Work Paper SCE13LG115

**Revision 1**

**Southern California Edison**

**Residential LED Interior Fixtures**

**For Work Paper Reviewer Use Only**

**List all major comments that occurred during the review. This table may only be removed during management review.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Major Comment** | **Reviewer Name** | **Date** | **Outcome/Resolution** |
| Minor edits need to be incorporated. Good job otherwise! | Alfredo Gutierrez | 10/1/15 |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

# At-a-Glance Summary

|  |  |
| --- | --- |
| **Measure Codes** | Refer to Excel Calculation Attachment |
| **Measure Description** | Residential LED Interior Fixtures |
| **Base Case Description** | CFL/Halogen/Incandescent Fixtures using A19 screw-in lamps or integrated modules |
| **Units** | Per fixture |
| **Energy Savings** | Refer to Excel Calculation Attachment |
| **Full Measure Cost ($/unit)** | Refer to Excel Calculation Attachment |
| **Incremental Measure Cost ($/unit)** | Refer to Excel Calculation Attachment |
| **Effective Useful Life** | ILtg-Res-LED-50000hr: 16 years EUL, 5.33 years RUL |
| **Measure Installation Type** | Replace on Burnout (ROB), Retrofit First Baseline Only (REF) |
| **Net-to-Gross Ratio** | All-Default<=2yrs: 0.7, Res-Default-HTR-di: 0.85 |
| **Important Comments** | This work paper has a complementary Ex Ante Database data set that will be provided in a separate submission to the California Public Utilities Commission (CPUC). |

# Revision History

|  |  |  |  |
| --- | --- | --- | --- |
| **Rev** | **Date** | **Author** | **Summary of Changes** |
| 0 | 2/13/15 | Yun Han | * New WP for the 2013-15 cycle * WP effective 1/1/2015-12/31/2015 |
| 1 | 9/17/15 | Yun Han | * New template for 2016 program year * WP effective from 1/1/2016 |

# Commission Staff and Cal TF Comments

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Rev** | **Party** | **Submittal Date** | **Comment Date** | **Comments** | **WP Developer Response** |
| 0 | CS |  |  |  |  |
| 0 | Cal TF |  |  |  |  |

Cal TF website: <http://www.caltf.org/>

# Section 1. General Measure & Baseline Data

## 1.1 Measure Description & Background

This work paper details the replacement of Residential interior CFL/Incandescent/Halogen light fixtures using A19 lamps with interior LED fixtures ranging from 15 to 41 Watts. The list of measures is shown in the tables below.

**Base, Standard, and Measure Cases**

|  |  |
| --- | --- |
| **Case** | **Description of Typical Scenario** |
| Measure | Residential LED interior fixture |
| Existing Condition | Residential incandescent/halogen/CFL interior fixture |
| Code/Standard | N/A |
| Industry Standard Practice | N/A |

For the purpose of this workpaper, the term Residential LED Interior Fixtures is used to describe all the interior fixture products that are used for the Multifamily EE Rebate’s (MFEER) Direct Install Program. The fixtures include Ceiling Mounted Downlights, Vanity, and Wall Sconces. Due to how the Multifamily Direct Install program implements the projects, the three different types of fixtures are reported as a single measure – Residential Interior LED Fixtures with one Watt increments.

