

COMBINING
ENERGY EFFICIENCY
AND QUALITY DESIGN

Mt. WACHUSETT COMMUNITY COLLEGE



A *knowhow*[™] CASE STUDY

demonstrating lighting



The college has had many compliments from staff and students on the lighting redesign.

The student cafeteria at Mt. Wachusett Community College has a split personality. By day it's a bright and cheerful gathering place for students to eat, socialize, and study. At night when the lights dim down, the space can become a lecture hall or conference room or entertainment venue.

The cafeteria in the Dr. Arthur F. Haley Academic Center used to be a drearier place. The aging lighting systems provided barely enough light to read by, and frequent lamp burnouts created terrible dark spots. When Peter Russo, account manager for

the Massachusetts Electric Company, offered to help relight the space, the college didn't hesitate to accept.

A primary goal was to replace the energy-hogging incandescent downlights and old box-style pendants with more modern, more efficient technologies. Working together, Joseph Amato, facilities director at Mt. Wachusett, and MECo's Architectural Liaison selected a sleek indirect lighting fixture using T8 fluorescent lamps. The technology is so efficient that it provides more light for fewer watts. By bouncing light off the ceiling, these fixtures lend a lightness and spaciousness that was sorely lacking.

Lighting is crucial in a multipurpose educational space and must accommodate the many uses of the facility. Sufficient light and glare control are key for reading and other fine tasks, especially at night. A bi-level switching system provides different "moods" for the space and lends flexibility for multimedia presentations, workshops, and recreational activities. Along with all its flexibility, the new lighting in the cafeteria will save the college substantial dollars in energy costs each year.

PROBLEMS OVERCOME

The 3,630 square-foot student cafeteria with a relatively high ceiling—11 feet 2 inches—is a multipurpose space filled with dining/work tables and chairs. Previously, two different lighting systems were employed: rows of square pendants at one end of the long room and incandescent downlights in the other areas.

The recessed downlights incorporated deep black baffles, and lamp burnouts plagued the maintenance staff. Over time the 150W PAR floodlamps that were originally specified were replaced with lower-wattage flood and even some 60W A-lamps. Light levels under those fixtures not burned out were only 10 to 12 footcandles, with readings between fixtures even lower.

The pendants, which dated back to the seventies, had an up-down light distribution with aging, yellowed egg crate louvers on the bottom. The 20-inch by 20-inch structures were oversized, out of scale for the room. Light levels here were only slightly better than in the downlight area, averaging about 18 footcandles.

The overall impression was gloomy and inappropriate as a gathering place for young people. Students who wished to study there likely had difficulty or experienced eyestrain.



Prior to 1999, the cafeteria in the Dr. Arthur F. Haley Academic Center was a drearier place.

LIGHTING QUALITY

The *Classroom Lighting knowhow™ Series* guide, also developed by the DesignLights™ Consortium, describes several lighting schemes for educational spaces that optimize energy use while creating a productive, comfortable, and adaptable environment. Mt. Wachusett exemplifies the guide's "better yet" lighting layout for a multipurpose space.



Other cafeteria space nearby is visited by far fewer students now.

The new lighting spreads glare-free lighting on the walls and ceiling for less than 1.4 watt per square foot. Sufficient light levels, good color properties, uniformity, and balanced brightness are also achieved. The silhouette of the sleek new pendants lends visual interest to the scene. The control system allows energy savings and adjusts the light level to the tasks at hand.

Longer lamp life and indirect lighting eliminate the maintenance headaches of the previous system. Fluorescents and compact fluorescents offer ten times the life of incandescent lamps, and thus need to be replaced less often. The evenness of light bounced off the ceiling means that individual lamp burnouts will be hardly noticed by students and will give the maintenance staff more time to schedule replacements.

Energy-efficient recessed compact-fluorescent lighting along the perimeter serves as emergency egress lighting. Because the windows reduce the distribution of light from the indirect-pendants, in these areas the downlights provide supplemental light at night.

QUALITY LIGHTING SOLUTION

Aesthetically, the linear pendants completely update the look of the space. Three rows of pendants are suspended 27 inches from the ceiling via aircraft cable, providing acceptable uniformity on the ceiling and excellent uniformity of light on the work surfaces. In addition, bouncing light throughout the space flatters the appearance of students, faculty, and visitors. Each 4-foot light fixture is lamped with two T8 fluorescents run on electronic ballasts. At a correlated color temperature of 4100K, the fluorescents create a moderately upbeat ambiance and blend well with daylighting. For studying, dining, relaxing, and socializing, the color-rendering index is good at 82 (out of 100 maximum possible).

Recessed downlights along the outer walls house two horizontal four-pin compact fluorescent lamps. These low-glare fixtures are far more efficient than the previous incandescent fixtures. The 841 rating of the 26 W fluorescent lamps match the color qualities of fluorescent pendants.

