Do It Yourself Lighting Power Survey:

Lighting Power Audit for Use with the Massachusetts
Type Watts Per Square Foot Method of Calculating
A Building's Lighting Power Budget

MASTER

June 1980

Prepared for:

U.S. Department of Energy

Assistant Secretary for Conservation and Solar Energy
Office of Energy Management and Extension

Under Contract No. DE-FG01-79CS60467

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Washington, D.C. 20585

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Building Code Commission
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Do-It-Yourself Lighting Power Survey

Once you are familiar with the terminology and lighting basics, you are well-equipped to conduct a thorough survey of your building's lighting system yourself. Before we consider the step-by-step lighting survey procedures, let's look at some of the advantages which this self-audit approach to energy conservation offers:

It's Cheaper To Do It Yourself: Some of the most immediate and cost-effective changes you can make are low-cost or no-cost actions such as delamping or buying and replacing with more efficient lamps. These changes are obvious—but only after you take the time and effort to look at your system. By making these decisions yourself, you reduce the pay back period for investments, because expensive consulting service need not be included in your calculations. Even if it appears that one or more areas present special problems, when you do consult with someone, you can direct them to the specific problem areas and save time and money in the process.

Your Employees Become Part of Your Corporate Conservation Effort: If top management takes the lead in this audit project, assigning staff to execute it and reviewing their results and recommended changes, your concern and determination to conserve energy and save money are conveyed quite directly—certainly more so than by simply circulating a consultant's report. This lesson is quite likely to carry over into other operational habits which affect energy consumption and costs.

No One Knows Your Building and Its Needs Better Than You Do: Explaining these things to some expert takes time and money which might be better spent educating yourself—about lighting systems and about your building's current use of them.

Six Easy Steps For Auditing Your Lighting System

Step 1. Divide Your Building Into Categories

These categories should be defined by the level of illumination which is necessary to conduct business or commerce in those areas. Classrooms, offices or merchandising areas might comprise "Category A"; auditoriums, waiting areas or inventory storage might comprise "Category B"; corridors, lobbies, and inactive storage might comprise "Category C". (See Fig. 1)

Fig. 1
Suggested Category Areas

TYPE OF USE

Interior

Category A: Classrooms, office areas, automotive mechanical areas, museums, conference rooms, drafting rooms, clerical areas, laboratories, merchandising areas, kitchens, examining rooms, book stacks, athletic facilities.

Category B: Auditoriums, waiting areas, spectator areas, restrooms, dining areas, transportation terminals, working corridors in prisons and hospitals, book storage areas, active inventory storage, hospital bedrooms, hotel and motel bedrooms, enclosed shopping mall concourse areas, stairways.

Category C: Corridors, lobbies, elevators, inactive storage areas.

Category D: Indoor parking.

Exterior

Category E: Building perimeter: wall-wash, facade, canopy.

Category F: Outdoor parking.

Step 2. Determine the Total Square Footage for Each Category

One key tool for completing this step quickly and accurately is your floor plan. The actual blue prints are the best source for room size, but you might also draw a schematic plan like the one shown here, so that you can color code it by category. (See Fig. 2).

Fig. 2
Building Floor Plan

Category A
Category B
Category C

SUMMARY SHEET**LIGHTING POWER AUDIT****GENERAL INFORMATION:**Building Name: _____ Tenant ☐ Landlord ☐

Address: _____

City/Town: _____

Building Owner: _____

Building Supt./Engineer: _____

Telephone # _____

Building Use Type: _____

TOTALS BY CATEGORY:

Category	Total Area/ Category	× Allowance/ Sq. Ft.	= Total Watts Allowance	Total Connected Load
A				
B				
C				
D				
Interior Total				
E				
F				
Exterior Total				

CERTIFICATION:

This is to certify that to the best of my knowledge this power audit accurately represents the connected lighting load in this building.

NAME (Print)_____
SIGNED_____
DATE

Return Address:

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Send to:

Fig. 4 Typical Lighting Fixture Wattage

I. Fluorescent

Lamp Description	Lamps per Fixture	Lamp Type	Fixture Wattage*
4 Ft. 40 Watt Rapid Start	1-F40T12		50
	2-F40T12		92
	3-F40T12		142
	4-F40T12		184
8 Ft. Slimline Instant Start	1-F96T12		100
	2-F96T12		170
	3-F96T12		270
	4-F96T12		340
8 Ft. High Output	1-F96T12/HO		140
	2-F96T12/HO		252
	3-F96T12/HO		392
	4-F96T12/HO		504
8 Ft. 1500 ma Power Grove, SHO or VHO	1-F96PG17		
	1-F96T12/SHO or VHO		230
	2-F96PG17		
	2-F96T12/SHO or VHO		450
	3-F96PG17		
	3-F96T12/SHO or VHO		680
	4-F96PG17		
	4-F96T12/SHO or VHO		900

