



Meeting Notes

TDD Task Group

Monday, September 19, 2011

2:00 p.m. – 3:00 p.m. ET

Chair: *Dave De Block, ODL inc.*

1. Call to Order

- a. Participants: Dave DeBlock, Charlie Curcija, Howdy Goudy, Neall Digert, Robert Hall, Roger LeBrun, Steve Urick, Scott Hanlon (NFRC Staff), Gilbert Riopel, Jeff Brain, Mudit Saxena, Greg Vincent (by Audio, only)

2. Appointed Recording Secretary (Neall Digert, Solatube International, Inc.)

3. Meeting Agenda reviewed and approved.

4. Presentation and Review of TDD VT Testing and Draft Summary Report by LBNL

- a. Draft report, titled “Visible Transmittance Test Procedures for Tubular Daylighting Devices,” distributed to TG Members via e-mail by C. Curcija on 9-19-11.
- b. Charlie summarized the testing Methodology
 - i. Changing Sky Conditions required frequent realignment of test apparatus.
 - ii. Rather than using IRT, Charlie explored doing Exterior Reference Test.
 - iii. 2-meter dia. integrating sphere limits the size (diameter) of product that can be tested.
- c. Product Test Conditions
 - i. 5 Tubular Daylighting Device specimens tested (one reference tube and four industry products specimens).
 - ii. Currently, the test process reports results with respect to a “relative” solar position geometry relative to tested TDD aperture orientation.
 1. Two Degrees of Solar Position Freedom are supported (LBNL will insert a sketch that illustrates the SALT and Solar Azimuth angle determination):
 - a. Solar Altitude Angle: The vertical angle between the “horizontal” plane relative to the tube-opening and the Sun’s position. Tests performed for “relative Solar Altitude Angles of 20, 30, 40, 50, 60, 70, 80, and 90 degrees.
 - b. Solar Azimuth Angle: The horizontal angle between centerline axis of the “horizontal” plane relative to the tube opening and the solar position, with 180 degrees representing a due-south solar position. Test SALT data sweeps performed for relative Solar Azimuths of 180, 210, and 240 degrees.
 - iii. Daylight Resource measured using two photometric Sensors (one shaded, and one un-shaded).



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- iv. Two referencing/measurement techniques used to determine and report VT values.
 - 1. Internal Referencing Technique (IRT), which was used for previous specimen testing.
 - 2. External Referencing Technique (ERT), which improves testing efficiency by using an external sensor as the reference point.
- v. Sphere Response Factor (SRF) is determined using “open port” measurements of interior sphere sensor response and the external sensor reading.
- d. Test Results
 - i. Test specimen data sets for four internal/external reference techniques and data sweep methodologies are reported for TG review and consideration.
 - 1. IRT
 - 2. ERT – Reference measurements taken at the Start and Stop of each data sweep test series.
 - 3. Fixed Sweep methodology uses an External Reference with the resource sensor looking outward towards the sun.
 - a. Ratio of Outward looking sensor and Inward Looking Sensor seeing the brightness of the Integrating Sphere’s Surface
 - b. Outward looking sensor reading multiplied by the aperture area used to determine the available lumen resource.
 - c. Using one average value as reference for a specific product specimen’s tested SALT sweep angles for a given Azimuth Angle.
 - 4. Varying Sweep
 - a. Uses a variable reference point that changes with each sweep data point.
 - b. Need to perform one sweep with an open aperture, and then repeat the sweep with the specimen in place.
 - c. Perform one reference measurement, and then do the series of five tubes, all occurring within a 30-minute time period.
 - d. Further research relative to sensor placement and use of shielded vs. unshielded sensors would be beneficial to determine best solution for determining reference readings.
 - e. Per Charlie, using the fixed sweep reference conditions (especially taken at lower SALT angles) provides a better and more consistent range of VT ratings.
 - f. Test Apparatus allows any test conditions to be achieved at any time of the day, but variable factors associated with Air Mass and Ground Reflectance will be more significant as testing times increasingly vary from Solar Noon. Suggestion: Measure higher Solar Altitudes at times closer to Solar Noon, while lower SALT angles could be done closer to mid-morning/afternoon. In all conditions, the tube would be “looking” mostly up to the sky.
 - ii. Specimen Charts represent Fixed Sweep reference conditions.



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- iii. 240 Degree Data is not in the current report, but will be added once additional data processing is completed by LBNL.
- iv. Angle Sweeps are automated and can be achieved quickly (3/6/9/21 angles)
 - 1. Sphere's Altitude Tilt employs a gear reduction that allows the 90-degree data sweep to occur in less than one minute and data would be collected in both the downward and upward sweeps, providing two sweeps of data for each azimuth-specific specimen test. LBNL was able to perform the five sample tests for a single Azimuth angle in under 30-minutes.
 - 2. Tests performed when the Sky Ratio was less than or equal to 0.3 to ensure that clear sky conditions were represented. Sky ratio reading was only valid at the 90-degree SALT data point of each data sweep, and was therefore assumed to be representative for the specific test specimen's data-sweep test.
 - 3. Surrounding site conditions played a bigger role in low-angle apparatus testing
- v. Charlie welcomes input from the TG relative to additional information required in the report, changes to how data is reported, or data points that should be retested.
- vi. Appendix Review
 - 1. Tube E may be the reference tube. Howdy to confirm...
 - 2. With 210 Azimuth, there is less variance between Fixed Sweep and Variable Sweep transmittance curves.

5. No New Business

6. Next Steps

- a. Hold TG conference call to discuss member thoughts on report and request for modifications/clarifications. Conference call tentatively scheduled for Tuesday, October 4, 1:00-2:00p.m. ET.
- b. Prepare summary of report changes/clarifications to be submitted to C. Curcija for consideration.

7. Adjourn – 3:15 p.m. ET