Control flexibility supports the multi-purpose uses of the cafeteria. A tandem-wired ballast option was selected for the pendant fixture that allows each lamp within the fixture to be placed on one of two switching circuits. Both circuits on achieves full light levels; energizing only one circuit provides less light that is preferred by some students for computer-use. During evening social events, only the perimeter compact fluorescent down-lights are needed, creating intimately low light levels appropriate to the mood.

QUALITY INDICATORS	RATING		
	ACCEPTABLE	GOOD	EXCELLENT
Control of Direct and Reflected Glare			✓
Light on Walls and Ceilings		✓	
Fixture Locations 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)	✓		



COMBINING
ENERGY EFFICIENCY
AND QUALITY DESIGN

“It’s a brighter, cheerier space, and there’s a lot less strain on the eyes when you’re trying to read. When the lights are on full I believe they can brighten your spirits or make people feel better.”

Joe Amato,
facilities director



When Peter Russo offered to help, Joe Amato didn’t hesitate to accept. Massachusetts Electric Company provided a new lighting design using *knowhow™ Series* concepts.

IMPRESSIONS

The modern fixtures and the energetic atmosphere they create are noticed and appreciated by students. Several remarked that studying in the space is much easier now. A similar cafeteria space nearby—with the old lighting—is visited by far fewer students. Joe Amato said he’s had many compliments from staff and students on the lighting re-design.

“The idea was to increase the light levels so people could more easily write and read papers on the table, and just to make it a brighter, more upbeat place for the students,” said Amato. “When the lights are on full I believe they can brighten your spirits or make people feel better.” He is not alone in his opinion: several studies have shown that many people prefer indirect lighting to direct downlighting.

The switching system is used frequently. “It’s great to have two different levels of lighting. I think it’s much more attractive, especially during special events,” Amato added. “Half energy has a more subdued mood for dinners and musical performances.”

The conspicuous dark areas caused by lamp burnouts are completely eliminated. “We were always replacing those incandescent lamps. We’ll be up on that ladder a lot less often now, which is safer. And even when a lamp is out, it won’t leave a dark spot,” he said.

AND NOW THE NUMBERS

The new lighting significantly improves aesthetics, flexibility, and task illumination. Substantial energy savings will help payback the investment in the new system. Connected load is reduced by half from over 3 to only 1.22 watts per square foot. Horizontal illumination at the tables now averages 45 footcandles, about three times higher than previously.

COSTS

Total fixtures and lamps	\$8,780
Total installation labor	\$16,000
Installed system cost	\$24,780
Materials per square foot	\$2.41
Installation labor per square foot	\$4.40
Total cost per square foot	\$6.81

SAVINGS

Demand reduction	6.3 KW
Watts saved per square foot	1.8 W/SF
Annual utility cost savings ¹	\$3,300

¹Based on 5,600 hours per year usage and local utility rate of \$0.09 per kilowatt-hour.



"We were always replacing incandescent lamps. We'll be up on that ladder a lot less often now, which is safer. And even when a lamp is out, it won't leave a dark spot."

Joe Amato, facilities director, Mt. Wachusett Community College

PROJECT SUMMARY

Utility:	Massachusetts Electric Company
Utility Representative:	Peter Russo
Customer:	Mt. Wachusett Community College
Facility:	Dr. Arthur F. Haley Academic Center
Location:	Gardner, Massachusetts
Space:	Multipurpose Educational
Area:	3,630 square feet
Ceiling Height:	11 feet 2 inches
Fixtures Used:	Finelite Series 3 indirect pendant luminaires with two T8 Phillips fluorescent lamps, and Prescolite recessed 26W compact fluorescent downlights
Mounting:	Suspended 27 inches from ceiling on 12-foot centers
Light Levels Achieved:	45 footcandles average (horizontal)
Lighting Power Density:	1.22 Watts per square foot
Lighting Specifier:	WV Engineering Associates
Installing Contractor:	Ostrow Electric

THE LIGHTING KNOWHOW™ SERIES

The DesignLights™ Consortium publishes the *knowhow™ Series* for office, small retail and classroom 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, 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 New England 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.

National Grid

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

Northeast Energy Efficiency Partnerships, Inc.

New York State Energy Research and Development Authority

Northeast Utilities

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

NStar

- Boston Edison Company
- Commonwealth Electric Company
- Cambridge Electric Light Company

United Illuminating

Unitil

- Fitchburg Gas and Electric Light Company

Prepared by Weller & Michal Architects Inc. with WV Engineering Associates PA.
Technical writing by Lois I. Hutchinson. Photography by George Leisey. Graphic Design by Braden Printing, Inc.

Disclaimer: These studies are provided for information purposes only. Neither the Sponsoring Agents nor any of their employees or sub-contractors makes any warranty, expressed or implied, or assumes any legal liability or responsibility for the accuracy, completeness or usefulness of any data, information, method, product or process disclosed in this document, or represents that its use will not infringe any privately owned rights, including, but not limited to, patents, trademarks or copyrights.