Measures and Codes

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Measure Codes** | | | | **Measure Name** |
| SCG | SDG&E | SCE | PG&E |
|  |  | LT-52657 |  | 15-16 Watt Interior Fixture (Res) LED replacing Base Case, Total Watts = 2.96 x Msr Watts |
|  |  | LT-88237 |  | 16-17 Watt Interior Fixture (Res) LED replacing Base Case, Total Watts = 2.96 x Msr Watts |
|  |  | LT-94776 |  | 17-18 Watt Interior Fixture (Res) LED replacing Base Case, Total Watts = 2.96 x Msr Watts |
|  |  | LT-51718 |  | 18-19 Watt Interior Fixture (Res) LED replacing Base Case, Total Watts = 2.96 x Msr Watts |
|  |  | LT-67611 |  | 19-20 Watt Interior Fixture (Res) LED replacing Base Case, Total Watts = 2.96 x Msr Watts |
|  |  | LT-93376 |  | 20-21 Watt Interior Fixture (Res) LED replacing Base Case, Total Watts = 2.96 x Msr Watts |
|  |  | LT-92639 |  | 21-22 Watt Interior Fixture (Res) LED replacing Base Case, Total Watts = 2.96 x Msr Watts |
|  |  | LT-58127 |  | 22-23 Watt Interior Fixture (Res) LED replacing Base Case, Total Watts = 2.96 x Msr Watts |
|  |  | LT-98384 |  | 23-24 Watt Interior Fixture (Res) LED replacing Base Case, Total Watts = 2.96 x Msr Watts |
|  |  | LT-51055 |  | 24-25 Watt Interior Fixture (Res) LED replacing Base Case, Total Watts = 2.96 x Msr Watts |
|  |  | LT-67077 |  | 25-26 Watt Interior Fixture (Res) LED replacing Base Case, Total Watts = 2.96 x Msr Watts |
|  |  | LT-94978 |  | 26-27 Watt Interior Fixture (Res) LED replacing Base Case, Total Watts = 2.96 x Msr Watts |
|  |  | LT-74554 |  | 27-28 Watt Interior Fixture (Res) LED replacing Base Case, Total Watts = 2.96 x Msr Watts |
|  |  | LT-72547 |  | 28-29 Watt Interior Fixture (Res) LED replacing Base Case, Total Watts = 2.96 x Msr Watts |
|  |  | LT-55125 |  | 29-30 Watt Interior Fixture (Res) LED replacing Base Case, Total Watts = 2.96 x Msr Watts |
|  |  | LT-63872 |  | 30-31 Watt Interior Fixture (Res) LED replacing Base Case, Total Watts = 2.96 x Msr Watts |
|  |  | LT-54591 |  | 31-32 Watt Interior Fixture (Res) LED replacing Base Case, Total Watts = 2.96 x Msr Watts |
|  |  | LT-95714 |  | 32-33 Watt Interior Fixture (Res) LED replacing Base Case, Total Watts = 2.96 x Msr Watts |
|  |  | LT-59066 |  | 33-34 Watt Interior Fixture (Res) LED replacing Base Case, Total Watts = 2.96 x Msr Watts |
|  |  | LT-69011 |  | 34-35 Watt Interior Fixture (Res) LED replacing Base Case, Total Watts = 2.96 x Msr Watts |
|  |  | LT-52455 |  | 35-36 Watt Interior Fixture (Res) LED replacing Base Case, Total Watts = 2.96 x Msr Watts |
|  |  | LT-52123 |  | 36-37 Watt Interior Fixture (Res) LED replacing Base Case, Total Watts = 2.96 x Msr Watts |
|  |  | LT-89839 |  | 37-38 Watt Interior Fixture (Res) LED replacing Base Case, Total Watts = 2.96 x Msr Watts |
|  |  | LT-89969 |  | 38-39 Watt Interior Fixture (Res) LED replacing Base Case, Total Watts = 2.96 x Msr Watts |
|  |  | LT-66138 |  | 39-40 Watt Interior Fixture (Res) LED replacing Base Case, Total Watts = 2.96 x Msr Watts |
|  |  | LT-74352 |  | 40-41 Watt Interior Fixture (Res) LED replacing Base Case, Total Watts = 2.96 x Msr Watts |

To qualify for incentives, the residential LED interior fixture must be on the Energy Star Certified Light Fixtures Qualified Products List (QPL) [A]. Any fixtures requiring the use of A19 lamps must use LEDs and also be on the Energy Star’s QPL. Energy Star fixtures using A19 lamps must have GU-24 sockets.

