

COMBINING  
ENERGY EFFICIENCY  
AND QUALITY DESIGN

## A knowhow™ CASE STUDY

# KINETICS SYSTEMS



# demonstrating lighting

Kinetics Systems designs, builds and installs high-purity process systems and equipment. They are one of the largest companies serving the biotechnology and pharmaceutical industry.

The Kinetics' engineering and architectural team has designed some of the most innovative and cost-effective facilities in the world. Kinetics wanted to apply the same dynamic thinking to their new lighting layout to produce an energy-efficient and visually attractive workspace for their employees.

Today, Kinetics Systems lights 2,028 square feet of additional open office space with bright and comfortable indirect pendant lighting and compact fluorescent downlights. The high quality lighting system is performing very well. Employees who work within this area choose to turn off the task lights located within each cubicle because the extra light unnecessary.

Overall, the new energy-efficient design provides higher-quality lighting for the variety of engineering and office tasks performed by Kinetics' employees, as well as a more comfortable, more attractive ambiance.

Open Plan offices in the older section of the building were being inadequately lit by poorly located acrylic lensed troffers—a situation Kinetics Systems wanted to rectify in the new space.



## PROBLEMS OVERCOME

Kinetics Systems intended to install new lighting technologies to avoid common lighting problems such as poor color rendering, noisy ballasts and visual discomfort that other Kinetics divisions were experiencing. Within older sections of the building the lighting suffered from many of the characteristic disadvantages of an outdated design. The basic lighting layout used four T-12 lamps in standard acrylic lensed recessed troffers. Employees worked on everyday tasks under noisy magnetic ballasts and the unflattering color of T-12 lamps.

For the renovated private offices and smaller rooms, Kinetics' facilities department selected new parabolic troffers fitted with energy-efficient T-8 lamps. For open-plan office spaces furnished with cubicles, better options existed.

Unless they are closely spaced, open-celled or parabolic troffers can be problematic. Localized sources of direct light can throw shadows into office cubicles. Kinetics intended to install 66-inch high partition panels within the space, so avoiding this problem was a priority for the firm.

The designers also wanted to avoid the high contrast between bright light sources and dark ceiling areas that could make computer work difficult and uncomfortable. These varying light levels can create distracting patterns and reflected glare on screens obscuring the data being displayed on them.



A combination of compact fluorescent downlights and pendant mounted indirects illuminate the office space.



## LIGHTING QUALITY

Kinetics Systems facilities department developed the new lighting design working with DesignLights™ Consortium member Massachusetts Electric and lighting consultant Charles Michal. The lighting scheme reflects the principles of the *Office Lighting knowhow™* series guide produced by the DLC. This guide points out that employee productivity and satisfaction are primary goals of an “energy effective” office lighting system, which is exactly what Kinetics Systems had in mind.

Suspended indirect fixtures are more versatile than recessed troffers in an open-office plan work environment because their location need not relate directly to the workstations below.

The fixture’s indirect, upward light distribution makes the whole ceiling a soft light source. Depending on the fixture selected, a direct, downward component can be added as well.

## QUALITY LIGHTING SOLUTION

In the open office area, two rows of perforated indirect luminaires, suspended 18-inches from the ceiling are installed 12-feet apart. The two rows contain 8, 16 and 24-foot long fixtures that span the 67-foot office length.

Fixtures are highly efficient, exceeding the minimum 80% fixture efficiency recommendation laid out in the *Office Lighting knowhow™* guide. Designers selected a perforated steel body so that about 5% of the light from the fixture would soften the contrast of the fixture itself seen against the bright ceiling plane. The 18-inch suspension and wide light distribution from the fixtures permits generous 12-foot spacing between rows.

The designers specified a T-8 lamp with a 4100K-color temperature and a color-rendering index in the 80’s. This combination is closer to natural day lighting and provides an upbeat atmosphere within the space. The color quality is a big improvement on the low 60’s CRI of the older T-12’s.

Complementing the indirect fixtures are fifteen 8-inch diameter recessed 28-Watt compact fluorescent downlights that light up the aisles and add luminosity to the surrounding walls. They’re positioned at 6-foot and 8-foot intervals.

