



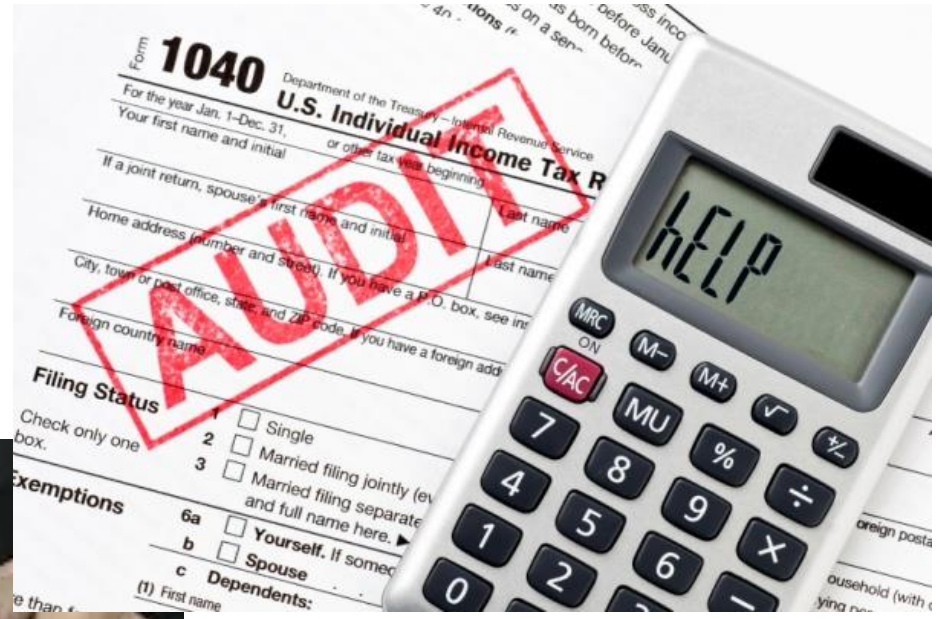
THE IMPORTANCE OF CONDUCTING A [GOOD] LIGHTING AUDIT

Tim Nelson

Biking → Swimming Pools → Energy



What is an Audit?



What is an Audit?



What is a Lighting Audit?

69 Elements													
Location-Area / Room	Element #	Fixture	Attributes	Burn Group Hours	Action	Qty	Notes						
HQ / Production													
PRODUCTION	#1	F-F54T5HO-6	Highbay-1X4-Miro Reflector-Aircraft Cable	Manufacturing 3900	Retrofit	58							
	#2	F-F54T5HO-6	Highbay-1X4-Miro Reflector-Aircraft Cable	Manufacturing 3900	Retrofit	18							
	#3	F-F96T12-2	Industrial Strip-1X8-White Reflector-Aircraft Cable	Manufacturing 3900	Retrofit	3							
	#4	F-F96T8-2	Industrial Strip-1X8-White Reflector-Surface	Manufacturing 3900	Retrofit	4							
	#5	F-F54T5HO-6	Highbay-1X4-Miro Reflector-Aircraft Cable	Manufacturing 3900	Retrofit	4							
	#6	F-F32T8-4	Troffer-2X4-Prismatic-Recessed	Manufacturing 3900	Retrofit	3							
WAREHOUSE	#57	F-F54T5HO-6	Highbay-1X4-Miro Reflector-Aircraft Cable	Warehouse 2600	Retrofit	50							
	#58	MH-MH400-1	Highbay-Mogul-Clear-Pendant	Manufacturing 3900	Retrofit	2							

Is Your Auditor Qualified?



Is Your Auditor Qualified?



Is Your Auditor Qualified?



Is Your Auditor Qualified?



Is Your Auditor Qualified?