The MFEER program quality control ensures correct documentation of existing measure, base case, and specification of the energy efficient product installed.  SCE requires a detailed Product Location Form (PLF) for each project submitted for rebate or incentive.  The PLF is an Excel spreadsheet with a tab for measures installed in dwelling areas and another for measures installed in common area locations.  The PFL contains the following fields: Apartment Address, Measure Installed, Product Make/Model, Install Locations (detailed to Kitchen, Bathroom, Hallway, Living Room, Bedroom, Dining Room, Laundry Room, and Porch/Patio), as well as Common Area locations.  This information is entered and tracked in the program’s tracking database.  This level of data is provided in the Participation Data that is provided to the CPUC on a quarterly basis.

This measure applies to all Residential building types including Single Family, Multi-family, and Mobile Home – Double-Wide in all SCE Climate Zones.

## 1.2 Technical Description

Ceiling Mounted Downlight Fixtures are mounted on the surface of the ceiling as opposed to the recessed downlights, in which the fixture installs flush to the ceiling. Vanity light fixtures are used in bathrooms to illuminate the area while combing, brushing, make-up, etc. They are mounted over the mirror to reduce shadows that would otherwise come from a ceiling mounted fixture. Sconce light fixtures are installed along the walls used to provide illumination in common areas and hallways.

All three LED fixtures described typically uses two to four A19 lamps with a GU-24 socket or contains integrated LED modules instead of the A19 GU-24 lamp.

## 1.3 Installation Types and Delivery Mechanisms

The delivery method that is available for these measures is:

* Financial Support – Direct Install

The program/install type for the above measures is:

* Retrofit – First Baseline Only (REF)
  + Please see the Direct Install Program’s influence document [D] and Section 1.1 for program implementation.
* Replace on Burnout (ROB)

**Installation Type Descriptions**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Installation Type** | **Savings** | | **Life** | |
| 1st Baseline (BL) | 2nd BL | 1st BL | 2nd BL |
| Replace on Burnout (ROB) | Above Code or Standard | N/A | EUL | N/A |
| Retrofit First Baseline Only (REF) | Above Customer Existing | N/A | EUL | N/A |

A delivery mechanism is a delivery method paired with an incentive method. Delivery mechanisms are used by programs to obtain program participation and energy savings.

**Delivery Method Descriptions**

|  |  |
| --- | --- |
| **Delivery Method** | **Description** |
| Financial Support | The program motivates customers, through financial incentives such as rebates or low interest loans, to implement energy efficient measures or projects. |

**Incentive Method Descriptions**

|  |  |
| --- | --- |
| **Incentive Method** | **Description** |
| Direct Install | The program implements energy efficiency measures for qualifying customers, at no cost to the customer. |

## 1.4 Measure Parameters

### 1.4.1 DEER Data

Although the fixture savings in this work paper are based on A19 lamps with a 2.96 WRR, the LED A19 lamps listed in the READI tool do not provide 1 Watt increments up to the wattage range needed and also does not provide the proper EUL for a lighting fixture.

DEER Difference Summary

|  |  |
| --- | --- |
| **DEER Item** | **Used for Workpaper?** |
| Modified DEER methodology | No |
| Scaled DEER measure | Yes |
| DEER Base Case | No |
| DEER Measure Case | No |
| DEER Building Types | Yes |
| DEER Operating Hours | Yes |
| DEER eQUEST Prototypes | No |
| DEER Version | N/A |
| Reason for Deviation from DEER | DEER does not contain this measure |
| DEER Measure IDs Used | N/A |

**Net-to-Gross Ratio**

The NTG values were obtained using the DEER READI tool. The relevant NTG values for the measures in this work paper are in the table below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **NTGR ID** | **Description** | **Sector** | **BldgType** | **Measure Delivery** | **NTGR** |
| All-Default<=2yrs | All other EEM with no evaluated NTGR; new technology in program for 2 or fewer years | All | Any | Any | 0.7 |
| Res-Default-HTR-di | All other EEM with no evaluated NTGR; direct install hard-to-reach only. | Res | Any | DirInstall | 0.85 |

Note: Direct install measures that are not hard-to-reach will use the default NTG value.

