area

The recent years Viken has been involved in the development of new concepts especially adapted to a deregulated electricity market, involving running, control and administration of street lighting. Viken has initiated several studies both on the concept and more on the organisation of the street lighting activities in general.

The whole report can be downloaded from divisions webpages.

R 4-24 Definition of an Eye Sensitivity Function in the Mesopic Region to be Used for the Calculation of Road Lighting Levels

Pieter Walraven had sent email:

On the issue of reportership Mesopic vision.

After looking into the problem of defining a mesopic sensitivity curve for defining the quality of several light sources for public lighting, it soon became clear that the problem is a complicated one. All over the world there apparently grew interest in the problem. In Europe a Consortium was established (chairperson Liisa Halonen) to study the problem. At Rensselaer Institute a group, chaired by Mark Rae, looked also at the problem. At the recent Veszprem-meeting of the Divisions 1 and 2 papers were given on the issue. CIE established a TC on this topic. At the meeting of the Divisions I recommended that a contact should be established with Division 4. I do not know whether this happened. If not I would recommend to Division 4 to establish such a contact. Now so much work is going on, I think a reporter on this issue in Division 4 is of Not much use. I therefore recommend finishing my reportership.

János Schanda had answered to this email saying: “I would be willing to take care of the mentined liaison.”

Axel Stockmar suggested Stefan Voelker (Germany) to be new liaison. After short discussion the meeting decided Stefan to be the new liaison.

R 4-25 Automotive lighting (Ad de Visser)

Associate Director gave his yearly report: "Automotive and Standards":

Automotive

- Reports to GTB

Regular reports to GTB regarding CIE activities were given.

- TC4-10

There are still two documents "nearly ready for publication" since many years within TC 4-10 "Automobile lighting systems". Dr. Karl Manz is reviewing these documents. Suggestion is to allow for one more year and then to cancel this activity.

- GTB / CIE Agreement / CIE TC's on particular automotive lighting issues

GTB adopted new terms of reference and is now an independent and international committee for the preparation of regulations for automotive lighting, in liaison with CIE, IEC and ISO. Whether the agreement between GTB and CIE has now automatically been terminated, or that it should be reviewed is a pending issue. Basically, there seems not to be a change in the type of work being done by both organisations. It also depends on whether CIE feels the need to install a TC on research in the field of automotive lighting as a successor of TC4.10, but then on specific issues. Anyhow, approval from CIE Division 4 and Board are necessary when changing the agreement.

- PAL symposium

Next PAL symposium (Progress in Automobile Lighting) will be on 23,24 September 2003. In case of registration before 1 September, a discount of 100 Euro is given. Information can be found on www.pal-symposium.de; registration may also be done by registration@pal-symposium.de.

- New developments (update with reference to the 2002 report, only):

- Mandatory use of Daytime Running Lights (DRL) is under discussion of the EU. However, governments seem to have deviating opinions. The EU Commission has given an assignment to a research consortium (project leader TNO) to clarify the backgrounds of these deviating opinions and a proposal on how to proceed.

- Boundaries of signal colours for automotive lighting are nearly all harmonised between USA and ECE. But the use of it for some lamps is now a discussion that might take many years. This does concern the rear direction or turn indicator (amber and/or red), the steady burning front turn indicator or front position lamp (white and/or amber) and the colour of the DRL lamp (white and/or amber and may be selective yellow or something in between).

- The introduction of mercury free gas discharge light sources in the Regulations is in its voting procedures.

- Car industry is introducing other types of power supplies than only 12 V DC. That has an impact on light sources that are directly operated by the power supply. This is being investigated.

- Red coloured filament lamps were introduced to allow the car stylists more design freedom and to compete LED's. However, these light sources were not allowed for stop lamps as governments fear for colour wash out by direct sunlight. A kind of "phantom light and colour wash out test" is under study.

- LED headlamps are being developed, in particular front fog, DRL and low beam headlamp. A particular task force is preparing the amendments of the regulations. LED manufacturers are heavily involved in (and even chair) the Task Force LED Forward Lighting.

- Websites
 - ECE Regulations: <http://www.unece.org/trans/main/wp29/wp29regs.html>
 - US FMVSS: <http://www.access.gpo.gov/>
 - SAE standards (costs charged): <http://www.sae.org/servlets/index>

Standards

- Draft standard TC4-16 “File format for electronic transfer of luminaire data” has passed the editor.

12. New R&D reports

There was no new R&D reports.

