



## PIER Lighting Research Program



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***NYSERDA***  
***Fixture Performance Report***  
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# NYSERDA Fixture Performance Report

## EXECUTIVE SUMMARY

From 1997 to 2000, the LaMar Lighting Company, Inc., of Farmingdale, NY, developed a new type of fluorescent lighting fixture. The fixture used an externally mounted ultrasonic motion sensor to detect motion in stairwells and corridors, and solid state controls in order to dim fixtures to lower light levels and lower energy use when stairs and corridors are not occupied. More than 1500 of these fixtures were successfully installed in Starret City, a large, multi-building apartment complex in Brooklyn, NY.

Early in 2001, LaMar Lighting was awarded a research and development contract from the New York State Energy Research and Development Authority (NYSERDA). The project was “to develop and commercialize a lighting system that incorporates a 2-lamp 32W T8 electronic fixture, an integral ultrasonic motion sensor, bi-level dimming ballast, and battery back-up for use in stairwells and corridors or other spaces where full and no-light motion sensors are impractical.” From 2001 through 2003, NYSERDA provided funding to improve the original design of the LaMar fixture and to facilitate its commercialization. NYSERDA also funded a field test of the new fixture including full scale monitoring of light levels and energy use.

The purpose of this report is to communicate the results from the NYSERDA project so the information may be used to help further commercialization of the bi-level technology in California in order to save significant amounts of lighting energy. This report includes a summary of the information produced for the NYSERDA project, and product literature and a website information in support of the commercialized fixture. As mentioned, NYSERDA funded a field test of the fixture including full-scale monitoring by the Lighting Research Center from Rensselaer Polytechnic Institute (RPI) in New York. Extensive data is presented on two field test sites:

1. a high-rise residential complex located on Roosevelt Island just east of Manhattan, and
2. a high-rise office building located on Lexington Avenue in New York City.

Due to extremely low occupancy in both staircases (0.7%-3.3%) as measured by RPI, energy savings were significant for both projects (53%-60%) compared to the existing lighting. NYSERDA rebates and high electrical rates in New York City generated a payback period of about 2.5 years (excluding the cost of emergency battery packs which are not part of bi-level performance). Energy savings would have increased even further and paybacks would have been even shorter had the project chosen to dim to 5 or 10% instead of the 33% that was chosen. Both sites also showed increased illuminances.

## BI-LEVEL FIXTURE

The concept of using an occupancy sensor to turn off lights and save energy was developed long before the NYSERDA and PIER LRP projects. However, there are many applications, like stairwells and corridors, where building occupant comfort or building codes require that the area not be entirely dark when occupants enters the space. There is an important difference between the step-down function used in the LaMar bi-level fixture and fixtures that are simply turned off and on by a motion sensor. In the LaMar fixture, lamps are dimmed but power is not turned completely off. Therefore, when stairwell occupancy calls for full light output from the fixture, the ballast simply steps back up to full power.

All LaMar dimming fixtures are contained in the Occu-smart® product line. Fixtures come in 2', 3' and 4' lengths for both 120V and 277V applications. Both 1-lamp and 2-lamp models are available. Models are available to dim to 5%, 10%, or 33% of normal, depending on voltage/ballast combinations. Battery packs can be added for emergency lighting applications. Vandal-proof options are also available. LaMar lighting is currently manufacturing a limited line of bi-level stairwell fixtures. The line is limited because multi-level ballasts are not currently available for all step-down percentages desired and are not always available for both 120V and 277V applications. Specification sheets are provided in Appendix A.

### **OCCU-SMART® ENERGY USAGE CHART**

LaMar has prepared a simple chart illustrating both the full output wattage and the standby wattage for each lamp/fixture/ballast combination. Full output wattage assumes the use of F32T8 lamps. (If existing fixtures are to be replaced by Occu-smart fixtures, existing fixture wattage will be higher if T12 lamps are in use.) Standby wattage, for the dim mode, ranges from 11W to 13W for the 5% and 10% standby fixtures and 14W to 28W for the 33% fixtures. Wattage consumption by the motion sensor and power pack is negligible and is not included in these numbers. The chart is shown Appendix B.

### **INITIAL PRODUCT AWARENESS**

Bill Warren is a respected lighting designer and a regular contributor to the magazine of the Illuminating Engineering Society of North America (IESNA) entitled *LD+A (Lighting Design Application)*. He was also a consultant to the Starret project where the bi-level fixtures by LaMar were first used. Impressed with the performance and energy saving potential of these fixtures, Mr. Warren made them the focus of two lengthy articles in 2000 and 2001. Please see Appendix C for the full text of these two articles.