This work paper includes measures that are offered via direct install activities into hard-to-reach (HTR) customer homes. “Final Resolution E-4700”, dated December 18, 2014, defines specific criteria to classify customer homes as HTR. The “Required Corrections to Measure Level Input Parameters Identified by Commission Staff per D.14-10-046 Order Paragraph 16”, dated November 3, 2014, includes additional clarification for the geographic criteria.

SCE’s Multi-Family Energy Efficiency Rebate (MFEER) program addresses the ongoing concern with “split incentives”, where the residents are not the owners of the property, so they lack incentive to improve their energy usage. Similarly, the property owners do not live on-site and pay higher utility expenses due to inefficient appliances, thus lack any incentive to upgrade. The MFEER is designed to drive this customer segment toward participation by offering property owners a variety of energy efficiency measures and services. The MFEER program will offer and track measure installations in both common and dwelling areas of multifamily complexes and common areas of mobile home parks and condominiums. Measures offered via direct install activities in both common and dwelling areas of multifamily complexes and common areas of mobile home parks and condominiums will receive the HTR NTG. Other measures in the MFEER program will receive default NTG (NTGR\_ID: Res-Default>2), unless otherwise specified in DEER.

**Spillage Rate**

Spillage rates are not tracked in work papers; they are tracked in an external document which will be supplied to the Commission Staff.

**Installation Rate**

The IR values were obtained using the DEER READI tool. The relevant IR values for the measures in this work paper are in the table below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **GSIA ID** | **Description** | **Sector** | **BldgType** | **ProgDelivID** | **GSIAValue** |
| Def-GSIA | Default GSIA values | Any | Any | Any | 1 |

**Effective and Remaining Useful Life**

The EUL and RUL values were obtained using the DEER READI tool. DEER defines the RUL as 1/3 of the EUL value. The RUL value is only applicable to the first baseline period for an RET measure with an applicable code baseline. The relevant EUL and RUL values for the measures in this work paper are in the table below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **EUL ID** | **Description** | **Sector** | **UseCategory** | **EUL (Years)** | **RUL (Years)** |
| ILtg-Res-LED-50000hr | LED Fixture – Indoor – Residential | Res | Lighting | 16 | 5.33 |

### 1.4.2 Codes and Standards Analysis

**Title 20 2015** [493, Section 1605.1(k) – Lamps section lists the minimum requirements for incandescent reflector lamps, medium base compact fluorescent lamps, and general service incandescent lamps which affect the measures in this work paper.

**Energy Star:** Energy Star issued a document, ENERGY STAR Program Requirements for Integral LED Lamps – Partner Commitments Version 1.1 [488] which details the Energy Star requirements for Integral LED Lamps. The requirements in the document consist of two parts; general requirement for all LED lamps and lamp type specific requirement. Those requirements are the minimum requirements for an integral LED lamp to be adopted by any SCE energy efficiency program.

**Title 24 2013** [355] does not affect fixture replacements in Residential building types.

Although code exists, this work paper uses recommended wattage reduction ratios from the Energy Division’s Workpaper Disposition for Lighting Retrofits (30 May2014 [481]) to calculate the base case wattage. Therefore, Title 20 code is not used.

Code Summary

|  |  |  |
| --- | --- | --- |
| **Code** | **Reference** | **Effective Dates** |
| Title 20 (2015) | Section 1605.1(k) | January 1, 2015 |
| Energy Star | Version 1.1 | September 30, 2014 |

## 1.5 EM&V, Market Potential, and Other Studies – Base Case and Measure Case Information

N/A

## 1.6 Data Quality and Future Data Needs

N/A

# Section 2. Calculation Methodology

The methodology of the wattages to be used for energy savings is based on the LED wattage being offered and the Wattage Reduction Ratio (WRR). Since the baseline fixtures use A19 lamps, the A-lamp WRR of 2.96 provided by the Energy Division [481] is used to calculate the baseline wattage. The 2.96 WRR factors in a mixed CFL/halogen/incandescent baseline that yields a single multiplier that can be applied to the LED wattage to calculate the baseline wattage.