13. Discussion of the new items

a) Division director suggested a new TC: Emergency lighting in tunnels:

Recent experiences showed that emergency lighting is among the top priorities for the authorities who have the responsibility of supervision and operation of tunnels. Each country is developing its own solutions which leads to quite a confusion.

This new TC (TC 4-43) will cover the following items:

- Escape route lighting of carriage-ways and footways in case of fire taking into account aspects from ventilation.
- Stand-by lighting in case of power supply interruption.
- Lighting of emergency exits.
- Lighting of lay-byes

The main aim is not only to recommend the appropriate lighting levels but also to give general guidelines for design and installations.

Axel Stockmar suggested stand-by lighting should be removed from the terms of reference.

There was a short discussion pointing out that this TC should work with cooperation to Division 5. After the discussion the majority of people was in favor of this TC.

The meeting decided Marc Gillet to be the chairman of this new TC. Marc asked volunteers to his TC; Peter Blaser, Giuseppe Rossi, Richard Stark, Sermin Onaygil, Marko Bizak, Pentti Hautala and some others volunteered.

b) A letter from Georogee Birnbaum

DD told he has got a letter from Georogee Birnbaum (Israel) suggesting a new TC: “The legibility distance of signs for countries where the signs are in two/three languages”. The meeting had a discussion on this item and decided to set up a new reportership for one year. The reporter should also think about the chairperson, members and terms of reference of this possible new TC. In next meeting, after this report, decisions about new TC can be made.

c) Control of tunnelling lighting

Peter Blaser suggested a new reportership on: “Control of tunnelling lighting”. The meeting decided to set up a new reportership for one year. Peter should give a report in next DIV 4 meeting.

d) Misaiming of headlights

Justin Rennilson suggested a new reportership on : “Misaiming of headlights”. He also suggested Joe Lones (USA) to be that reporter. There was a discussion and after that voting: 9 in favor, none against. So the meeting decided to set up a new reportership.

14. Liaison matters

The next liaison matters were discussed:

CEN/TC 226: Road Equipment Pentti Hautala

Pentti told that there has been one meeting, but no items related to roadlighting.

GTB Ad de Visser gave his report earlier.

Internat. Astronom. Union Elizabeth M. Alvarez del Castillo presented Hogo Schwarz (Chile) who gave a PowerPoint presentation about EDI (Environmental Damage Index). This PP-presentation will be added to divisions webpages.

ST-1 / C1 Surface Characteristics (Prof. Schmith-Clausen)

Professor Schmith-Clausen said that he is a member in German group, he will give his report later (to be added to webpages).

ST-3 / C5 Road Tunnel Operations (Marc Gillet)

Marc told he has got no contacts to PIARC, even after trying to have contacts to them. DD said this contact to PIARC should be better in future.

J. Lecoq promised to contact Corinne Brusque to solve the problem.

14. Planning the future meetings

2004 meeting:

On our Monday meeting Mr Jose Louiz Pimenta gave a PowerPoint presentation about São Paulo, Brazil. No other invitations. The meeting voted about the invitation; 11 countries in favor, none against. So the invitation was accepted. DD said that by the end of August the Brazilian NC should send more precise information to division officers.

2005 meeting:

DD pointed out that CIE midterm meeting is in Leon, Spain, Lux Europa is 19.9.-21.9.2005 in Berlin. After a short discussion the meeting decided to wait one year before making decisions about meeting place 2005.

15. Other business

Professor Schmith-Clausen informed that PAL-conference is in English.

Ad de Visser suggested that an Excel-sheet containing the information about the situation of TC:s should be added to divisions webpages. There was a discussion about the CIE policy to publish information about TC-work. Wout van Bommel said he thinks it is a good thing to give information about the situation of TC:s. The meeting decided to publish Excel-sheet where is the situation of every TC; last meetings; current number of draft etc., but decided also that "draft-reports" should not be published to people outside TC and DIV 4 members.

At the end division secretary had a short PowerPoint presentation with pictures about his visit to San Diego.

18. Closure

DD closed the meeting (16.55), thanking The US National Committee of CIE and other our hosts about the conference, meeting facilities and pleasant atmosphere of our meeting.