Good auditor

- Asks lots of good questions
- Takes notes, pictures
- Covers the entire facility
- Measures existing footcandles
- Comes prepared



Steps of an Audit: Prerequisite Data

Knowledge

- Organization goals
- Who to talk to

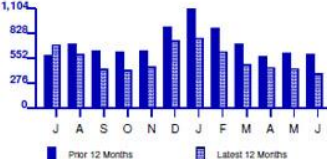
Steps of an Audit: Prerequisite Data

Utility Bills

www.duquesnelight.com
1-412-393-7100

Customer Name and Service Address:
SAMPLE RESIDENTIAL BILL

Account Number 9999-999-999-915
Rate: RS-Residential Service
Date Prepared: 06/16/11

Meter Reading Usage Information	Summary				
Next Scheduled Meter Reading Date: July 15, 2011	Prior Billing Information				
Meter Read Information for Meter Number: G00000000	Amount of Last Bill \$68.99				
Present: Jun 15, 2011 - Actual 9806	Payment(s) Received as of 06/01/11 -68.99				
Prior: May 16, 2011 - Actual 9773	Total Amount Owed From Your Last Bill \$0.00				
Difference 33	Your Pledge to Dollar Energy Fund \$5.00				
Your Meter Multiplier x 12	DLC Basic Service Charges 28.23				
Total kWh Used 396	Supplier Basic Service Charges 34.81				
Electric Usage:	TOTAL ACCOUNT BALANCE PAYABLE TO DLC \$68.04				
Comparing Your Usage	TOTAL BUDGET PAYMENT PLAN AMOUNT \$89.00				
Avg kWh Per Day Jun 10 20 Jun 11 13	ACTUAL METER READING BILL				
Avg Temperature (F) 69 69	See following pages for more detailed information.				
YTD Usage (kWh) 4,524 3,216	Please contact us at 1-412-393-7100 with any billing questions before the due date on your bill.				
kWh	Thank You. By giving to the Dollar Energy Fund, you help people without heat or light. Your pledge of \$5.00 is included in the 'Budget Amount' or 'Amount Due' below. Your year-to-date total of \$30.00 is tax deductible.				
					
<ul style="list-style-type: none"> Average Monthly Usage for the past 12 months is 550 kWh. Total Annual Usage for the past 12 months is 6,600 kWh. For comparison to other electric suppliers—your supply generation and transmission Price to Compare is 9.33 cents/kWh. 					
Estimated Gross Receipts Tax \$3.82	Estimated PA State Taxes \$4.29	Late Charge after Jul 7, 2011 \$0.78	Payment Due Jul 7, 2011	To Join the Budget Payment Plan see the message on page 3	Amount Due \$68.04

Please return this portion with your payment. Please enclose check facing forward.
Make payment payable to Duquesne Light Company.

Account Number 9999-999-999-915 PLEASE PAY THIS AMOUNT BY Jul 7, 2011 \$68.04

\$

Make account changes or pledge to the Dollar Energy Fund on the back-check box.