The energy savings estimates are calculated as follows:



The following is a sample energy savings calculation for a 15 Watt LED Interior Fixture in Multi-Family (Common Area) building type, Climate Zone 6.

The demand reduction estimates are calculated as follows:



The following is a sample demand reduction calculation for a 15 Watt LED Interior Fixture in Multi-Family (Common Area) building type, Climate Zone 6.

A complete list of energy savings and demand reduction for other measures in different building types and climate zones can be found in the attachment [B].

# Section 3. Load Shapes

The ideal load shape for net benefits estimates would represent the difference between the base case and measure case. The closest load shapes that are applicable to the measures in this work paper are listed in the table below.

Building Types and Load Shapes

|  |  |  |
| --- | --- | --- |
| **Building Type** | **Load Shape** | **E3 Alternate Building Type** |
| Residential Single Family | DEER:Indoor\_CFL\_Ltg | RES |
| Residential Multi-family | DEER:Indoor\_CFL\_Ltg | RES |
| Residential Mobile Home - Double-Wide | DEER:Indoor\_CFL\_Ltg | RES |

# Section 4. Costs

For Direct Install measures, SCE directly utilizes one or more contractors as part of the program. The actual cost can vary by contractor, the date in which the work occurred, and by the volume of business. Contractor costs are confidential information and are based upon contractually agreed upon pricing as established in their purchase order with SCE; therefore, the SCE program tracking system is the only source for this data.

## 4.1 Base Case Cost

Base case costs are taken from online retailers [C] and inserted to the LED Wattage ranges as shown in the table below. Fixtures range from 2 to 4 lamp fixtures that is also reflected in the cost difference. Labor cost is taken from RSMeans 2010 [408].

**Base Case Costs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Measure** | **Installation Type** | **Base Equipment Cost** | **Base Labor Cost** | **Total Base Cost** |
| LT-52657 | ROB | $35.49 | $9.40 | $44.89 |
| LT-88237 | ROB | $35.49 | $9.40 | $44.89 |
| LT-94776 | ROB | $35.49 | $9.40 | $44.89 |
| LT-51718 | ROB | $35.49 | $9.40 | $44.89 |
| LT-67611 | ROB | $35.49 | $9.40 | $44.89 |
| LT-93376 | ROB | $35.49 | $9.40 | $44.89 |
| LT-92639 | ROB | $35.49 | $9.40 | $44.89 |
| LT-58127 | ROB | $35.49 | $9.40 | $44.89 |
| LT-98384 | ROB | $50.10 | $9.40 | $59.50 |
| LT-51055 | ROB | $50.10 | $9.40 | $59.50 |
| LT-67077 | ROB | $50.10 | $9.40 | $59.50 |
| LT-94978 | ROB | $50.10 | $9.40 | $59.50 |
| LT-74554 | ROB | $50.10 | $9.40 | $59.50 |
| LT-72547 | ROB | $50.10 | $9.40 | $59.50 |
| LT-55125 | ROB | $50.10 | $9.40 | $59.50 |
| LT-63872 | ROB | $71.47 | $9.40 | $80.87 |
| LT-54591 | ROB | $71.47 | $9.40 | $80.87 |
| LT-95714 | ROB | $71.47 | $9.40 | $80.87 |
| LT-59066 | ROB | $71.47 | $9.40 | $80.87 |
| LT-69011 | ROB | $71.47 | $9.40 | $80.87 |
| LT-52455 | ROB | $71.47 | $9.40 | $80.87 |
| LT-52123 | ROB | $71.47 | $9.40 | $80.87 |
| LT-89839 | ROB | $71.47 | $9.40 | $80.87 |
| LT-89969 | ROB | $71.47 | $9.40 | $80.87 |
| LT-66138 | ROB | $71.47 | $9.40 | $80.87 |
| LT-74352 | ROB | $71.47 | $9.40 | $80.87 |

## 4.2 Measure Case Cost

Measure case costs are taken from online retailers [C] and inserted to the LED Wattage ranges as shown in the table below. Same labor cost is used from the base cost.

