



TECHNICAL SPECIFICATIONS, REQUIREMENTS AND STANDARDS

Alternative Consumption Technologies, Inc. (dba: Go Green Solutions) began providing a custom LED engineered light fixture to LA Metro In August of 2012. To date over 10,000 LED 4' tubes have been provided for retrofitting of the RED Line tunnel. These LED tubes are provided as retrofit tubes for existing Holophane 7200 Prismatic fixtures as well as a complete unit with an OEM LED Prismatic fixture provided by Go Green with a separate UI file #356675.

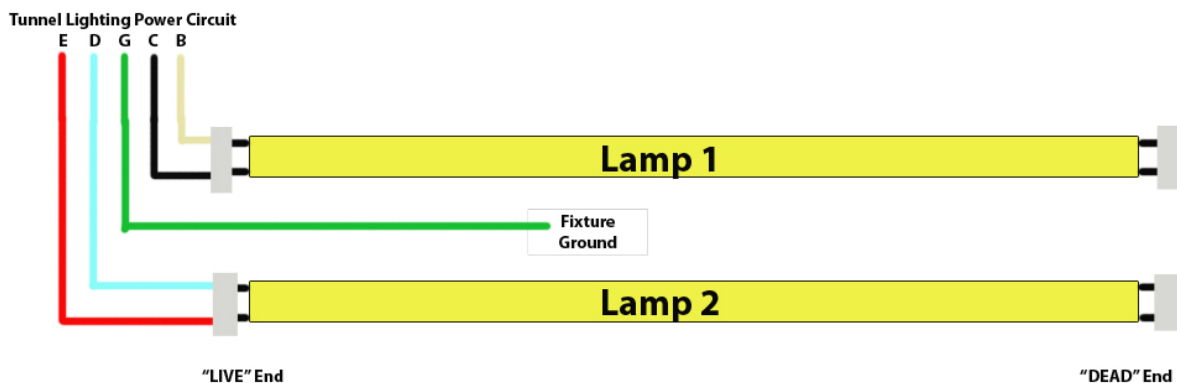
Product Overview:

- Retrofit Option; The LED tube is a self ballasted lamp that is replaced into the Holophane Prismatic fixture similar to the replacement of a traditional fluorescent tube once the lens housing has been opened. The time to accomplish this task once a technician is in front of the mounted fixture is estimated to take no more than five (5) minutes.
- New Fixture: These fixtures are based on the Holophane Prismatic fixtures currently installed in Metro's tunnels and meet NFPA 130 compliance for Underground Rail Transit. The total power draw per fixture does not exceed 36 watts at 277 volts. The fixtures currently being provided to Metro have clear lenses on the end diffuser and utilize a sine wave array of LED emitters that aggregates more light at the ends of the fixture. This produces approximately 20% more light in the areas between fixtures than standard tubes.

Redundancy:

Each fixture will contain two LED lamps. In each fixture, one lamp will be powered on Circuit 1, while the other lamp will be powered by Circuit 2. This will ensure that if one power source fails, the other lamp will continue to operate properly.

Circuit Diagram:





Life Expectancy

There are two very important components in Go Green's LED lamps that will most significantly affect the life expectancy of the product: the LED chip and the quality of the electrolytic capacitors in the LED driver circuit.

Go Green's LED lamps utilize Cree's ML-E X-Lamp High-Power LEDs. This LED chip is designed with a heat-sinking system to draw heat away from the LED junction – extending the overall life of the LED. In testing, Go Green's heat-sinking chassis, held the solder point temperature (Tsp) of the LED chips at 33°C [See Volume II – Cree Luminaire Evaluation 200065]. According to Cree's LM-80 data, with Tsp of 45°C and operating at 175mA, after 6,000 hours of constant operation, the average lumen maintenance was 97.9% [See Volume II – Cree MLE LM-80 Test Report]. Using the IESNA Technical Memorandum 21 (TM-21), the LM-80 test data was extrapolated resulting in a calculated L70 for the ML-E (at 175mA drive current and 45°C Tsp) of 170,000 hours (approximately 19.5 years) [See Volume II – Cree TM-21 XLamp ML-E L70 Lifetime].