II. High Intensity Discharge

Lamp Type	Lamp Designation	Watts	Fixture Wattage*
Mercury	MV 100	100	118
	MV 175	175	200
	MV 250	250	285
	MV 400	400	450
	MV 1000	1000	1075
Metal Halide	MH 175	175	210
	MH 250	250	292
	MH 400	400	455
	MH 1000	1000	1070
High Pressure Sodium	HPS 70	70	88
	HPS 100	100	130
	HPS 150	150	188
	HPS 250	250	300
	HPS 400	400	465
	HPS 1000	1000	1090

*Includes Lamp and Ballast Wattage

LIGHTING POWER AUDIT					DETAIL SHEET	
GENERAL INFORMATION:					Sheet <u>1</u> of <u>4</u>	
SAMPLE						
Building Name: <u>Mc Cormick Office Building</u> Address: <u>300 Main Street</u> City/Town: <u>Boston, Massachusetts</u> Building Owner: <u>Frederick Jones</u> Superintendent: _____ Phone: _____						
CATEGORY OF USE: <u>A</u>						
Room Name	Area (Sq. Ft.)	Lamp or Fixture Type	Quantity	Watts/ Unit	Total Connected Load (Watts)	
OFFICE	532	2-F40T12	2	92	184	
		150W/FL incandescent	4	150	600	
CONFERENCE	864	4-F40T12	6	184	1104	

Fig. 5

DETAIL SHEET

LIGHTING POWER AUDIT

Sheet__of__

GENERAL INFORMATION:

Building Name: _____

Address: _____

City/Town: _____

Building Owner: _____

Superintendent: _____

Phone: _____

CATEGORY OF USE:_____

[illegible]

Step 3. Assign a Power Allowance for Each Category

These allowances should be expressed in watts-per-square foot. Some states already assign specific allowances for pre-defined categories, and you may want to check with your state energy office. But for your own auditing purposes, you may want to *assign allowances which are even more stringent*. For example, some states currently allow 3 watts per square foot in offices, but experience has shown that 2 watts per square foot is more than adequate for achieving a healthy and productive office work environment.

Step 4. Multiply the Total Square Footage for Each Category by the Respective Power Allowances

This will establish the maximum level of lighting power which should be necessary in each category. If your state has adopted a standard which requires you to meet minimum lighting power efficiencies for each category, this step will provide you with the respective budgets you must meet.

Step 5. Add the Budget Sub-Totals for Each Category to Determine Your Total Building Budget

Some states allow you "trade-off" lighting power between and among categories within a building. Using retailing as an example, this would mean that you could exceed the power allowance for merchandising areas so long as you reduced by an equivalent amount in inventory or storage areas. Compliance with standards in states which allow this option is achieved by meeting the total budget for the total building. The Summary Sheet provides a useful format for calculating these individual category and total building budgets (see Fig. 3).

Step 6. Walk Through Your Building Room-by-Room, and Calculate Your Connected Lighting Load Fixture-by-Fixture

Up to now, it is conceivable that you may have completed Steps 1-5 without ever having left your office. But the only way to adequately assess if you have met the individual category or total building budgets is by a thorough accounting of the system. The Detail Sheet is your key tool, and a separate one should be completed for each category. It should include the following: room name or number, size of each room in square feet, a separate line for each fixture or lamp type within each room.

If you use fluorescent or high intensity discharge lamps, the total fixture wattage—including ballast—should be noted (see Fig. 4). On the bottom of the Detail Sheet, you should identify the totals for both square feet and connected load for the given category as reported on that page. The final totals for each category should be transferred to the Summary Sheet, where the respective budgets should already be identified from Steps 4 and 5.

You simply compare. If you exceed either the individual category or the total building budgets, you can then use the Detail Sheets to plan the necessary modifications (see Fig. 5)

It should be noted that some states have allowed an exemption for "task lighting" from inclusion in the Total Connected Load. Task Lighting is defined as that which illuminates a specific work site and is individually switched at that site. (Examples: desk lights, machine lights, examining lights). Here too, you should check with your State Energy Office to see if this exemption applies.

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NOTICE

The attached *Do-It-Yourself Lighting Power Survey* is a self-mailer designed to foster greater lighting energy efficiency in the buildings of those who make the survey to find out how they can achieve such efficiency. It was prepared as an account of work done under grant number DE-FG01-79CS 60467, by the Massachusetts State Building Code Commission, and sponsored by the United States Government. Neither the United States nor the United States Department of Energy, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, mark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.