

# BBA Model Technical Specification: High-Efficiency Troffers

A Better Building Alliances (BBA) Project

Version 4.0 (April 15, 2013)

- A. General Description: 1'×4', 2'×2' or 2'×4' Troffer
- B. Application
- Ceiling application
    - Ceiling types
      - F (Flanged)
      - M (Modular) and Z (Z Spline)
      - G (Grid)
      - SS (Screw Slot)
      - Plaster Frame Kit
  - Mounting
    - Recessed
    - Surface-mounted
- C. Construction/Finish
- Dimensions
    - Nominal dimensions:
      - 1×4 – width = 12", length = 48"
      - 2×2 – width = 24", length = 24"
      - 2×4 – width = 24", length = 48"
    - Maximum height (depth) = 5"
  - No visible welding, plane-protruding screws, latches, springs, hooks, rivets or plastic supports viewed from the occupied (room) side.
  - Air-handling capability (optional)
  - Recessed, Type IC (intended for insulation contact) (optional)
  - Earthquake clips (optional)
  - NYC electrical code (optional)
  - Chicago electrical code (optional)
- D. Electrical
- Operating voltage: 24 Vdc, 120 Vac at 60 Hz, 277 Vac at 60Hz, or universal voltage (120, 220/240, 277 Vac at 50/60 Hz)
  - Power factor:  $\geq 0.90$  (at full luminaire output and across specified voltage range)
  - Total harmonic distortion:  $\leq 20\%$  (at full luminaire output and across specified voltage range)
  - Surge protection: ANSI C62.41-2002 Category A surge protection standards up to and including 2.5 kV
  - Sound: Class A not to exceed a measured value of 24dB
  - Maximum standby power: 1W
  - Power supply/driver/ballast

- Warranty: 5 years on equipment  
*LED Power Supply/ Driver*
  - Driver efficiency (at full load):
    - $\geq 85\%$  for drivers capable of  $\geq 50$  watts
    - $\geq 80\%$  for drivers capable of  $< 50$  watts
  - Federal Communications Commission (FCC) compliance: FCC Part 15 Class A (Commercial) requirements for EMI/RFI emissions

*Fluorescent Ballast*

- Output frequency  $\geq 40\text{kHz}$
- Lamp current crest factor:  $\leq 1.7$
- Minimum lamp starting temperature:  $50^\circ\text{F}$  ( $10^\circ\text{C}$ ) at full light output.  $60^\circ\text{F}$  ( $15^\circ\text{C}$ ) at 50% or lower dimming
- Ballast Luminous Efficiency (BLE)
  - 1 lamp  $\geq 0.83$
  - 2, 3 or 4 lamp  $\geq 0.86$
- FCC compliance: FCC 47 Part 18 Non-Consumer requirements for EMI/RFI emissions
- ROHS Directive EC 2002/95
- Transient protection: ANSI C82.11-2011 section 5.11
- Inrush current: ANSI C82.11-2011 section 5.121
- End-of-lamp-life protection for T5 and smaller lamps

E. Accessibility for Maintenance

- Power supplies/drivers/ballasts, LED arrays, boards or light engines shall be easily field replaceable using common hand tools (e.g. screwdrivers, pliers, etc.) and without uninstalling the luminaire

F. Photometric Performance

- Minimum initial delivered luminaire lumens

*LED Luminaires*

- 1×4 - 1,500 initial lumens
- 2×2 - 2,000 initial lumens
- 2×4 - 3,000 initial lumens

*Fluorescent Luminaires*

- 1×4 - 1,300 initial lumens
- 2×2 - 1,800 initial lumens
- 2×4 - 2,800 initial lumens

- Minimum Luminaire Efficacy Rating (LER) (for Fluorescent) or Luminaire Efficacy (LE) (for LED)
  - 1×4, 2×2 and 2×4 – 85 lm/W

- Spacing criteria (SC): The ratio of center-to-center fixture spacing to mounting height (ceiling-to-work plane)