### **OCCU-SMART® WEBSITE**

With the help of NYSERDA funding, LaMar Lighting developed an excellent website in support of the Occu-smart product line. This website is updated continuously as product features are upgraded or modified. This is the place to find the most up to date information concerning product specifications and other details. The website address is <http://www.occusmart.com> and example pages are shown in Appendix D.

## **SITE INSTALLATION AGREEMENT**

The first step in the field-testing process for these new fixtures was to find building owners willing to participate and to execute a simple agreement. The agreement was actually a bit complex in that it had to include: LaMar Lighting (supplying the bi-level fixtures); the building owner (purchasing the fixtures); the Lighting Research Center (overseeing fixture installation and monitoring); and NYSERDA (supplying fixture rebates and reporting support). A copy of this agreement is included in Appendix E as a model that might be used by others proposing to do similar work. A similar agreement was used during the field tests for the PIER LRP Project 5.1 Bi-level Stairwell Fixture.

## **DOCUMENTS INDICATING MUNICIPAL APPROVAL**

Every jurisdiction is different. Municipal authorities may need to be educated on this new technology. In the case of New York City, where the field tests took place, the New York City Fire Department deferred jurisdiction for “providing illumination in the public areas of a building” to the Multiple Dwelling Laws and Housing Maintenance Code administered by the New York City Department of Buildings. Copies of this correspondence and approvals are included in Appendix F.

## **OWNER’S LETTER OF APPRECIATION**

A satisfied building owner must always remain the highest priority. The letter of appreciation shown in Appendix G points out that the fixtures (all 250 of them) work as predicted and that the stairwell lighting increases when needed—all done so quickly that users can “barely tell that there are bi-level fixtures installed.” Owners are obviously pleased with the energy costs savings, but they are secondary to the provision of having safe light when needed.

## **FINAL REPORT: FIELD TEST DELTA EVALUATION**

Appendix H provides the 32-page report, which presents the complete findings by the Lighting Research Center from a field test including two high-rise buildings in the New York City area, a multi-family apartment building and an office building. For each field test location, LRC provides:

- Luminaire Characteristics,
- Project (building) Description and Photographs, and
- Photometric Measurements (by staircase).

In addition, the report covers:

- Summary of Energy Savings,
- Laboratory Tests of Ballast Wattage,
- Project contact Information,
- Code Implications,

- Energy Calculation Methodology,
- Typical Light Logger Calculation Example,
- Occupancy percentage Sheets, and
- Energy Calculation Sheets.

The most important findings from both case studies are that occupancy in both buildings (where access to the stairwell is restricted) is very low: 0.68% to 1.3% for upper floors and 1.53% to 3.32% for lower floors. As a result, the annual energy savings range from 53% to 60% over the “before” condition.

The full text of this field test report is contained in Appendix H.

### **FIELD TEST DELTA SNAPSHOT**

RPI is well known for its series called the “Delta Snapshots.” Each is a colorful yet technical summary of a lighting-related case study. A Snapshot has been prepared for the Rivercross building, from the field test report referenced above. This 2-page summary is provided in Appendix I. A pdf file with a color version of the Snapshot is available at [www.occusmart.com](http://www.occusmart.com).

**APPENDIX A: PRODUCT LITERATURE AND SPECIFICATION SHEETS**

**FOR**

**OCCU-SMART® BI-LEVEL FLUORESCENT LIGHTING FIXTURE**

**BY**

**LAMAR LIGHTING COMPANY, INC.**

**APPENDIX B: OCCU-SMART® ENERGY USAGE CHART**

**BY**

**FIXTURE TYPE AND OPTIONS**

## **APPENDIX C: INITIAL PRODUCT AWARENESS**

### **ARTICLES FOR LD+A MAGAZINE BY WILLARD L. WARREN**

**ENERGY CONCERNS: JUNE 2000**

**ENERGY CONCERNS: SEPTEMBER 2001**

**[REPRINTED BY PERMISSION OF THE AUTHOR.]**

## **APPENDIX D: OCCU-SMART® WEBSITE**

[HTTP://LAMARLIGHTING.COM/OCCUSMART/PRODUCTS.HTML](http://LAMARLIGHTING.COM/OCCUSMART/PRODUCTS.HTML)

**[SELECTED TYPICAL PAGES]**

**APPENDIX E: SITE INSTALLATION AGREEMENT**

**BETWEEN**

**LAMAR LIGHTING COMPANY, INC**

**AND**

**A PROPOSED MONITORING SITE**

**WITH MONITORING TO BE CONDUCTED BY  
LIGHTING RESEARCH CENTER – RENSSELAER POLYTECHNIC INSTITUTE**

**AND**

**FINANCIAL SUPPORT FROM  
NEW YORK STATE ENERGY RESEARCH AND DEVELOPMENT AUTHORITY  
(NYSERDA)**

## SITE INSTALLATION AGREEMENT

The following is a Site Installation Agreement between Lamar Lighting Co. Inc., hereinafter referred to as "Lamar" and \_\_\_\_\_, hereinafter referred to as \_\_\_\_\_, for the supply of approximately \_\_\_\_ motion detecting bi-level lighting fixtures, hereinafter referred to as "fixtures". The fixtures are to be installed on the premises owned and operated by \_\_\_\_\_, whose address is \_\_\_\_\_.

