

# Case Study



MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY • ENVIRONMENTAL ASSISTANCE DIVISION • 1-800-662-9278

## Michigan Department of Environmental Quality *Lansing, Michigan*

### ENVIRONMENTAL ASSISTANCE DIVISION IMPROVES ITS LIGHTING AND SAVES ENERGY

The Environmental Assistance Division (EAD) is the information and assistance division within the Michigan Department of Environmental Quality (MDEQ), a state agency responsible for promoting environmental quality in Michigan. EAD's key purpose is to educate companies, institutions, and other government entities on pollution prevention techniques aimed at reducing air emissions, water discharges, and solid and hazardous waste. The division also promotes recycling.

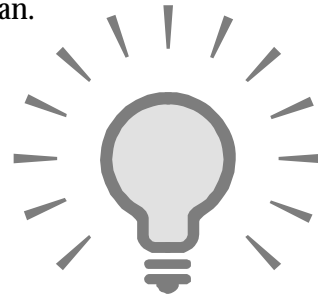
The Environmental Assistance Division is responsible for organizing the State of

Michigan's participation in the U.S. Environmental Protection Agency's (EPA) Green Lights program. Under Green Lights, participants sign a Memorandum of Understanding with EPA, agreeing to upgrade their facilities with energy efficient



lighting, in cases where it can be economically justified by return on investment. The focus has been on upgrading the lighting in all state-owned buildings and in buildings that have a five-year or longer lease.

In accordance with the Green Lights agreement, EAD made a decision in March of 1998 to upgrade the lighting in its own leased facility. The division has 101 staff located in 20,500 square feet of office space in Lansing, Michigan.



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Several lighting upgrade options were explored. Meetings were held between building management and EAD staff to determine which lighting upgrade option would work best for both parties.

The factors considered when discussing the lighting upgrade included:

✓ **Determining the type of lease — net lease or gross lease?** A net lease defines energy costs within a tenant's space as the responsibility of the tenant. A gross lease typically requires the landlord to pay for all building electricity. EAD has a net lease and pays its own electric bill. This was fortunate because, as tenants, EAD would benefit from any energy cost savings from a lighting upgrade.



✓ **Determining the owner's willingness to participate in the cost of materials or labor involved in a lighting upgrade.** In this case the owner was willing to supply the labor to install any lamps that were purchased but was unable to purchase new fixtures, ballasts, or lamps.



✓ **Determining the length of the lease** to help analyze the amount of investment EAD was willing to make and the necessary time frame for a payback on that investment.



✓ **Examining current light levels, lighting grid layout, and fixture and lamp type.** In this case there was a uniform grid layout of 4-lamp, T-12, 34-watt, recessed prismatic lens fixtures that did provide enough light.



✓ **Comparing lighting upgrade choices** to determine costs, payback potential, and lighting level capability. EAD narrowed the choices down to three upgrade possibilities:



- ❶ two T-8 lamps per fixture with reflector and an electronic ballast;
- ❷ three T-8 lamps per new fixture with an electronic ballast; or
- ❸ two T-10 lamps per fixture, retaining one magnetic ballast already in place.

Final analysis showed a tenant with a medium-length lease, a modest amount of capital to invest in leased building improvements, and adequate light levels with a uniform grid layout. Thus, EAD opted for the less-conventional, T-10 delamping upgrade.

To upgrade, the existing 4-lamp, T-12 fixtures had to be replaced with two T-10 lamps. The procedure was to remove all four lamps, disconnect power to the outer ballast (because an unused but still-connected ballast will draw

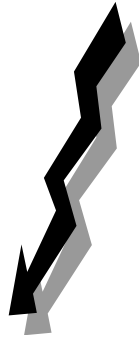
about 6 watts), and install two T-10's on the inside lamp position. EAD chose the inside lamp position because this did not leave the appearance of a dark spot in the middle of the fixture.

**ENVIRONMENTAL ASSISTANCE DIVISION REAPS THE BENEFITS OF LIGHTING UPGRADE**

This facility upgraded 288 fixtures with 576 new lamps, resulting in a savings of 54 watts per fixture. At 3,200 lighting hours per year, this calculates into an energy savings of 49,766 kwh. Peak kilowatts were reduced by 15.5. This energy savings will provide a reduction of \$3,000 dollars in energy costs per year, a savings which will generate a quick payback on investment in only 1.13 years. Other environmental savings include:



- ✓ A mercury **source reduction** of 21,888 milligrams.
- ✓ Yearly **reductions** in carbon dioxide emissions of 89,579 pounds.
- ✓ Yearly **reductions** in sulfur dioxide emissions of 517,566 grams per year.
- ✓ Yearly **reductions** in nitrogen oxide emissions of 174,181 grams per year.



This upgrade provided several advantages:

✓ **Efficiency:** T-10 lamps provide more light with more lumens per watt than the T-12, 34-watt lamps they replaced. This increase in efficiency allows for the delamping of each fixture from four lamps to two. By delamping to two lamps per fixture, only one ballast is required. This results in less watts being needed to power the fixture. The result is electrical savings of 40% for lighting costs. With only two lamps and one ballast burning, less heat is produced and a savings in building heating and cooling is also realized.



✓ **Quality of the Lamps:** The T-10 lamp, much like the efficient T-8, contains the latest in lighting technology. Rare earth phosphors are used which result in an improved color rendering of objects, easier starting with less flickering, and a 20% increase in lamp life (rated at 24,000 hours). The lamps purchased were 5000k lamps which emit light in the pleasing daylight spectrum. EAD also chose the low-mercury **Alto\*** lamp.



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\*Note: The tradename for the T-10 Alto lamp used in this study is the Philips T-12 Advantage 50k lamp. The term T-10 lamp is used throughout the Case Study because these new lamps were formerly called T-10's and use the T-10 technology. They should not be confused with the less efficient, T-12 40cw lamp.

Fluorescent lamps normally contain enough mercury to be considered hazardous. The Alto lamp has reduced this mercury level from the industry standard of 22.8 mg per lamp to less than 10 mg per lamp and is not considered a hazardous waste at the end of its life.

✓ ***Continued use of the existing magnetic ballasts:*** This approach prevents hundreds of pounds of useful ballasts from being recycled or discarded long before the end of their life. Switching to electronic ballasts at the end of the current magnetic ballasts' life is a viable and recommended option that can be implemented as the final phase of the upgrade. This final phase is feasible because the T-10's are compatible with certain electronic ballasts. The initial phase provides excellent lighting with a superb payback, and the final phase completes the upgrade and provides a long-term, efficient upgrade that is competitive with the T-8 upgrades for overall efficiency.



The T-10 upgrade chosen by EAD fit the particular circumstances at its leased facility. This upgrade has been described as one possible choice. In an owned building or in a building with a long-term lease with funding for capital improvements, one of the T-8 upgrades would very likely have been recommended. The upgrade presented here is a viable option for tenants in the same situation. It provides an efficient, long-term option, particularly when the final phase involves the implementation of electronic ballasts.



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