Amount Enclosed

#BWNHBYB
#0499999999995757#

SAMPLE RESIDENTIAL BILL

DUQUESNE LIGHT COMPANY
PAYMENT PROCESSING CENTER
PITTSBURGH, PA 15267-0001

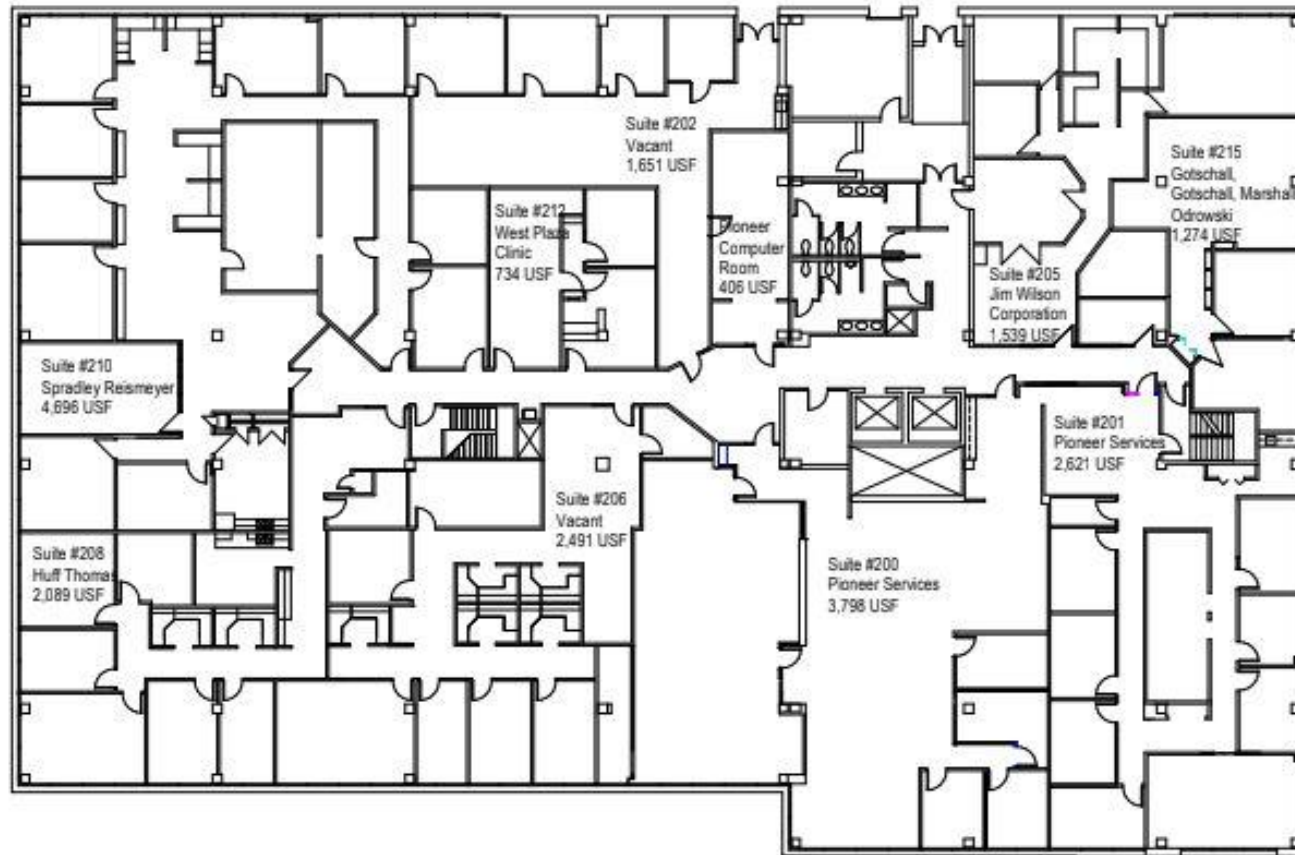
!152670001008!

99999999999157 000000068822 000000089005 000000068042



Steps of an Audit: Prerequisite Data

Maps



1 Floor 2
1/16" = 1'-0"

Day of the Audit...

Walk the facility with a person that knows the facility



Ask Questions:

When do the lights go on and off?

Are controls in place? Where could they be used?

Problem Areas?

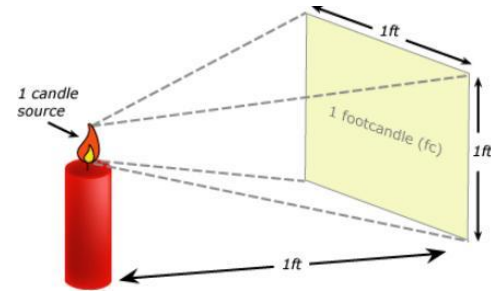
- Too dark
- Too bright
- Shadowy
- Flickers, glare, contrast



Day of the Audit...

Other info gathered:

- Ceiling and fixture heights
- Footcandle levels
- Potential installation challenges (need boom lift vs. scissor lift)
- Emergency lighting
- Non-operating fixtures
- Voltages (don't just ask: trust but verify)
- Pictures, pictures, and more pictures