Whereas the fixtures are manufactured by Lamar, and are to be the subject of a demonstration project funded in part by the New York State Energy Research and Development Authority (NYSERDA), under agreement #7133, "Occusmart Lighting Demonstration". The Occu-smart system incorporates an internal ultrasonic motion sensor which controls a bi-level electronic ballast, to provide reduced light levels with corresponding energy savings, in areas such as stairwells which do not require full light levels on a constant basis. Upon detection of motion, the fixture immediately switches to full light output for approximately 15 minutes. The purpose of this project is to study and quantify the energy savings potential of the Occusmart system in a stairwell environment. The study will also determine occupancy and usage of a typical commercial office-building stairwell to further demonstrate the efficiency of the fixtures.

This project is being administered by Lamar Lighting, who has entered into a subcontract agreement with the Lighting Research Center, at Rensselaer Polytechnic Institute, to conduct the study, provide appropriate monitoring, and prepare a research paper or "Delta Field Test" about the project. The paper may or not make specific reference to the demonstration site, including building type, location, and ownership.

It is understood and acknowledged that the undersigned are authorized to enter into this agreement on behalf of their respective companies.

In consideration of the aforementioned, the parties agree as follows:

Lamar will supply the fixtures at a subsidized cost directly to \_\_\_\_\_. \_\_\_\_\_ agrees to pay the full quoted purchase price less a one-third NYSERDA program subsidy. Any rebates available are to be applied for directly by \_\_\_\_\_, and it is understood that Lamar has no responsibility in obtaining or funding these rebates but Lamar agrees to assist and facilitate in applying for and obtaining said rebates. The fixtures are to be installed in stairwell locations mutually agreeable with building management and Lamar. All installation labor will be provided and paid for by \_\_\_\_\_, with up to \$\_\_\_\_\_ to be covered as a labor allowance under this program. Lamar will refund this allowance to \_\_\_\_\_, after all fixtures are installed, and invoices satisfied subject to \_\_\_\_\_'s right to offset up to the \$\_\_\_\_\_. It is agreed that Lamar and LRC staff members shall have access, upon reasonable notice to \_\_\_\_\_ and at reasonable times during business days, to the subject fixtures for the purpose of monitoring and checking for proper operation approximately 6-10 times during the program period. It is agreed that the term of this testing shall be approximately three months, or as otherwise agreed.

\_\_\_\_\_ agrees to allow Lamar to install, via temporary measures (i.e. Velcro, double stick tape, or the like) self-contained light loggers, which measure the light cycles and occupancy status, in approximately forty locations throughout the stairwells. These devices will be monitored and data downloaded by LRC personnel on a periodic basis. The devices remain the property of Lamar, and will be removed at the conclusion of the study.

It is requested that \_\_\_\_\_ provide any feedback data to Lamar as to occupant acceptance of the fixtures for the purposes of evaluating customer satisfaction.

Approved by: \_\_\_\_\_ Date : \_\_\_\_\_ , for \_\_\_\_\_.

Approved by: \_\_\_\_\_ Date: \_\_\_\_\_ , for Lamar Lighting Co., Inc.

## **APPENDIX F: DOCUMENTS INDICATING MUNICIPAL APPROVAL FOR BI-LEVEL FIXTURE INSTALLATION**

- **FIRE DEPARTMENT – THE CITY OF NEW YORK**
- **NEW YORK CITY DEPARTMENT OF BUILDINGS**

## **APPENDIX G: OWNER'S LETTER OF APPRECIATION**

**APPENDIX H: NYSERDA FINAL REPORT**

**FIELD TEST DELTA EVALUATION:  
OCCU-SMART® LIGHT FIXTURE**

**SUBMITTED TO**

**LAMAR LIGHTING COMPANY, INC.  
AND  
NYSERDA**

**BY**

**LIGHTING RESEARCH CENTER**

**MARCH 18, 2004**

## **APPENDIX I: FIELD TEST DELTA SNAPSHOT**

**[A 2-PAGE REPORT SUMMARY]**