**Measure Case Costs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Measure** | **Installation Type** | **Measure Equipment Cost** | **Measure Labor Cost** | **Total Measure Cost** |
| LT-52657 | ROB | $90.08 | $9.40 | $99.48 |
| LT-88237 | ROB | $90.08 | $9.40 | $99.48 |
| LT-94776 | ROB | $90.08 | $9.40 | $99.48 |
| LT-51718 | ROB | $90.08 | $9.40 | $99.48 |
| LT-67611 | ROB | $90.08 | $9.40 | $99.48 |
| LT-93376 | ROB | $90.08 | $9.40 | $99.48 |
| LT-92639 | ROB | $90.08 | $9.40 | $99.48 |
| LT-58127 | ROB | $90.08 | $9.40 | $99.48 |
| LT-98384 | ROB | $128.50 | $9.40 | $137.90 |
| LT-51055 | ROB | $128.50 | $9.40 | $137.90 |
| LT-67077 | ROB | $128.50 | $9.40 | $137.90 |
| LT-94978 | ROB | $128.50 | $9.40 | $137.90 |
| LT-74554 | ROB | $128.50 | $9.40 | $137.90 |
| LT-72547 | ROB | $128.50 | $9.40 | $137.90 |
| LT-55125 | ROB | $128.50 | $9.40 | $137.90 |
| LT-63872 | ROB | $167.00 | $9.40 | $176.40 |
| LT-54591 | ROB | $167.00 | $9.40 | $176.40 |
| LT-95714 | ROB | $167.00 | $9.40 | $176.40 |
| LT-59066 | ROB | $167.00 | $9.40 | $176.40 |
| LT-69011 | ROB | $167.00 | $9.40 | $176.40 |
| LT-52455 | ROB | $167.00 | $9.40 | $176.40 |
| LT-52123 | ROB | $167.00 | $9.40 | $176.40 |
| LT-89839 | ROB | $167.00 | $9.40 | $176.40 |
| LT-89969 | ROB | $167.00 | $9.40 | $176.40 |
| LT-66138 | ROB | $167.00 | $9.40 | $176.40 |
| LT-74352 | ROB | $167.00 | $9.40 | $176.40 |

## 4.3 Full and Incremental Measure Cost

**Full and Incremental Measure Cost Equations**

|  |  |  |  |
| --- | --- | --- | --- |
| **Installation Type** | **Incremental Measure Cost** | **Full Measure Cost** | |
| **1st Baseline** | **2nd Baseline** |
| ROB | (MEC + MLC) – (BEC + BLC) | (MEC + MLC) – (BEC + BLC) | N/A |
| REF | (MEC + MLC) – (BEC + BLC) | MEC + MLC | N/A |