	0° – 180° Plane	90° – 270° Plane
1×4, 2×2 and 2×4	1.0 – 2.0	1.0 – 2.0

G. Chromaticity

- Correlated Color Temperature (CCT): Only allowed CCTs are 2700K, 3000K, 3500K, 4000/4100K, 4500K and 5000K

*LED*

- Acceptable tolerances as provided in ANSI C78.377-2011.
- Color rendering index (CRI):  $\geq 80$  with a positive  $R_9$  value.
- Tested per LM-79-2008

*Fluorescent Lamps*

- Acceptable tolerances as provided in ANSI C78.376-2001
- NEMA designated lamp (T5, T8, biaxial, etc.)
- CRI  $\geq 80$

H. Lumen maintenance/Rated lamp life

*LED*

- $\geq 77.4\%$  of initial lumens @ 36,000 hours (this equates to a  $\geq 70\%$  of initial lumens @ 50,000 hour target.)
- Determined by IES LM-80 data [parameters (drive current and steady-state temperature) determined by the In-situ Temperature Measurement Test (ISTMT)] then applying IES TM-21 procedure evaluated @ 36,000 hours.

-OR-

- The requirement may also be met by IES LM-80 data intersection of the exponential decay function  $L_{70} = L_{100}e^{-\lambda t}$ , where  $L$  = Luminance;  $\lambda$  is a constant;  $t$  = time = 35,000 hours (based upon LM-80 data and ISTMT, evaluated @ 6,000 hours with minimum lumen maintenance of 94.1%).

*Fluorescent Lamps*

- Minimum rated life of 30,000 hours. (based upon programmed rapid start ballast with a 12-hour operating cycle.)

I. Standards

- IES LM-63-2002, Standard File Format for Electronic Transfer of Photometric Data
- UL 1598-2008 NMX-J-307/1-ANCE/C22.2 NO.250.0-08, Luminaires

*LEDs*

- IES LM-79-2008, Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products
- IES LM-80-2008, Approved Method: Measuring Lumen Maintenance of LED Light Sources
- IES TM-21-2011, Projecting Long Term Lumen Maintenance of LED Light Sources
- ANSI/NEMA/ANSLG C78.377-2011, Specifications for the Chromaticity of Solid State Lighting (SSL) Products
- ANSI/UL 8750-2009, Standard for Light Emitting Diode (LED) Equipment for Use in Lighting Products
- ISTMT, Contained within the ENERGY STAR Manufactures Guide:  
[www.energystar.gov/index.cfm?c=ssl\\_res.pt\\_ssl](http://www.energystar.gov/index.cfm?c=ssl_res.pt_ssl)

*Fluorescent*

- IES LM-9-2009, Electrical and Photometric Measurements of Fluorescent Lamps
- IES LM-41-1998, Photometric Testing of Indoor Fluorescent Luminaires
- ANSI C78.376-2001, Specifications for the Chromaticity of Fluorescent Lamps

J. Optional Provisions

- Emergency lighting
  - Emergency battery pack available factory or field installed
- Dimming

- Manufacturers shall provide listing of compatible dimmers that have been tested and approved for use with their products
- Dimming protocols
  - Analog 0-10v dimming
  - Step dimming from 100% to at least one preset level between 70% and 10%
  - Continuous, flicker-free dimming from 100% to 20%
  - Continuous, flicker-free dimming from 100% to 10%
  - Continuous, flicker-free dimming from 100% to 5%
  - Open digital dimming protocols, both wired (e.g. DALI or DMX/RDM) and wireless (e.g. ZigBee)
- Controls
  - Daylight sensing
  - Occupant/motion sensing
  - Constant lumen management
  - Load shedding/demand response
- Centralized power conversion/controls/metering
  - Power conversion
    - System shall have centralized power conversion from high voltage AC to low voltage DC
    - Capable of powering a minimum of four discrete luminaires
  - Controls/metering
    - Standby power draw: <10W at the central power supply
    - Contains ambient temperature sensor(s)
    - Contains sensor(s) for motion detection
    - Contains fixture current and voltage sensor for integrated power metering
    - Field-upgradeable for new fixture types or future sensor package upgrades and modifications