DESIGNLIGHTS CONSORTIUM®

Testing Guidance:
Unique Product Categories

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Overview

- **DLC guidance for product families that include**
  - Multiple CCTs
  - Multiple voltages

- **Testing guidance for**
  - 8-ft linear ambient luminaires
  - Vertical and horizontal refrigerated case luminaires
  - Multiple-lamp kits

- **Lumen maintenance evaluation**
  - TMP location in LM-80 vs. ISTMT
  - Completing the TM-21 Calculator

DLC Guidance

- **Product families with multiple CCTs**
  - Understand which CCT is the worst in terms of performance (lumen output, efficacy, thermal condition, etc.) for your product before conducting testing
  - If the middle CCT is worst, be sure to provide color data on the lowest and highest CCT

- **Product families with different voltage ranges**
  - Understand which input voltage results in the lowest lumen output and efficacy
  - Understand which input voltage results in the worst Power Factor and Total Harmonic Distortion

8-ft Linear Ambient Luminaires

- If the 8-ft product is submitted as part of a family application and does not perform worse for any LM-79 metrics, then LM-79(s) of the 8-ft product are not required. We may require ISTMT for the 8-ft product if the board configuration results in a hotter thermal environment.

- If the 8-ft product is submitted as a single application, all the necessary test reports are still required, but distribution data can be shared from a shorter version of the product if the optic is the same.

Refrigerated Case Luminaires

- Listed on the QPL by unit with unit-level performance data for light output characteristics
- The DLC understands that most refrigerated case lighting products are sold as a system with multiple units attached to a power supply
- Individual units connected alone on the same power supply used in the system do not perform the same as they would when the total system is connected to the power supply because of efficiency variance based on the load on the power supply

Refrigerated Case Luminaires

- **To obtain unit-level photometric data that is accurate for an individual unit when installed in the system, the DLC would like testing conducted as follows:**
  - Each individual unit should be tested using the goniophotometer method according to LM-79 for light output and light distribution (zonal lumen density) data
  - The worst-case system configuration should be tested for the other necessary metrics: efficacy, color, etc.
    - The worst-case system will be the variation in your product line that would result in the lowest efficacy that you would sell as a new system commercially.
    - This is typically at the worst (smallest) loading conditions for a given power supply.

Refrigerated Case Luminaires

- **The DLC will evaluate the individual unit efficacy as if it is equal to the system efficacy when the unit is installed in that system**
  - DLC will still identify unit-level data in the worst case scenario of a refrigerator case lighting system to evaluate against the unit-specific performance specifications

- **The DLC understands that manufacturers often use various power supplies or combinations of power supplies to achieve the appropriate loading conditions**
  - A unique application and set of test data must be provided for each driver or driver combination
  - The refrigerated case luminaires must be sold with a specific driver

Multiple Lamp Kits

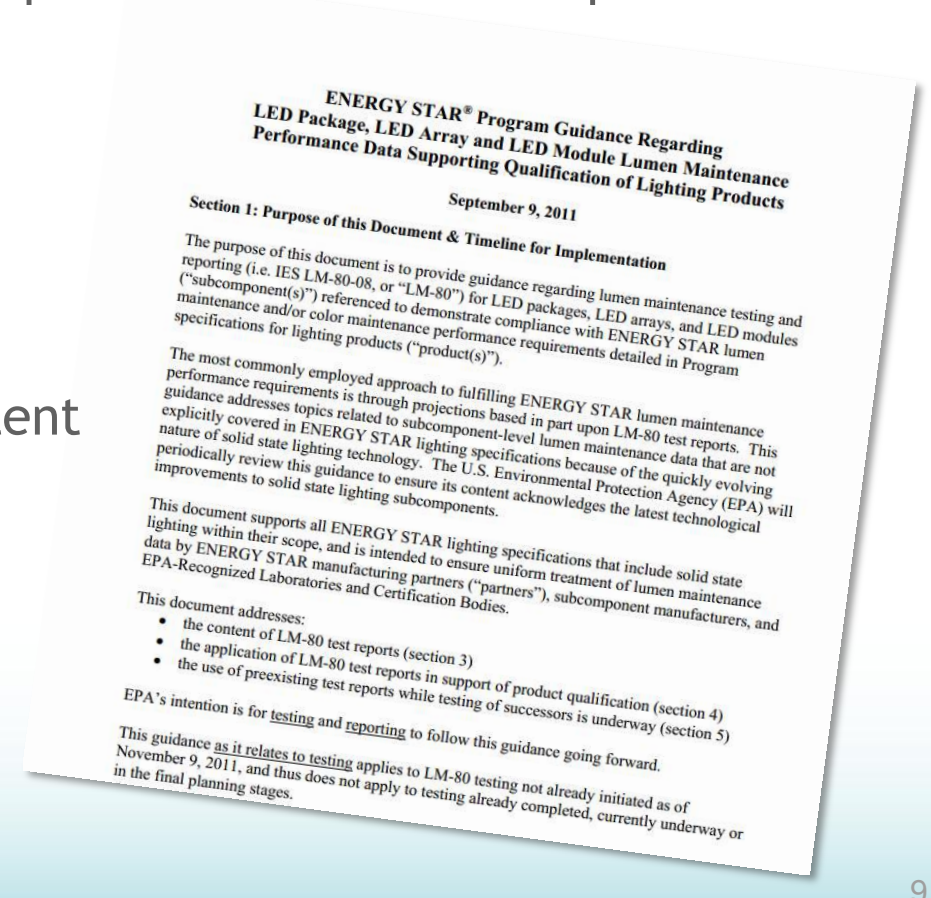
- **Multiple Lamp kits with pins**
  - Two-foot three lamp kit or four-foot two lamp kit
    - Test the whole kit, divide the total lumen output and wattage by the number of lamps to get the bare lamp test data (lumen output, efficacy, electrical)
    - Install the kit in a pre-approved reference troffer to get the system test data (lumen output, efficacy, distribution, In-SITU Temperature)
  - Multiple lamp kits other than two-foot three lamp or four-foot two lamp configurations are not currently eligible
- **Multiple Lamp kits without pins**
  - Test the kit in a pre-approved reference troffer