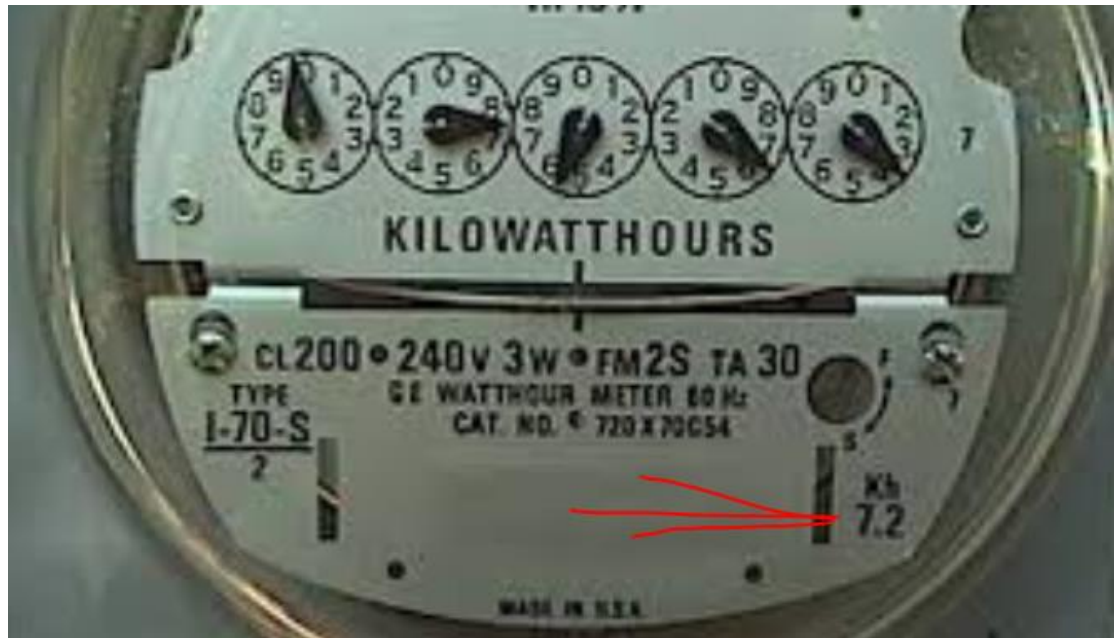


VOLTAGE



Other factors to consider

- Climate
- Facility size
- Facility age
- Schedules
- Equipment type
- Building Design
- Processes
- Culture
- Behavior



Results of an Audit

- Compare against other facilities (watts/sf, \$/sf)
- Potential savings opportunities
- Confirm if on correct tariff
- Confirm if lighting levels are adequate



What might you find in an Audit?

Mixed up colors in a troffer



What might you find in an Audit?

Mixed up tube sizes



T12

T8

T5

What might you find in an Audit?

Too bright



What might you find in an Audit?

Too dark



What might you find in an Audit?

Uncomfortable



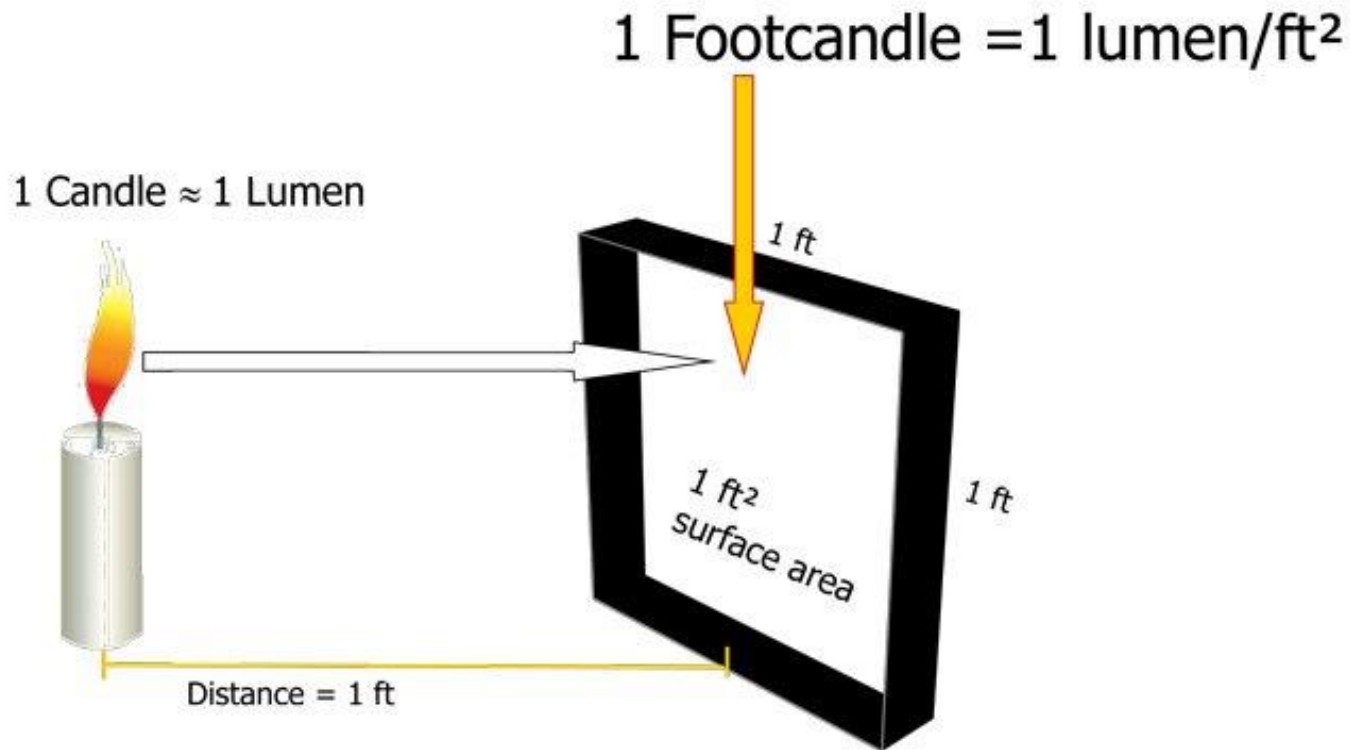
What might you find in an Audit?

