Instructions for participants in the 2017 AERC inter-laboratory comparison for measurements of optical properties of shading materials

Introduction

Laboratories that submit data to the Complex Glazing Database (CGDB) have to participate in an inter-laboratory comparison (ILC). This a procedure that allow both contributors and database maintainers to confirm that the measurement capabilities of the laboratories are of high quality.

This is the first time the procedures in AERC 1.1 is used in an ILC, so the result is expected to be used as a measure of the accuracy of the methods of AERC 1.1.

The box

Each box is labeled on the outside with its number, e.g. Box 14. All reports will use this number as identifier rather than the name of the individual laboratories.

The 2017 shading material ILC consists of 5 samples that are chosen to cover a large range of properties and measurement procedure:

1. Enviroscreen 898, dark shade, metallized front side, small openness/inhomogeneity
2. Sunbrella Black/White, 2 distinct colors to average, same front and back
3. SunTex 80 Brown, large openness, single sided
4. Ensemble of 18 Mermet fabrics for sample variability test AERC 1.1 Appendix B
5. Generic White/Aluminum blind slat

Each sample have a sticker stapled to it defining front side and up side of the sample. The staple was used to secure the label during handling, feel free to remove the staple if it makes sample mounting easier in your instrument, just remember to mark front/up in some other way in case the sticker falls off. The sticker also has a number on it showing which sample it is, prefixed by the box number (e.g. 14-2 is sample 2 in box 14).

Handling and Storage recommendation

Try to not touch the samples in the area where the properties are measured. Saving the samples allow for you to remeasure them in the future if you get a new instrument or move your instrument and are worried about the alignment.

General measurement instructions

Specific instructions for measurement and reporting for each sample is given in the next section, here we cover basic directions that hold true for all samples.

UV/Vis/NIR

The UV/Vis/NIR range is defined as 300-2500 nm. The data interval must be equal to, or lower than, 5 nm.

The sample dictates which values should be measured.

The samples have labels stuck on the side that is defined as front, while also marking the up orientation. ~~back, if the label for some reason has come off the back can is the side without film or coating.~~

Emittance and TIR

AERC 1.1 appendix E describes the use of an emissometer to get a single integrated value for thermal IR emissivity and transmittance (TIR) and integrated values can be reported. If an FTIR with integrating sphere is used, the IR range is defined as 5-25 µm with a data interval of smaller than or equal to 1 µm steps.

Reporting

Use the Excel workbook and fill out the data in the different tabs. Each tab has the properties required for measurement. Note that the tabs have space for IR measurements which will not be used if you are using an emissometer, instead report those values in the tab labelled *Integrated emissivity results*.

Specific measurement instructions

Here are the details for each sample where the relevant parts of AERC 1.1 are referenced. Note that if these instructions contradict AERC 1.1, these instructions are wrong.

Sample 1

This sample represents a case of double-sided fabric where the inhomogeneity is much smaller than the illuminated area (AERC 1.1 appendix C section 4.2.1). To minimize the effect of the inhomogeneity you are to try to create as much mismatch between the hole pattern and your

beam as possible. The most common case is to rotate a rectangular pattern 45 degrees with respect to a rectangular light beam. Orientation could matter even if the beam of your instrument is circular, as any polarizing effects of the weave could amplified by the polarization of the grating monochromator. N.B. this is not the angle of incidence.

This sample has to be measure on both the front and the back.

Sample 2

This sample represents the case where the inhomogeneity is much larger than the light beam described in AERC1.1 appendix C section 4.2.2. Each area, black and white, are to be measured separately. The spreadsheet has prefilled equations to calculate the average.

The front and back of this material is considered identical for this exercise so you only have to measure one side.

Sample 3

This sample represents the case of intermediate inhomogeneity described in AERC1.1 appendix C section 4.2.3. You have to measure the product in at least three positions. Calculate standard deviation after three measurements and unless it is below a 0.02 you have to perform more measurements and recalculate the standard deviation after each additional measurement until your average has high enough confidence. The workbook does not contain any tools for calculating solar properties or standard deviation. If you need to add more measurements, just keep adding sets of 4 columns in the worksheet.

The front and back of this material is considered identical for this exercise so you only have to measure one side.

Sample 4

You have been provided with 18 pieces of this fabric. Each piece is marked box-4-sample#. The exercise is to perform the material tolerance testing described in AERC 1.1 section 5.1.1.2-4 (see also example in AERC 1.1 appendix B). This exercise expects use of a multi-channel instrument that reports integrated visible values. It is possible to qualify for full measurements even if you do not participate in this part.

Sample 5

Curved sample might cause issues, try your best to flatten the sample. The properties should be measured for the flat material. Note that the back has brush strokes that might generate a diffracted reflection. It might be helpful to set the instrument to a visible wavelength (or white) and see how the material reflects the light to the sphere wall, ideally you want to avoid the direct reflection to fall on ports or detectors.

Reporting instructions

Submission summary

Your submission consist of the Excel workbook named Workbook_AERCILC2017_boxNN.xls, where you replace NN with your box number. If you want to measure the samples in your box with multiple spectrophotometers, please add 100 to each additional workbook. E.g. Box nr 4 would submit workbooks _box4.xls, box104.xls, box204.xls etc.

This file should be emailed to jcjonsson@lbl.gov. Please pay attention to the naming of the file as it greatly helps the automated processing of the data.

Data format

Please enter measured reflectance and transmittance in values between 0 and 1 rather than %.

Instrument information

The first tab in the workbook contains information about your instrument, please fill that out with your information to the best of your capabilities.

Goal

The goal of the ILC is to make sure the submitting laboratories populate the CGDB with accurate data as well as learn about the accuracy of the methods written in AERC 1.1. In past ILCs, LBNL has been working with outliers trying to make sure they measure accurately and that is still our mission.

Questions

There is a balance writing this kind of instruction set, too short and it is not useful, too long and veterans ignore the instructions. I erred on the side of too short with the understanding that you will contact me for clarification. Being able to share information on our web site I believe this system is reasonable.

For any questions please contact jcjonsson@lbl.gov or igdb@lbl.gov.

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