ISTMT

- **Consistent reporting (*required)**
  - Full/complete model number *
  - Reference housing models *
  - Driver model numbers (If provided)
- **Be able to justify the hottest LED is measured**
  - Reviewers will request justification
  - If you don't know which is the hottest, measure multiple LEDs
  - Additional images of which LED is selected within the luminaire are helpful
- **TMP location verification**
  - Please ensure images are clear
    - If image(s) are resized for the test report, please send original(s) as separate attachment
  - Providing multiple images of the TMP is helpful

TMP Location

- **The DLC follows ENERGY STAR Program Guidance for the TMP location**
  - Manufacturer-designated LED temperature measurement point found within the LM-80
  - The purpose of the ISTMT is to relate the LM-80 test conditions to how the LED is actually being used, so the TMP must be consistent from LM-80 to ISTMT!



ENERGY STAR® Program Guidance Regarding LED Package, LED Array and LED Module Lumen Maintenance Performance Data Supporting Qualification of Lighting Products

September 9, 2011

Section 1: Purpose of this Document & Timeline for Implementation

The purpose of this document is to provide guidance regarding lumen maintenance testing and reporting (i.e. IES LM-80-08, or "LM-80") for LED packages, LED arrays, and LED modules ("subcomponent(s)") referenced to demonstrate compliance with ENERGY STAR lumen maintenance and/or color maintenance performance requirements detailed in Program specifications for lighting products ("product(s)").

The most commonly employed approach to fulfilling ENERGY STAR lumen maintenance performance requirements is through projections based in part upon LM-80 test reports. This guidance addresses topics related to subcomponent-level lumen maintenance data that are not explicitly covered in ENERGY STAR lighting specifications because of the quickly evolving nature of solid state lighting technology. The U.S. Environmental Protection Agency (EPA) will periodically review this guidance to ensure its content acknowledges the latest technological improvements to solid state lighting subcomponents.

This document supports all ENERGY STAR lighting specifications that include solid state lighting within their scope, and is intended to ensure uniform treatment of lumen maintenance data by ENERGY STAR manufacturing partners ("partners"), subcomponent manufacturers, and EPA-Recognized Laboratories and Certification Bodies.

This document addresses:

- the content of LM-80 test reports (section 3)
- the application of LM-80 test reports in support of product qualification (section 4)
- the use of preexisting test reports while testing of successors is underway (section 5)

EPA's intention is for testing and reporting to follow this guidance going forward.