The electrolytic capacitors used in Go Green's LED driver are United Chemi-Con's KZE series. The operational lifetime of electrolytic capacitors depends on the operating temperature and the ripple current through the capacitor. The general rule of thumb for estimating capacitor life expectancy is the life doubles for every 10°C the operating temperature is below the rated temperature. For the UCC KZE capacitors used in Go Green's driver circuit, the capacitors are rated for 5,000 hours at 105°C. While in use, the operating temperature of the capacitors in the Go Green driver circuit is approximately 45°C (25°C ambient temperature), which is 60°C under the rated temperature. Therefore, it can be estimated that the electrolytic capacitors will last for approximately 320,000 hours (or 36 years).

Therefore, under the proposed Metro application, Go Green's LED lamps should last well beyond the 10-year warranty period.

Power Consumption

Each LED lamp consumes 14-18 Watts at, making the total power consumption of the fixture 28-36 Watts.

Operating Voltage

Go Green's LED tube is UL-classified for operation from 120-277 Volts AC, and will have no problems operating under the voltage range 250VAC to 280VAC.



Environmental Conditions

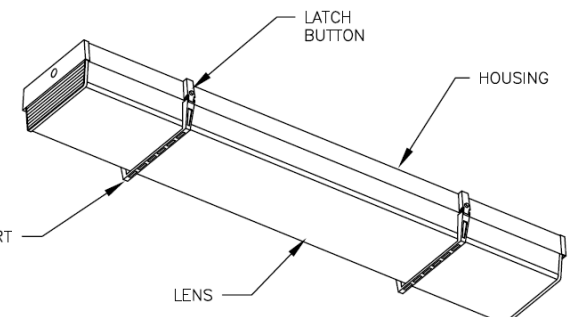
The Go Green 7200 Prismatite four-foot fixture has an overall length of 48.88 in. The UL-listed fixture is designed to be rugged and compatible in for many different environments. The extruded aluminum housing and durable prismatic acrylic lens are sealed by a neoprene gasket, making this fixture suitable for wet locations and capable of withstanding high pressure washing.

UL LISTED TO US AND CANADIAN SAFETY STANDARDS
WET LOCATION

PRISMATITE® 7200
(2 LAMP)

7200 SERIES CATALOG NUMBER

HOUSING/LENGTH	VOLTAGE
<input type="checkbox"/> 2=2' NOMINAL	<input type="checkbox"/> 12=120V
<input type="checkbox"/> 4=4' NOMINAL	<input type="checkbox"/> 27=277V
<input type="checkbox"/> 8=8' NOMINAL	



BALLASTS

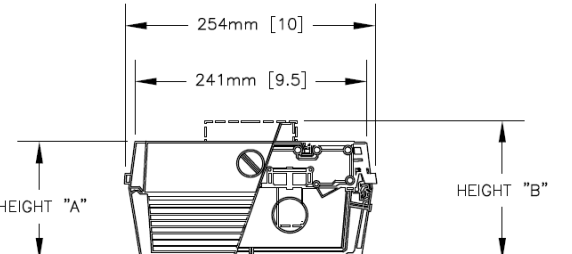
- J=MAGNETEK TRIAD FOR T8 LAMPS
- P=MAGNETEK TRIAD FOR 38-40W T5 LAMPS
- WB=ADVANCE MARK III (ENERGY SAVING) FOR 40W RS LAMPS
- WS=MAGNETEK UNIVERSAL (BASIC-12) FOR 40W RS LAMPS
- LT=FOR 40W RS LAMPS 0°F MIN START TEMPERATURE
- HO=FOR HO LAMPS, -20°F MIN START TEMPERATURE

OPTIONS (ADD TO CATALOG NUMBER)(SOME RESTRICTIONS APPLY):

- DR=IMPACT-RESISTANT LENS
- P1=PRISMATECT (CORROSION RESISTANT) FINISH
- SA=2 & 4 FOOT: TWO 1/2" THREADED STEM ADAPTORS;
- 8 FOOT: THREE 1/2" THREADED STEM ADAPTORS
- F=120V OR 277V FUSE INSTALLED


ACCESSORIES (SHIPS SEPARATELY)(ADD TO CATALOG NUMBER):