Tapani Nurmi
Secretary, CIE DIV 4



Meeting 30th June- 2nd July 2003 in San Diego, USA

Attendees:

| | | | |
|-----------------------|-------------|----------------------|----------------|
| Tapani Nurmi | Finland | James A. Havard | USA |
| Pentti Hautala | Finland | Richard E. Stark | USA |
| Ad de Visser | Netherlands | Jon M. Hart | USA |
| Peter Blaser | Switzerland | Nolie Agellon | Canada |
| Jose Luiz Pimenta | Brazil | David Burns | USA |
| Ton van den Brink | Netherlands | Ken Uding | USA |
| Kohei Narisada | Japan | Georgee Birnbaum | Israel |
| Peter Schwarcz | Hungary | Chris Monrad | USA |
| Paolo Soardo | Italy | Larry Monrad | USA |
| Giuseppe Rossi | Italy | H.J. Schmidt-Clausen | D |
| Tom Schnell | USA | Steve Jenkins | Australia |
| Norbert Johnson | USA | Tetsuji Takeuchi | Japan |
| Eirik M. Bjelland | Norway | Takashi Saito | Japan |
| Tor Mjoes | Norway | Hayato Ito | Japan |
| Alain Floris | France | Joe Lones | USA |
| Jacques Lecocq | France | David Crawford | USA |
| Bernard Duval | France | Rados Topalova | Canada |
| Ronald Gibbons | USA | Marc Gillet | Belgium |
| Liisa Halonen | Finland | Nigel Pollard | UK |
| Axel Stockmar | Germany | Patrick B. Tshawe | South Africa |
| Sermin Onaygil | Turkey | Marko Bizjak | Slovenia |
| Carl K. Andersen | USA | Frank Yates | USA |
| F. Javier Diaz Castro | Spain | J. Rennilson | USA |
| Paul Carlson | USA | Stephan Voelker | Germany |
| Mark Kleinschmit | USA | Karel Sokansky | Czech Republic |
| C. Cameron Miller | USA | Hans Allan Löfberg | Sweden |
| Chris Gaudette | USA | Dennis Couzin | USA |
| Hans J. Jacobsen | Denmark | Ron Laub | USA |
| Patrick Baldrey | UK | Hugo E. Schwarz | Chile |
| Wout van Bommel | NL | Terry McGowan | USA |
| Elizabeth Alvarez | USA | Larry Leetzow | USA |
| Christine Hermann | CIECB | | |



Reports from TC:s which have a meeting in San Diego

TC 4-21 Interference by Light of Astronomical Observations

The TC met on 3 July, 2003 with 8 members, 4 advisors, and 3 guests in attendance. The TC made significant progress on their draft document, "Guidelines for Reducing Sky Glow", but identifies a need to meet more than once a year to improve progress. Draft 6 will be distributed to the full TC after the meeting, for comments by 1 September, 2003. The more significant edits in Draft 6 include the acceptance of additions and deletions (to sections 1-8, not sections 9 & 10) proposed in Draft 5 (which was available to TC members since the Torino 2002 meeting). Draft 6 shows the new additions and deletions proposed by TC members since Draft 5, including (but not limited to)

- o Updates, based on definitions and practices of professional astronomy, to sections 3 (terminology), 6 (sky glow formula), and 7 (measurement of sky glow)
- o Section 5 (sources of sky glow) - augmented list of items and activities that contribute to sky glow

As a result of these discussions, further edits are expected in numerous sections. By the end of 2003, we hope our Div. 4 Editor will review our draft for formatting and grammatical compliance with CIE guidelines.

Attendees began discussing Section 9 (recommendations for sky glow limits) and plan to continue with a videoconference discussion in mid-November or early December 2003. Further interim meetings may be planned.

A workshop on Sky glow was held in San Diego on 30/6/03.

Thanks to Division 5 for hosting the workshop and Nigel Pollard for chairing it! Invited guests represented professional observatories of the Canary Islands, the northern part of Chile, Hawaii, and the southwest USA (top-priority areas for site protection, as designated by the IAU Commission 50 working group on light pollution).

The workshop was in 2 parts. Part 1 included invited overviews by Hugo Schwarz, Don Davis, and Paolo Soardo; part 2 by Marc Gillet, Jacques LeCocq, and Paolo Soardo. We expect to include the presentations in the CIE Quadrennium Session's CD or proceedings. Discussion was very helpful and the speakers received very positive feedback. Thanks to our speakers and attendees for their excellent contributions!