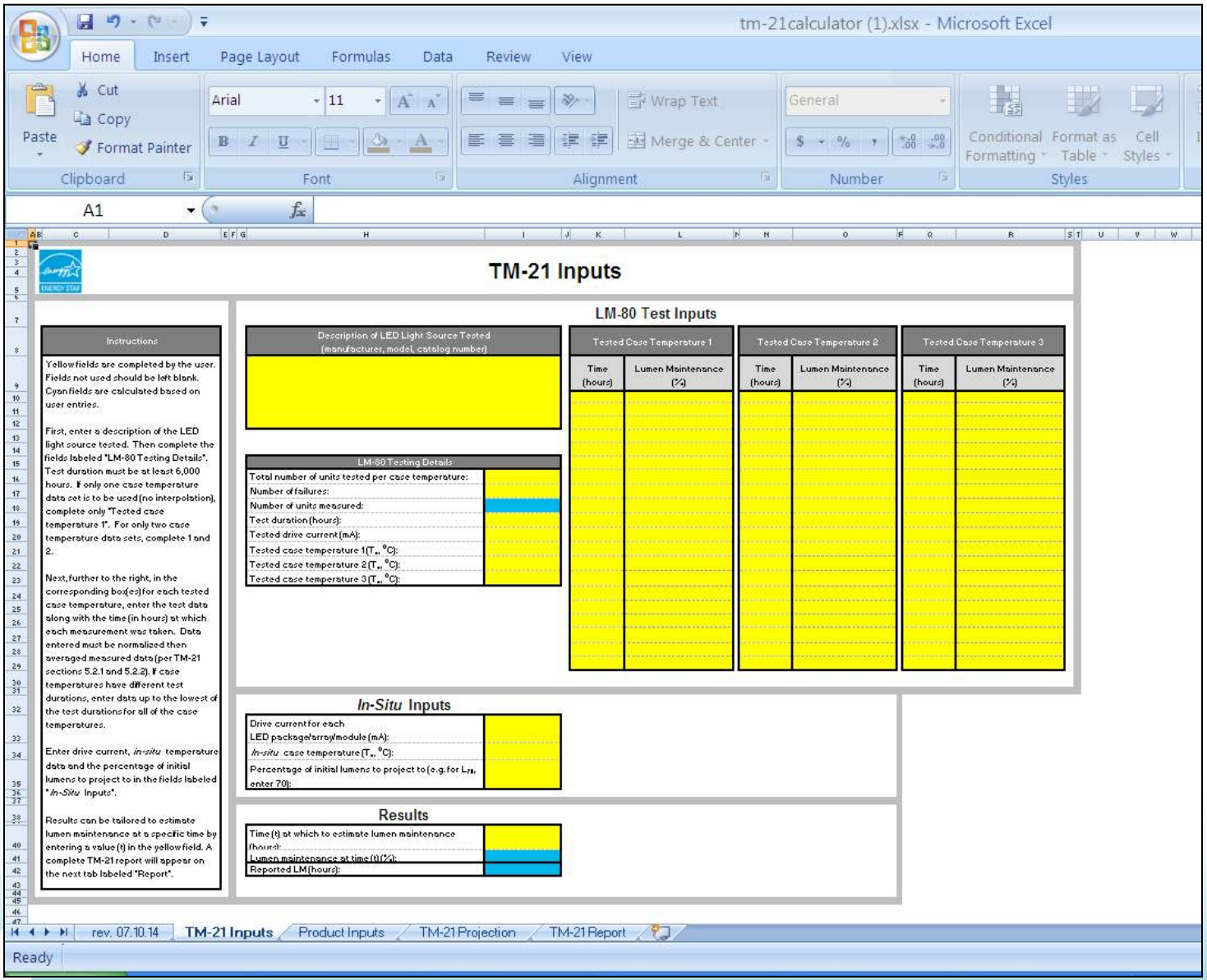
This guidance as it relates to testing applies to LM-80 testing not already initiated as of November 9, 2011, and thus does not apply to testing already completed, currently underway or in the final planning stages.

TM-21 Calculator

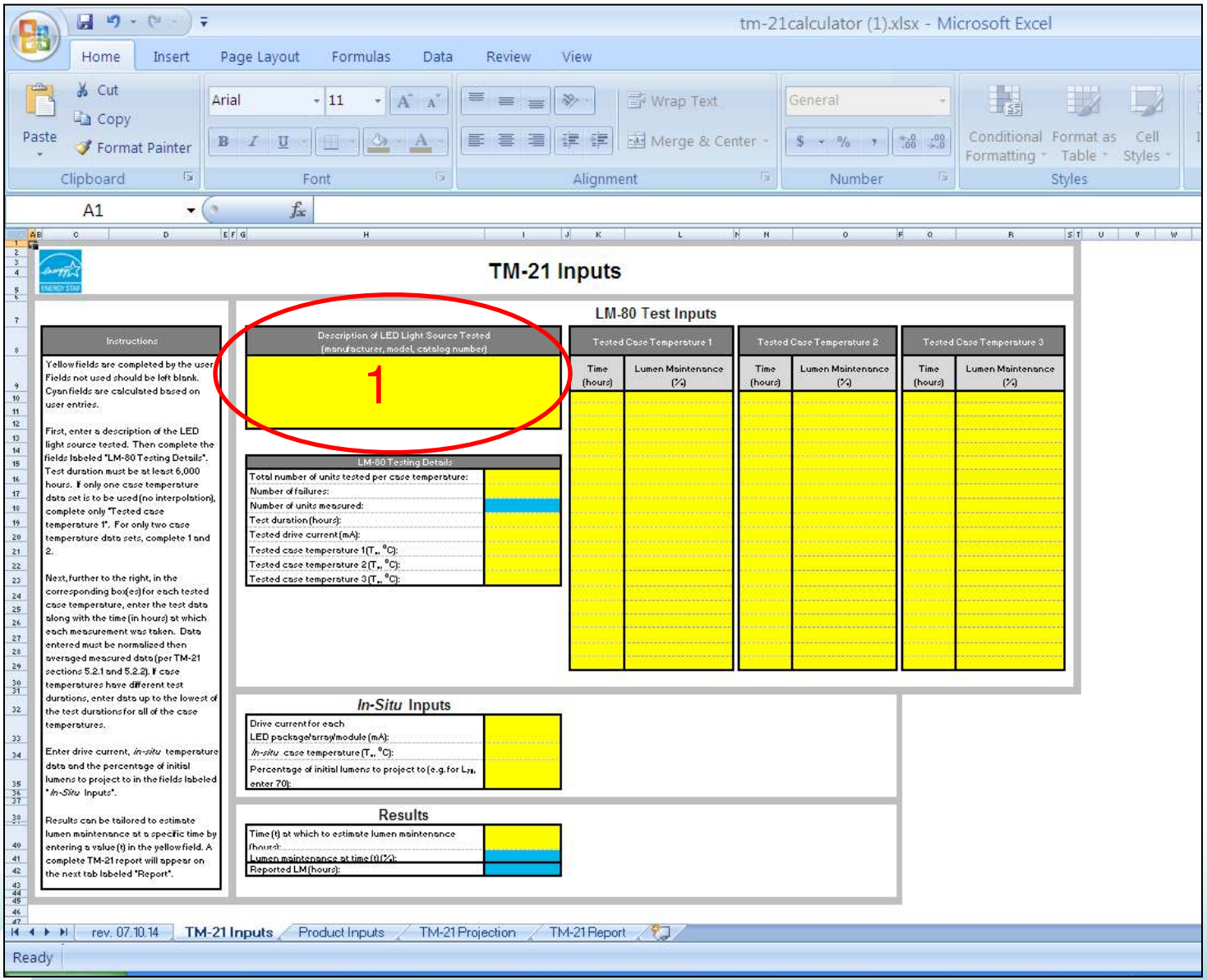
- **Receive daily questions about filing out the TM-21 calculator**