- CRK=CONTINUOUS ROW KIT (ONE PER FIXTURE)



CATALOG NUMBER	HEIGHT mm (in)	HEIGHT mm (in)	LENGTH mm (in)
72002XXP	124 (4.88)	N/A	608 (23.94)
72004XXJ WB	124 (4.88)	N/A	1241 (48.88)
72004XXWS LT	124 (4.88)	N/A	1241 (48.88)
72004XXHO	N/A	146 (5.75)	1241 (48.88)
72008XXHO	N/A	146 (5.75)	2480 (97.63)

Certain airborne contaminants can diminish the Integrity of acrylic. Please refer to the Acrylic Environmental Compatibility Chart (HL-2445) for suitable uses.



HOLOPHANE®
LEADER IN LIGHTING SOLUTIONS
An Acuity Brands Company
214 OAKWOOD AVENUE - NEWARK, OHIO 43055

ORDER NO: _____

TYPE: _____

DRAWING NO: MA-5155

CAD MODEL: 7200.DWG

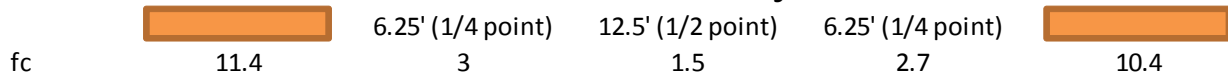
DATE: 11-16-09

Sheet 1 of 1

This fixture is a DIRECT WIRE installation, where the two 277V supply lines will come into the fixture and each source will power a separate lamp. There will be five wires in the fixture (Lamp 1 hot, Lamp 1 neutral, Lamp 2 hot, Lamp 2 neutral, and a Ground) Once a fixture is installed it will be extremely unlikely that an entire fixture will need replacement. Most likely it will simply be a tube that will need to be exchanged, in which case, the fixture will simply need to be opened, the faulty tube removed, and a new tube inserted. The overall replacement time should be well under five (5) minutes. All driver circuitry is internal within the LED tube lamp itself. The only other potential failure point

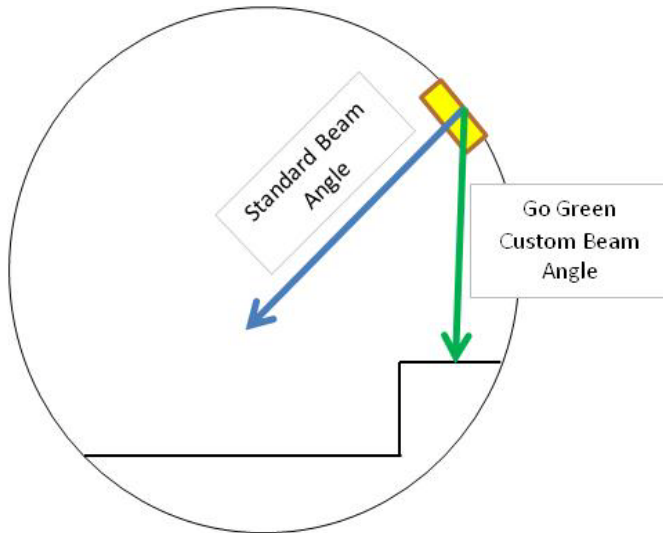
When mounted 7 feet above the walkway, the fixtures will provide approximately 11 foot-candles directly below the fixture. At the nodal point (12.5') between two fixtures spaced at 25 foot centers, the lights will provide approximately 1.5 foot-candles. At the quarter points (6.25' and 18.75') between the fixtures, the light present on the walkway is estimated to be approximately 2.8 foot-candles. These light values would be reduced at 30% lumen degradation to 8 fc (@ 0'), 2.1 fc (@ 6.25'), 1 fc (@ 12.5'), 1.9 fc (@ 18.75'), and 7.3 fc (@ 25').

25ft Centers Projection



Strobe Effect

Go Green has developed a custom LED tube lamp that directs the majority of the light through the bottom edge of the fixture rather than straight through the front face of the lens. This design significantly increases the amount of light present on the walkway surface below the fixture rather than wasting the light output of the fixture into the rest of the tunnel (and into the eyes of the train operators) [See Diagram Below].