News Notes:

- The International Astronomical Union Commission 50 Working Group on LP meets (in conjunction with lighting engineers) in Sydney on 22/08/03.
- A book on light pollution by Schreuder and Narisada can be ordered now.
- Kluwer has just published the proceedings of the Feb. 2002 international conference on light pollution which was held in La Serena, Chile. "Light Pollution: A Global View"
- International Dark-Sky Association meeting in Tucson, AZ 10-13/03/04
- European Symposium on light pollution in Stuttgart in 12-13/09/03

The TC will meet again in conjunction with the Division 4 meeting in Sao Paulo, Brazil in September 2004.

Elizabeth Alvarez, Chair



TC 4-24 Calculation and Measurement of Tunnel Lighting Quality Criteria

Progress Report 2002 / 2003 (Meeting Torino - Meeting San Diego)

After Torino meeting 9th draft was prepared including decisions and comments from the Torino meeting. Draft was sent in November for comments to the committee members with deadline for comments on 1th. March 2003. From the comments it was seen that some important matters would have to be discussed and decided at the San Diego meeting:

- Choice of the coordinate system
- Definition and calculation of uniformities in the transition zone
- Calculation of threshold increment
- Recommended calculation fields

At the San Diego meeting, for all the above points was decided to use the definition which were most close to the ones in CIE-140 for road lighting. The results of San Diego meeting will be included in 10th Draft planned to sent to committee members end of August 2003 for comments to produce after the final draft. Committee voting for the final draft is planned about March 2004.

P. Blaser

TC 4-26 Systems for measurement of photometric quantities of road lighting installations

The TC met in San Diego on Monday 30th 2003.

A new part of the guide concerning the evaluation of uncertainty in road luminance measurements was considered.

The suggested approach divides the uncertainty components into three groups:

1. The components correlated to the instrument characteristics and data acquisition and analysis methods

They are fully specified and examples of experimental set-up for their evaluations are given too.

2. The components correlated with the measurement geometry

They are described in detail and some example of their influence will be given using a simulated plant.

3. The components correlated with the plant actual working conditions

Generally they are not known or their evaluation could be impossible or too expensive or, according to the measurement aim, not necessary, therefore the actual plant conditions shall be described as well as one can in the test report, but the guide suggests to overlook their influence in the overall uncertainty.

A table for the evaluation of the uncertainty budget following the ISO guide with all the parameters described before was discussed and approved.

The illuminance part of the guide was also improved with a detailed analysis of some problems typical of the split cell method of measurement.

The incomplete parts of the guide will be prepared in the next months considering the results of work of TC4-24 and TC4-35.

To improve the collaboration between members and speed up the finishing of the guide an Internet site has been organized.



It is divided into two parts, one to highlight the aim of the TC and the other, with a password for the members, with the last guide draft and member comments.

The TC members' ballot is expected in next spring.

TCC Giuseppe Rossi

TC 4-35 Tunnel Lighting

“Guide for the lighting of road tunnels and underpasses”

Since the Torino meeting we had one “3-days” meeting to complete the document. This meeting took place in London in November 2002. The draft 8 has been amended and circulated at the end of this winter for vote.

The result of the vote is:

- 14 Yes (6 with editorial comments)
- 7 No
- 6 Did not vote

- > 27 people consulted of the voters
- > 2/3 exactly of the voters are in favor of this document

Therefore, I decided, in agreement with our division director, to go ahead and submit our document to division vote after a closing meeting that took place here in San Diego. This meeting discussed the acceptance of not of these last editorial comments.

Also, after this job being completed a new working item shall be proposed which is “Emergency lighting in tunnels”.

Marc Gillet, Chair

TC 4-36 Visibility Design for Roadway Lighting

The TC met on July 1, 2003 in San Diego.

14 members, 24 guests = 38 present

Purpose of the meeting was to review the (2nd Draft) document on Visibility after having a committee vote. Six members voted yes to publish the document and four members vote to not publish.

The most common comment of negative voters was to organize the material in a more interrelated manner. Wout van Bommel suggested reducing his portion to visibility research history. Other sections can be condensed as well.

Mr. Rossi stated that further research on measuring devices would be available after 1st of November 2003.

Carl Andersson of the USA Federal Highway Administration reported on lighting research for the older driver. The conclusion is that headlights must be used in visibility research since they change target visibility.

Sermin Onaygil will provide the research update, past present and future for chapter five.

A new document should be ready for vote before the next Division 4 meeting.