- **Often filled out incorrectly, requiring revisions, which can cause delays. Common errors include the following:**
  - Using incorrect data points (median instead of average/mean)
  - Wrong hours inputted
  - Time at which to estimate luminaire maintenance

TM-21 Calculator



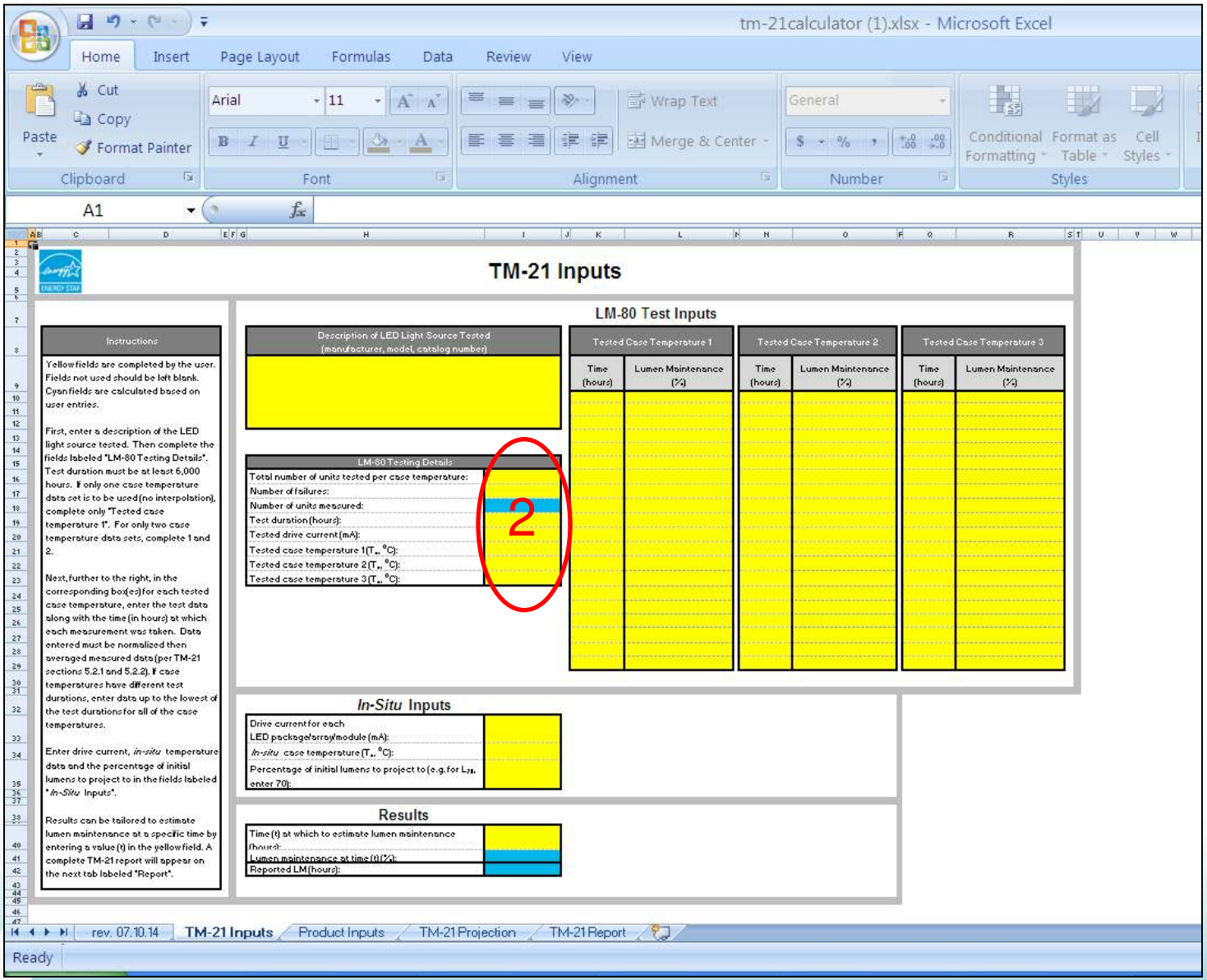
TM-21 Calculator



TM-21 Calculator

- **Section 1: Input description of LED Light Source Tested**
  - LED chip manufacturer, model number, catalogue number
  - Any other descriptive/identifying characteristics (e.g., CCT)