QUALITY INDICATORS	RATING		
	ACCEPTABLE	GOOD	EXCELLENT
Control of Direct and Reflected Glare			✓
Light on Walls and Ceilings			✓
Fixture Location Related to People			✓
Light Patterns and Uniformity			✓
Daylighting Integration	✓		
Color Rendering and Color Temperature			✓
Lighting Controls and Flexibility			✓
Quantity of Light on Horizontal Surfaces (fc)		✓	



Task lights located underneath overhead storage bins triple the number of footcandles per desktop.

## IMPRESSIONS

Kinetics' Office Manager, Nicole Sullo, observed that lighting in the open office area seems better on the eyes, is brighter and more attractive than that from the acrylic lensed fluorescent troffers in offices on the other side of the building. "The light is not harsh, but diffuses in all directions," she notes.

The engineers working in the open office cubicles find the overhead light ample and bright enough that they choose to turn off the task lights over their desks.

Sullo says employees are more satisfied, and, by inference, more productive. She praises the comfort provided by the suspended direct-indirect luminaires. "We don't hear people asking, 'Can you take out a light bulb; it's too bright... It's giving me a headache.' It's a big bonus."

## AND NOW THE NUMBERS

In the open office area, with task lights left off, 25 to 35 foot-candles is measured on desktops in cubicles. The *Office Lighting knowhow*<sup>™</sup> series guide points out that the use of partitions higher than 54-inches and overhead storage

bins will drop the maintained foot-candles on desktop average by 15-20%. However, with individual task lights turned on, the local work surface lighting triples to an average of 90 foot-candles per desktop!

Installed lighting power density of the pendant indirect fixtures is 0.83 watts/square foot. The lighting power density of the recessed downlights in circulation areas is 0.21watts/square foot. Combined, the open plan office area has a total lighting load of 1.04 watts/square foot. (Task lighting is excluded.)



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Nicole Sullo,  
Office Manager

### COSTS

Total fixtures and lamps	\$5,554
Total installation labor	\$1,850
Installed system cost	\$7,404
Materials per square foot	\$2.85
Installation labor per square foot	\$0.91
Total cost per square foot	\$3.76

### SAVINGS

Demand reduction	0.71 KW
Watts saved per square foot	0.35 W/SF
Annual utility cost savings <sup>1</sup>	\$185

<sup>1</sup>Based on 2,600 hours per year usage and local utility rate of \$0.10 per kilowatt-hour.



## PROJECT SUMMARY



<b>Utility:</b>	Massachusetts Electric
<b>Utility Representative:</b>	Ron Gillooly
<b>Customer:</b>	Kinetics Systems
<b>Facility:</b>	Kinetics Systems
<b>Location:</b>	Marlboro, Massachusetts
<b>Space:</b>	Office
<b>Area:</b>	2,028 square feet
<b>Ceiling Height:</b>	10 feet
<b>Fixtures Used:</b>	Corelite Class A AZ-WP-2T8-indirect with two 32 watt T-8 lamps (GE), and Halo 8" recessed downlights with 28 watt lamps (Sylvania)
<b>Light Levels Achieved:</b>	Average of 30 footcandles on work surfaces
<b>Lighting Power Density:</b>	1.04 watts per square foot
<b>Lighting Specifier:</b>	Kinetics Facilities Division and Charles Michal LC
<b>Installing Contractor:</b>	Giombetti Electric, Marlboro, Massachusetts

## THE LIGHTING KNOWHOW™ SERIES

The DesignLights™ Consortium publishes the *knowhow™ Series* for office, small retail, classroom and industrial/warehouse lighting. This *demonstrating lighting knowhow™ Case Study* highlights a specific installation of lighting that showcases quality, comfort and efficient use of energy. With members located throughout the Northeast and the Mid-Atlantic, the DesignLights™ Consortium is “a regional collaboration seeking to influence naturally occurring lighting events towards quality, comfort and efficiency.” The DLC includes among its members many electric utilities as active participants, as well as several other interested stakeholders. The DLC created these case studies with the intention of helping contractors and lighting specialists sell and deliver the benefits of high quality, energy efficient lighting to their customers in the commercial building market.

### Efficiency Vermont

#### Long Island Power Authority

#### National Grid

- Massachusetts Electric
- Narragansett Electric
- Granite State Electric
- Nantucket Electric

#### Northeast Energy Efficiency Partnerships, Inc.

### Northeast Utilities

- The Connecticut Light and Power Company
- Western Massachusetts Electric Company

#### New York State Energy Research and Development Authority

#### NStar Electric

#### United Illuminating Company

#### Unitil

- Fitchburg Gas and Electric Light Company



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