Richard E. Stark, chairperson



TC 4-38 Daytime visibility requirements for roadway signs

TC4-38 met at 3:30pm on June 30, 2003 in the Esquire room. The meeting opened with an announcement of the agenda and introductions of all those present. The committee membership then reviewed the minutes from the meeting in Torino. In Torino, the committee decided to reorganize Draft 3 into a new report structure that better meshes with the the report of TC4-40. During the meeting, the committee proceeded to finalize the outline of Draft 4 which we intend to assemble by November of 2003 and finalize during 2004. The majority of the writing assignments for the remaining work have been made and the chair will remind each person who took on a writing assignment of the exact topic and deadline. We will meet again at the Annual meeting of the TRB in Washington, DC, date TBD.

Tom Schnell

TC 4-40 Requirements for Retroreflective Traffic Signs

Draft 5, June 2003 had been sent out prior to the meeting.

The minutes of the Pennsylvania meeting have been approved by the committee.

Three meetings of TC 4-40 were scheduled for the 25th Session of the CIE. An average of 10 members of the committee were present at these meetings. The Secretary, Gernot Sauter distributed the 5th Draft of the report to all members. Significant changes to the previous drafts included a new portion to chapter 5 on headlights written by Kai Sørensen which included new measurements of dirty headlights. Prior to the meeting, Kai sent an updated report that has not been included in draft 5, but discussed at the meeting. Most of the figures presented by Prof. Schmidt-Clausen were included with expanded figure captions and descriptions of how the data was obtained. These were moved into the different chapters by the secretary and were included in draft 5 which was distributed. The chairman used the headlight distribution of UMTRI 50% and ECE 50% over the range of -6 to +6 degrees horizontal and 0 to 6 degrees vertical to make an abridged matrix which would fit on one page of the report. That matrix was graphed and contoured into 250 cd intervals and color coded along with the matrix. One overlay of the figure from Schmidt-Clausen of the mean positions of traffic signs above the horizontal with the graph of the headlight matrix illustrated the amount of light available for the three cases of signs (left, right and overhead) at intervals of 50 meters from 50 to 250 meters was included in the draft sent to the committee. At present this was done only for the US headlight.

Chapter 5 Headlights

At the first meeting Kai Sørensen presented his portion of the revised chapter 5. Discussion then centered around the degree of dirt accumulation on the headlights which he measured. This was compared with a figure on dirt effects given in chapter 5 by S-C. Conclusion was reached that we have not enough data to confirm the effects of dirt accumulation on the headlights with respect to the amount of luminous intensity especially with regard to overhead signs. At the first meeting one guest, Joe Lonas talked briefly about the aim or misaim of headlights. Many of the headlight distribution were made on headlamps that were removed from the vehicle or were never installed. The measurements made on headlights that were not removed were often done without the motor running and thus at different voltages than the standard calls for. Temperature effects the aiming and thus the aiming errors, along with the voltage and dirt accumulation must be addressed in the headlight chapter. Consensus was obtained that we



should generate one distribution as a mean and then give a window of acceptable high and low values. This could then be used for luminance calculations.

It has been decided that Paul and Kai will work together on chapter 5 to bring the various inputs together and make it consistent.

Steve Jenkins input

Steve Jenkins explained some of his work relevant to TC 4-40. His model includes luminance requirements for legibility (based on legibility index studies) as well as for conspicuity. For conspicuity two models are presented: 1) visual scanning in simple nighttime driving environment, visual acquisition will take place close to the legibility distance. 2) Attention conspicuity, when the driving task is more complex, sign message acquisition at 70% of the legibility distance. It was said that both models will not always be distinct, but overlap, or will be driver dependant in similar road environments.

S-C offered extensive eye-tracking data that will be ready for publication after spring 2004.

Karl and Norb will use relevant input to write chapter 4 (driving task and seeing signs).

In the following studies of sign luminance versus legibility have been discussed. The mathematical model after averaging the various studies is not correct because it neglects the 'roll-over' of the curve at high luminance levels, when the sign is glaring and legibility index reduced. The input will go in chapter 3 and will support the existing input with Forbes legibility curves written by Kai. More extensive explanation about the various studies is needed in respect of the subjects age, visual capability, sign colour and contrast as well as the model used to derive to the result (average, 85%tile...). Paolo offered to share experiment results of comparing sign legibility and distance in respect of Halogen or HID lamp.

The chapter on 'required action distance' has been discussed. What is missing is information about the sign size and speed, which will be very relevant when calculating action distances.

General

In order to make further progress, small groups will be editing sections of the document and present to the whole committee for comments and discussion.

Jay Rennilson resigned from his chairmanship. Paul Carlson will take over as chairman of TC 4-40.