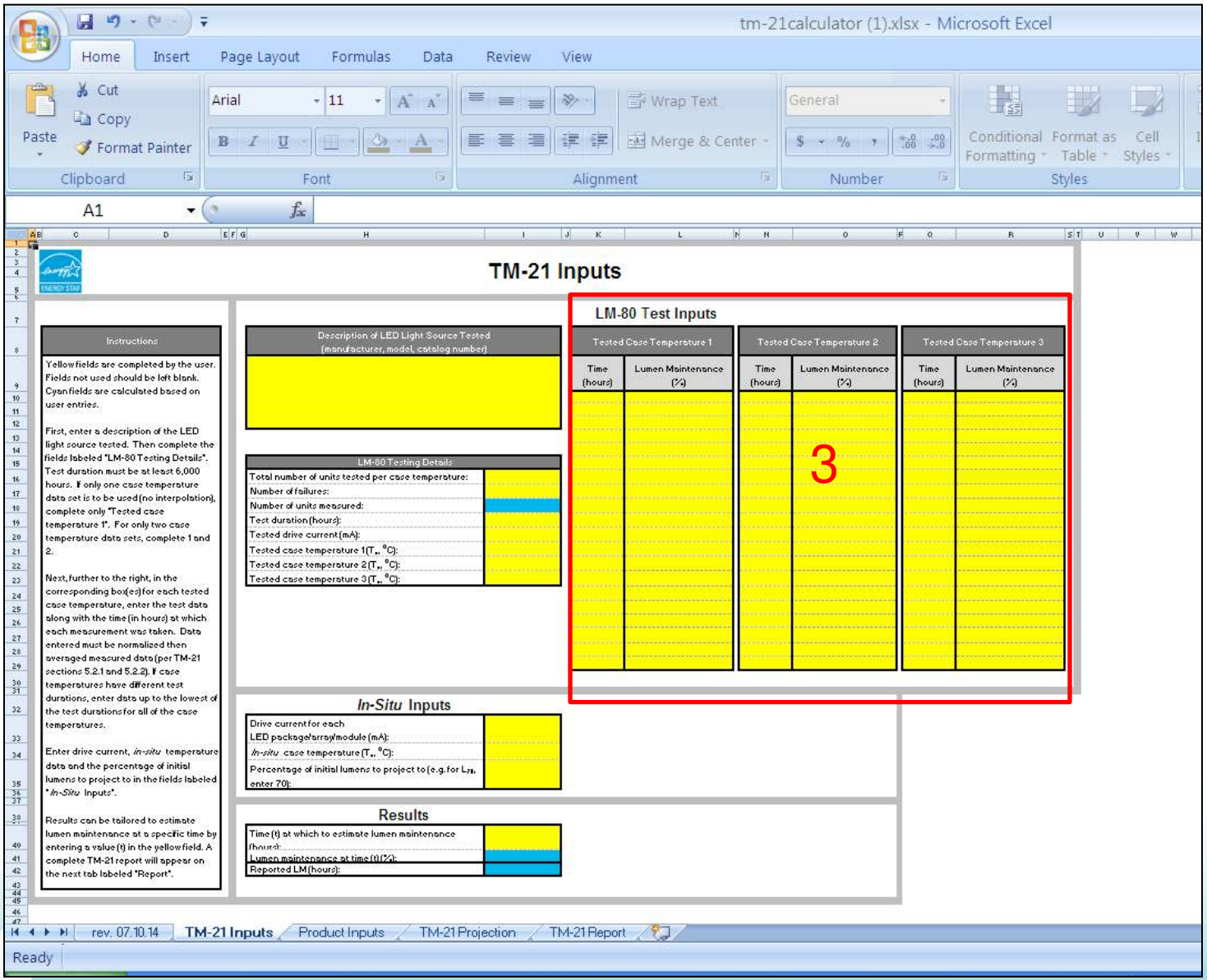
TM-21 Calculator



TM-21 Calculator

- **Section 2: Input LM-80 Parameters/Testing details**
  - Number of samples, test duration, drive current, case temperatures
  - This information comes directly from the LM-80 report
  - Be sure to note the number of failures, if any
  - Tested drive current should be entered in milliamps (mA)
  - Test duration will be the lowest of the 3 (or 2) case temperatures entered

