EEP18 Input paper

Agenda item 11.1

Task Number 2

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Results of Surface Colour Measurements and Suggested Amendments to IALA E-108

# Summary

At EEP17 the author was given actions (99,100 &101) to coordinate the measurements of RAL samples cards, analyse the results and present at EEP18 with a view to add a section to IALA E-108 on Surface Colours on measurement devices and procedures. Results from participating countries were received and are presented in this paper with conclusions and recommendations.

## Action arising from the input of the document

The information given in this input paper contributes to activity 3.4.7

## Related documents

IALA E-108 on Surface Colours

# Background

IALA E-108 recommends the colour boundaries for surface colours for the safe recognition of visual signals. It recommends colour collections that can be used and it also specifies the illuminant, the geometry and the observer for making measurements of surface colours.

It does not recommend measurement devices or give measurement procedures.

At EEP17 German Waterways provided members with RAL colour collection sample swatches. Members were asked to measure the samples and submit the results to the author for analysis. Eight countries agreed to participate. However two countries submitted results that did not meet the recommended measurement geometry and are not included in the results.

# results & Discussion

Figure 1 shows the results of the ordinary colours of the RAL samples. It can be seen that the Spectrophotometers agree to <1.5% for x,y coordinates and <4% for luminance (except for black). The colorimeters agreed in most instances, although there are some large differences in some results.

The small differences in the spectrophotometer results can be attributed to the differences in the sample swatches. Further investigation is required as to the differences in the colorimeters readings. However, it is understood that one member used their colorimeter as a colorimeter i.e. comparing the colour sample against a calibrated white tile. And the other member using their colorimeter as a colour difference meter, where reference standards of a colour are compared to the sample colour and the difference is reported along with the result.







Figure 1 Results for Ordinary Colours

The results of the measured fluorescent colour are shown in Figure 2. There is a large variety of results that cannot be attributed to the differences in the samples alone.

Fluorescence is the process by which electromagnetic radiation of one wavelength is absorbed and re-radiated at another wavelength. Sometimes a fluorescent material will absorb non-visible light and emit it as visible. Fluorescence and ordinary reflectance of radiation take place simultaneously and at the same wavelengths. When the colour of a fluorescent sample is measured, the fluoresced light is added to the reflected light at those wavelengths. Therefore, reflectance can exceed the 100% that is normally possible. This makes obtaining instrumental values that correlate well with visual observations tricky. However, one can filter out the fluorescence using an UV filter. Instrument 3 in Figure 2 is the only device with a UV filter fitted.



Figure 2 Results for Fluorescent Colours



Figure 3 Results for Fluorescent Colours with Instrument 3 removed

# conclusions

* Spectrophotometers are more accurate than colorimeters due to the grating technique, rather than filtering.
* The measurement of fluorescent colours requires more investigation.

# recommendations

It is recommended that the following text by added to IALA E-108.

2.5 Measurement Devices

There are two methods of measuring surface colours.

2.5.1 Spectrophotometry

A spectrophotometer measures spectral data - the amount of light energy reflected from an object at several intervals along the visible spectrum. The spectral data is shown as a spectral reflectance curve and can be weighted with a standard illuminant and standard observer. Procedure – (Insert words here)

2.5.2  Colorimetry

Colorimeters are tristimulus (three-filtered) devices that make use of red, green, and blue filters to emulate the response of the human eye to light and colour. Due to filter imperfections and not recording the spectral reflectance of the sample, tristimulus colorimeters are not suitable for assessing the IALA’s surface colour requirements.

However, CCD array colorimeters used as colour difference meters provide reasonable results (More text to be inserted here)

Procedure – (Insert words here)

# References

# Action requested of the Committee

The Committee is requested to:

1. Comment on the results of the trial;
2. Agree on the proposed approach to amending IALA E-108; and
3. Provide input on measurement procedures.