We thank Jay Rennilson for his excellent and extensive work over many years. It has been his personal energy and effort that was driving the committee work and enabled us to make such progress.

Next Meeting

The next meeting will be held in conjunction with the PAL meeting in Darmstadt (sept 25, 2003) and with TRB in the 3rd week of january 2004 in Washington.

Gernot Sauter



TC 4-41 Crime and Road Lighting

Kate Painter presented her “Toolkit” entitled “How to Evaluate the Impact of Street Lighting on Crime and Fear of Crime”

Several proposals were made for additions to the “Toolkit”, particularly relating to quality criteria for “improved” street lighting.

Changes will be made to the “Toolkit” and the result will be e-mailed to every member of TC 4-41 and on request, any CIE member. The “Toolkit” will be entered on the Division 4 web site. It was suggested that funding be sought for an international programme of lighting and crime research using the "Toolkit" as a base. Kate Painter suggested using the “International Victimization and Crime Survey” to near we crime across countries.

Patrick Baldrey, Secretaryr

Written reports from reporters

R 4-22 The use of LEDs in road transport (Steve Jenkins)

1. Introduction

There has been a burgeoning use of LEDs in a wide range of signaling devices for transport including road traffic signals, rear-turn combination signals in vehicles, variable message signs, railway signals, flashing beacons etc. They are also beginning to be used as illumination sources for some types of road lighting and there is potential for them to be used as the light source for vehicle headlights.

The great advantages of using LEDs are their long lifetime, their robustness and their luminous efficacy (lm/watt) compared with incandescent sources. LEDs also have some disadvantages. Many of these disadvantages are concerned with their measurement both for individual LEDs, for individual clusters and for final product signals and luminaires. Some of the problems include:

- The dependence of intensity on temperature.
- At what LED current should the measurements be carried out, DC or pulsed?
- Intensity distribution can only be measured when temperature/intensity of the LED array is stable, under what conditions should the intensity be corrected back to an earlier time?
- Test distance specifications will depend on the mix of beam angles in the array.
- How to measure and specify veiling reflection, sun-phantom.
- How to measure luminance uniformity?
- How to measure colour uniformity?

This Report will not address these measurement issues as these come within the purview of Division 2 and there are several committees dealing with different aspects of these measurement problems. Instead it will look at the application of LEDs to transport lighting and signaling in as far as they affect the user of the transport system.

2. Signals for Transport Systems

The use of LEDs in signals for transport systems has been mainly in such areas as traffic lights, railway signals, railway level crossing warning lights and traffic hazard warning lights as delineation devices for roadworks.

In a laboratory experiment, Bullough, Boyce, Bierman, Conway, Huang, O'Rourke, Hunter and Nakata (1999), which simulated daytime viewing and used subjects in the age range 25-35 years old, found no difference in mean reaction time, mean number of



missed signals, percent correct colour identification and rated brightness and conspicuity between a simulated incandescent signal and a LED signal.

Lewin, Corbin and Janoff (1997) carried out comparative tests between LED and incandescent traffic and pedestrian signals on their visibility and conspicuity, and on the effect they had on behaviour in the field. At that time only a green LED signal with a peak wavelength of 560nm was available and the yellow LED signal had only half the intensity required by the Standard. The photometric performance of the green and yellow LED signals nowadays are far better than they were then and so if we focus on the results for the red signal only, they found that the red roundel and red arrow performed as well as the incandescent signals both during the day and night.

There have been studies on the visual performance of rail level crossing warning lamps. Pezoldt, Koppa, Bowen and Mathur (1997) reviewed the literature and carried some limited empirical observations using only a few subjects. They concluded that colour normal drivers would have no difficulty in recognizing the LED signals as red (the three types of signal had dominant wavelengths of 655nm, 635nm and 628nm) and would not be able to say whether the signal they were looking at was any different from the normal incandescent signal. They suggested that the on-axis intensity for railway level crossing warning signals be 860cd which is considerably lower than the intensity of 1600cd specified in the AAR Signal Manual.

Green and Milanovic (2001) carried out a review of the literature that was relevant to proposing a Standard for Canada for LED signals at road/rail level crossings. They suggested an on-axis maintained intensity of 600cd. They saw that the broad beam pattern provided by LED signals and the elimination of the need for precise focusing and alignment (as required for incandescent level crossing signals) would lead to improvements in driver safety.