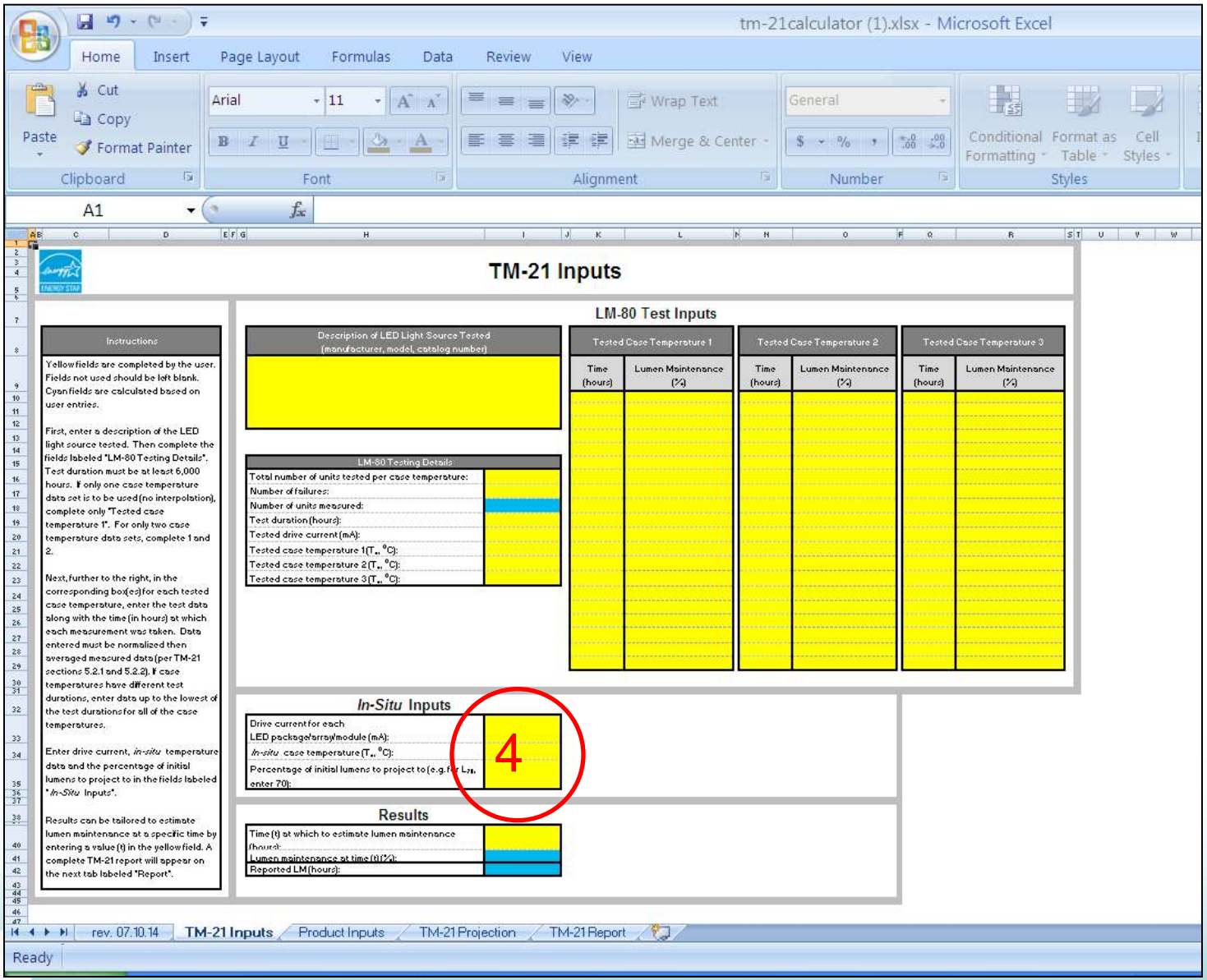
TM-21 Calculator



TM-21 Calculator

- **Section 3: Input LM-80 lumen maintenance**
  - Average (mean) values from final LM-80 report
  - Data must be entered in order of increasing temperature (e.g., 55, 85, 105)
  - If a data point has multiple decimal places (e.g., 98.5487), please enter all of the decimal places that are provided in the LM-80 report