MEC = Measure Equipment Cost; MLC = Measure Labor Cost

BEC = Base Case Equipment Cost; BLC = Base Case Labor Cost

**Full and Incremental Costs – REF Install Type**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Measure** | **Installation Type** | **Incremental Measure Cost** | **Full Measure Cost** | |
| **1st Baseline** | **2nd Baseline** |
| LT-52657 | REF | $54.59 | $99.48 | N/A |
| LT-88237 | REF | $54.59 | $99.48 | N/A |
| LT-94776 | REF | $54.59 | $99.48 | N/A |
| LT-51718 | REF | $54.59 | $99.48 | N/A |
| LT-67611 | REF | $54.59 | $99.48 | N/A |
| LT-93376 | REF | $54.59 | $99.48 | N/A |
| LT-92639 | REF | $54.59 | $99.48 | N/A |
| LT-58127 | REF | $54.59 | $99.48 | N/A |
| LT-98384 | REF | $78.40 | $137.90 | N/A |
| LT-51055 | REF | $78.40 | $137.90 | N/A |
| LT-67077 | REF | $78.40 | $137.90 | N/A |
| LT-94978 | REF | $78.40 | $137.90 | N/A |
| LT-74554 | REF | $78.40 | $137.90 | N/A |
| LT-72547 | REF | $78.40 | $137.90 | N/A |
| LT-55125 | REF | $78.40 | $137.90 | N/A |
| LT-63872 | REF | $95.53 | $176.40 | N/A |
| LT-54591 | REF | $95.53 | $176.40 | N/A |
| LT-95714 | REF | $95.53 | $176.40 | N/A |
| LT-59066 | REF | $95.53 | $176.40 | N/A |
| LT-69011 | REF | $95.53 | $176.40 | N/A |
| LT-52455 | REF | $95.53 | $176.40 | N/A |
| LT-52123 | REF | $95.53 | $176.40 | N/A |
| LT-89839 | REF | $95.53 | $176.40 | N/A |
| LT-89969 | REF | $95.53 | $176.40 | N/A |
| LT-66138 | REF | $95.53 | $176.40 | N/A |
| LT-74352 | REF | $95.53 | $176.40 | N/A |

**Full and Incremental Costs – ROB Install Type**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Measure** | **Installation Type** | **Incremental Measure Cost** | **Full Measure Cost** | |
| **1st Baseline** | **2nd Baseline** |
| LT-52657 | ROB | $54.59 | $54.59 | N/A |
| LT-88237 | ROB | $54.59 | $54.59 | N/A |
| LT-94776 | ROB | $54.59 | $54.59 | N/A |
| LT-51718 | ROB | $54.59 | $54.59 | N/A |
| LT-67611 | ROB | $54.59 | $54.59 | N/A |
| LT-93376 | ROB | $54.59 | $54.59 | N/A |
| LT-92639 | ROB | $54.59 | $54.59 | N/A |
| LT-58127 | ROB | $54.59 | $54.59 | N/A |
| LT-98384 | ROB | $78.40 | $78.40 | N/A |
| LT-51055 | ROB | $78.40 | $78.40 | N/A |
| LT-67077 | ROB | $78.40 | $78.40 | N/A |
| LT-94978 | ROB | $78.40 | $78.40 | N/A |
| LT-74554 | ROB | $78.40 | $78.40 | N/A |
| LT-72547 | ROB | $78.40 | $78.40 | N/A |
| LT-55125 | ROB | $78.40 | $78.40 | N/A |
| LT-63872 | ROB | $95.53 | $95.53 | N/A |
| LT-54591 | ROB | $95.53 | $95.53 | N/A |
| LT-95714 | ROB | $95.53 | $95.53 | N/A |
| LT-59066 | ROB | $95.53 | $95.53 | N/A |
| LT-69011 | ROB | $95.53 | $95.53 | N/A |
| LT-52455 | ROB | $95.53 | $95.53 | N/A |
| LT-52123 | ROB | $95.53 | $95.53 | N/A |
| LT-89839 | ROB | $95.53 | $95.53 | N/A |
| LT-89969 | ROB | $95.53 | $95.53 | N/A |
| LT-66138 | ROB | $95.53 | $95.53 | N/A |
| LT-74352 | ROB | $95.53 | $95.53 | N/A |

# Attachments

1. 2. 3. 

# References



[355]

[408]

[422]

[481]

[A] <http://www.energystar.gov/productfinder/download/certified-light-fixtures/>

[B] Attachment 1 – Calculation Template 2015 v5.xlsm

[C] Attachment 2 – LG115.0 Costs.xlsx

[D] Attachment 3 - Lighting Disposition December.docx