These studies show that there is no inherent difference in the visual performance of LED signals that have the same intensity or luminance as incandescent signals. The differences between the two technologies that have not yet attracted very much study are:

- Effects of veiling glare from the sun
- Effects of sun-phantom
- Effects of the rapid rise-time of LEDs
- Effects of coloured media interposed between the LEDs and the viewer
- Colour of yellow LEDs

The great majority of LEDs used in signaling devices are enclosed in clear material and so the colour they exhibit when activated is not apparent when they are inactive. When they are placed in a signal there is then no apparent need to place a coloured cover of lens over the LED array. This has the consequence that when the sun shines directly on them, they will reflect as a white signal. No study could be found that determined the maximum intensity that a white reflecting signal could be before it created confusion for the driver. This is a different situation to sun-phantom where the reflected signal is the same colour as the active signal and the presence of the sun-phantom, if bright enough, can cause confusion to the driver as it would compete for the signal that is active. The presence of veiling glare will also desaturate the colours of the signals when they are activated. The question of the maximum intensity limit to be placed on the veiling glare reflection was sidestepped by the Australian Standard on Traffic Signals by specifying that the colour of the signal must remain within the required colour boundaries even when tested with veiling glare present. This, so far, has had the result that no LED traffic signal has complied with the Standard with a clear cover. Some signals have complied by incorporating coloured covers or lenses and then having to meet the



sun-phantom requirements.

In two studies which addressed a similar issue in vehicle rear signaling, Sivak, Flannagan, Kojima and Traube (1998) and Sullivan and Flannagan (2001) looked at the visibility of turn signals with clear covers under bright, sunny conditions. In the 1998 study they found that the luminance contrast between the on and the off states was smaller in signals with clear covers than in signals with amber covers although the colour contrast between the on and off states was greater for the turn signals with clear covers. The second study compared the reaction time of drivers to the same two conditions, they found that the luminance contrast was the main characteristic that determined driver performance and that there was no compensatory advantage to be gained from the colour contrast. This would suggest that the use of clear covers should be treated with caution.

The effects of sun-phantom on LED signals with coloured covers or lenses is visually much the same as for incandescent signals. Any differences might be due to the different geometries or sun angle and viewing angle that the LED signals may be susceptible to. No study was found that looked at the sun-phantom intensity as a function of sun angle and viewing angle. This question would be more appropriate for Division 2.

LEDs signals of any sort (transport or vehicle) will have a much faster rise-time than their equivalent incandescent signals. How beneficial this might be has not been studied extensively. Research at UMTRI has demonstrated that fast rise-time signals do lead to faster reaction times than do slower rise-time signals. The practical benefit of this in the road situation has not been studied. Sivak, Schoettle and Flannagan (2001) found that the faster rise-time signals did not help in the detection threshold or the rated conspicuity when the signal was being masked by an adjacent headlamp. Faster rise-times would allow more flexibility in flashing devices such as railway level crossings, emergency beacons, traffic hazard warning lamps. In a review of the literature, Wigan and Jenkins (1982) demonstrated that there could be a conspicuity enhancement of signals that flashed in the frequency range 3-8Hz. At these higher than usual frequencies, the availability of fast rise-time sources is advantageous. There is very little literature on the effects of flash frequency and duty cycle on the visibility of signals in peripheral vision and their usefulness in the road system.

The spectral power distribution (SPD) of LEDs is very different to incandescent lamps being quasi-monochromatic and so may be more susceptible to the affects of sunglasses, tinted windows, colour defective drivers, ageing drivers and weather conditions. A study by Sullivan and Flannagan (2000) concluded that most of the effects of the quasi-monochromaticity of the LEDs can be expected to be minor. The usually tight constraints on the allowed chromaticity regions for signal colours ensure that any effects will be predictable.

The range of chromaticities for yellow LEDs overlaps with and lies outside the allowable chromaticity region specified in many Standards and Regulations. This then requires tight quality control by signal manufacturers. It may also be the case that the chromaticity of a yellow LED signal complies with the relevant specifications soon after activation but drifts outside the allowable chromaticity region as the signal warms up. The benefits of using yellow LED signals have yet to weighed against the disadvantage of their chromaticity lying just outside an allowable chromaticity region.

3. Signals for Vehicles

The unanswered questions that are extant for transport signals are also relevant to vehicular signals. The additional benefits of using LED signals on vehicles is that they pose no difficulty in being part of the proposed 42v electrical system in the vehicles of



the future, they are extremely robust which is a significant advantage in their use as side-markers for trucks, their ability to operate over a large voltage range makes them the preferred source for the rear combination signals for trucks with multiple trailers (where the voltage drop between each trailer may result in a very low intensity from an incandescent signal).