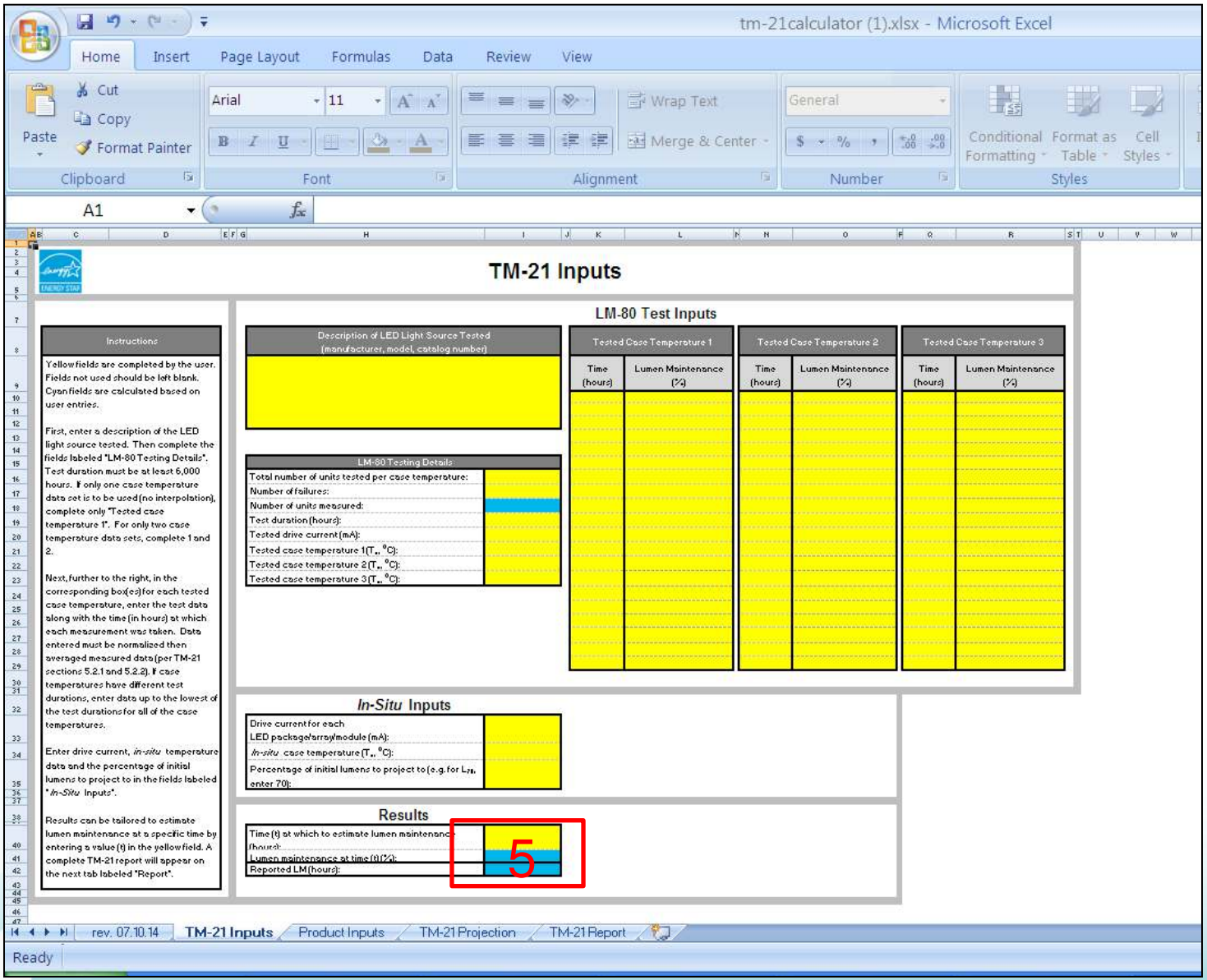
TM-21 Calculator



TM-21 Calculator

- **Section 4: Input ISTMT information**
  - Drive current, highest measured temperature
    - Please enter your drive current in milliamps, not amps
  - If you're not sure whether to use the highest measured temperature or the highest "normalized" temperature, it is more conservative to enter the hotter of the 2 temperatures
  - Enter % of Light Output to project to
    - 70 or 90, depending on DLC tier