Go Green Custom Beam Rotation vs. Standard Output Beam Angle

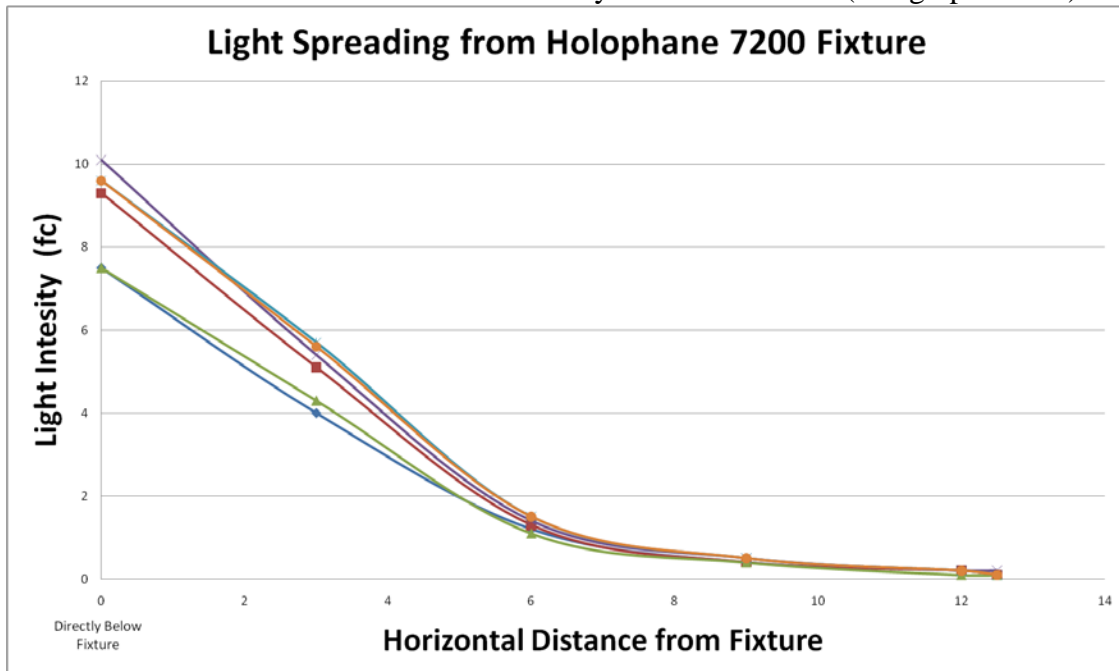
In regards to the blue lights that are required for the emergency area markings, a blue sleeve will be provided that will fit around each LED tube lamp.



Light Output Characteristics: Light Degradation

Over time the light output will decrease due to the LEDs wearing down. As mentioned in “**Life Expectancy**”, with a drive current of 175mA and a solder-point temperature of 45°C, Cree’s LM-80 data and TM-21 calculations estimate that the ML-E LEDs will have an L70 of 170,000 hours [See Volume II - Cree MLE LM-80 Test Report]. At 30% lumen degradation, the Go Green LED fixture will still produce 1 foot-candle at the halfway point (12.5’) between two fixtures. The proposer expects that the LED fixture may still provide adequate illumination on the walkway to meet the 0.3 fc minimum well past the 10 year warranty period.

Additionally, as the light output from the fixture decreases, due to the nature of the light spreading from the Holophane 7200 fixture, the light present horizontally from the fixture does not decrease at the same rate as directly below the fixture (See graph below).



As can be seen in the light spreading graph, even with a decrease in the light directly below the fixture, the illumination present horizontally from the fixture does not change significantly. It seems that dust accumulation and decrease in tunnel reflectivity will contribute more quickly to loss of mid-point illumination than a decrease in the light output directly below fixture.

Code Compliance

- NFPA 130 – Section 6.2.5.3
- NFPA 130 & 101
- NEC Article 310
- NEMA WC70
- NEMA Standards for Wet Locations
- NEMA Standards for Ingress Protection Levels
- ASTM 162 & 662 Low Smoke and Low Flammability
- IEEE 383 – Flame Propagating Criteria
- IEEE 383 – minimum short circuit time of five minutes in the flame test