4. Changeable Message Signs

Changeable message signs are increasingly being used in road environments because of their ability to provide drivers with real-time information. LEDs are used in the great majority of these types of signs, both for LED-only pixels and hybrid pixels where the pixel is a combination of LED and reflective pixel. To date most CMS have been single colour pixels but there are some examples now appearing of multi-coloured pixels where messages and graphics can be displayed in a wide gamut of colours.

Some of the issues that are currently being addressed are:

- The legality and adoption of the signs into relevant MUTCDs
- Use of abbreviations
- Amount of information displayed
- Reading time
- Restrictions on dynamic displays
- The question of a display when no traffic information is needed.

Much of the work on some of these issues has been carried out in the USA by Dudek and will contribute to a new chapter in the USA MUTCD. It is considered here that only the issues of reading time and the amount of information displayed come within the scope of Division 4.

Issues which have received scant attention are:

- The interaction between the cone of vision of the pixels and the application on the road
- The legend contrast in adverse environmental conditions (sun position)
- Confusion from veiling glare

CMS with LED-only pixels generally have a small cone of vision (about 15°) which works well with fixed overhead signs and straight sections of road. However, when portable, trailer-mounted CMS are used, the narrow angle necessitates careful aiming otherwise there will be a loss of contrast at inappropriate distances from the sign. Also the narrow angle may reduce the length of road over which the sign is legible if the road is curved. Hybrid signs will have a much wider cone of vision and so be much less susceptible to these concerns.

The use of a protective cover over the face of the CMS will cause annoying and sometimes debilitating reflections from the sun and sky. There have been very few studies that have looked at the legibility of CMS in the field and measured their luminance contrast. One such study was Garvey and Mace (1996). They looked at four types of CMS, Fibre optic pixels, LED-only pixels, hybrid pixels and reflective pixels. They found that the legibility distance of those they examined in the field all met the required legibility distance. The luminance contrasts of the signs were then measured under low, medium and high levels of vertical illuminance on the sign face. The daytime contrasts for the LED-only CMSs fell within the range 2 to 3, for the hybrids between 1 and 2, and for the reflective pixel CMSs between 1 and 3 and one reached a contrast of 5.



Generally, the recommendations for minimum contrast are 5 to 7, this is substantially above that found in the field for CMS that were judged to be adequately legible. It would seem that more work is needed to determine the visual and photometric performance of CMS in the field.

Some CMS have a restricted number of fixed legends. One obvious example is a speed restriction sign where the pixels are not in an array but are positioned so as to form a '50', '60' and '80'. These pixel positions all overlap each other and share the same "0". The difficulty comes when the sun shines directly on the sign face. This will tend to light up the inactive pixels and will cause confusion to the driver. This is not strictly a reduction in contrast of the active number, but a confusion between the overlapping of numbers that may be comparable in brightness. No studies could be found that would suggest a limit to the luminance of the inactive pixels when directly illuminated by the sun to avoid this confusion.

5. Illumination Systems

LEDs are now being considered as illumination systems although these are very early days. There have been some examples in Australia of street lighting using LED luminaires for pedestrian areas. These have been instituted on a trial basis and have not yet been evaluated.

The use of white LEDs in vehicle headlights is under development. The promise is a very flexible beam pattern by reducing or increasing the intensity of different LEDs in the headlight array. No evaluation of these headlights has been found.

The use of LEDs as illumination system for the interior of vehicles appears promising. However, there are issues of colour rendition that have yet to be resolved.

6. Recommendations

The development of LEDs has provided a wealth of opportunities for their use as an advantageous replacement of incandescent lamps. Their development as a useful and practical source has been remarkable over the last decade and the development shows no sign of abating.

There are many issues to be resolved concerning their use and characterization both as individual LEDs, as arrays of LEDs and as the light source for finished products of signal, signs and illumination systems.

At this stage, the recommendation is that no Technical Committee be formed for the reasons:

There has been little work carried out that directly impinges on the known shortcomings of using LEDs in various roles that come under the scope of Division 4.

The development of LEDs is rapid and continuing, whatever report a TC would write over the next four years would likely be overtaken by technological developments.

The recommendation is also that a Reporter be maintained in this area as a TC Report will be necessary in the foreseeable future.