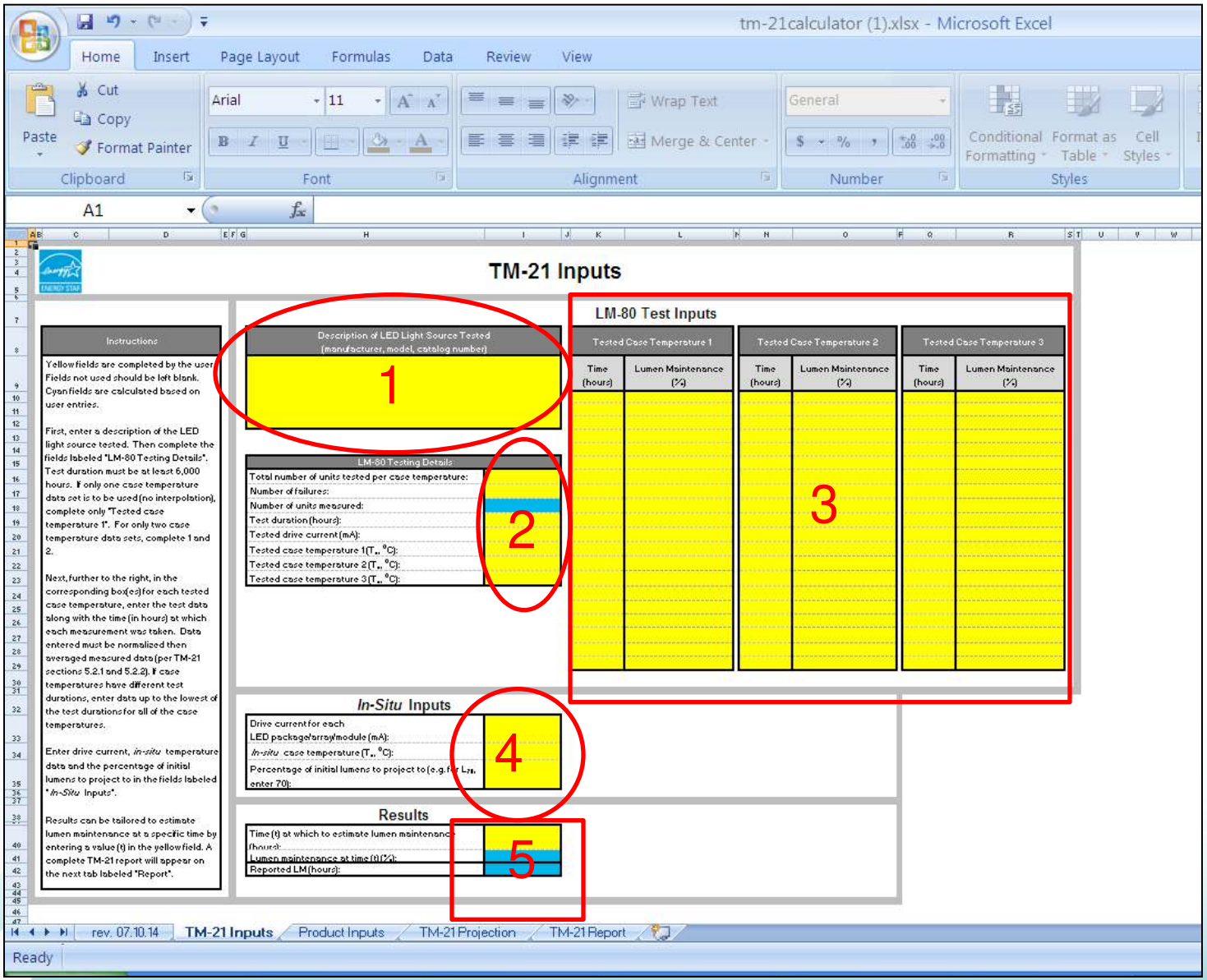
TM-21 Calculator



TM-21 Calculator

- **Section 5: Input time at which to estimate lumen maintenance**
  - Based on the number of samples tested per case temperature:
    - **10-19 samples tested, multiply the test duration (hours) by 5.5x**
    - **20+ samples tested, multiply the test duration (hours) by 6x**
  - If the resulting value is greater than the lumen maintenance requirements for that category, enter in the category-required-hours
    - **For example: Category requirement 50,000 hours; 25 samples tested for 10,000 hours → project to 60,000 hours**
    - **Because 60,000 hours is greater than the category requires (50,000 hours), enter 50,000 hours into the TM-21 calculator**

TM-21 Calculator



TM-21 Calculator Summary

1. **Input description of LED Light Source Tested**
   - LED chip manufacturer, model number, catalogue number
2. **Input LM-80 Parameters**
   - Number of samples, test duration, drive current, case temperatures
3. **Input LM-80 lumen maintenance**
   - Average (mean) values from final LM-80 report
   - Data must be entered in order of increasing temperature (e.g., 55, 85, 105)
4. **Input ISTMT information**
   - Drive current, highest measured temperature
   - Enter % of Light Output to project to (70 or 90, depending on DLC tier)
5. **Input time at which to estimate lumen maintenance**
   - Based on the number of samples tested per case temperature:
     - **10-19 samples tested, multiply the test duration (hours) by 5.5x**
     - **20+ samples tested, multiply the test duration (hours) by 6x**

THANK YOU!

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