Potential savings!



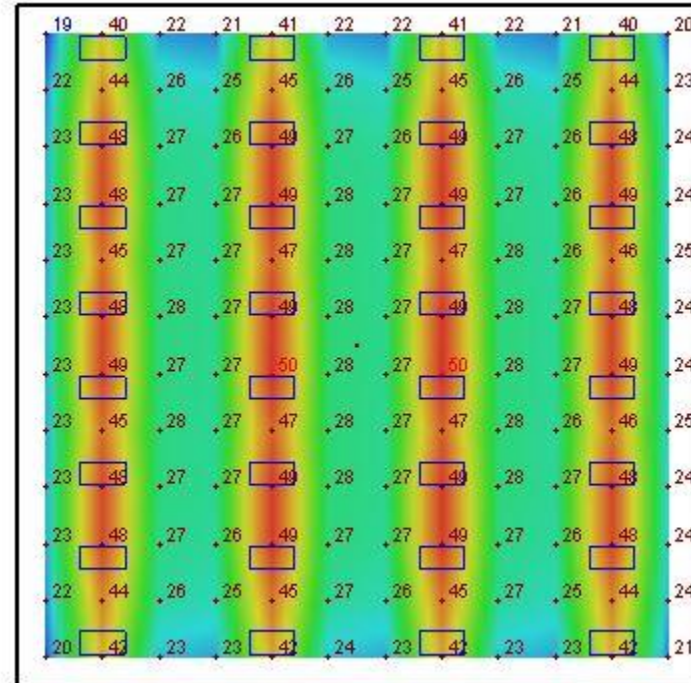
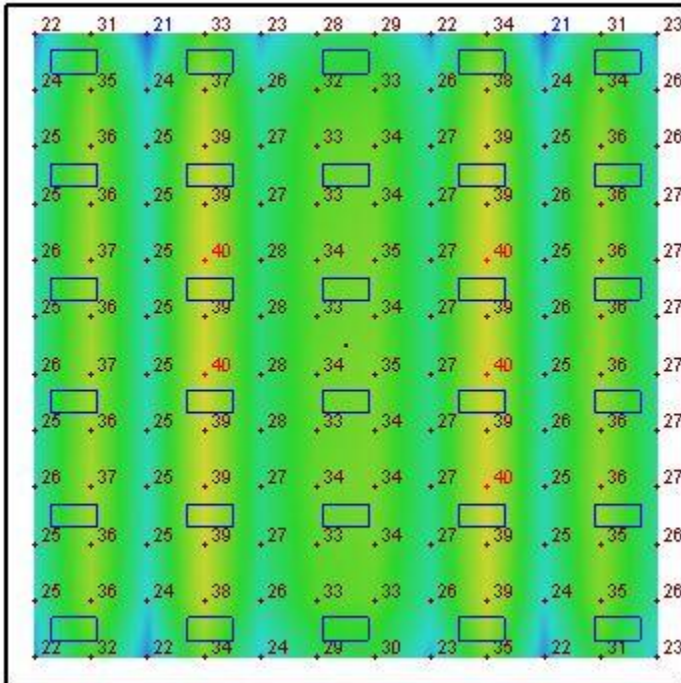
How is lighting quality measured?

Illumination level (foot-candle or Lux)



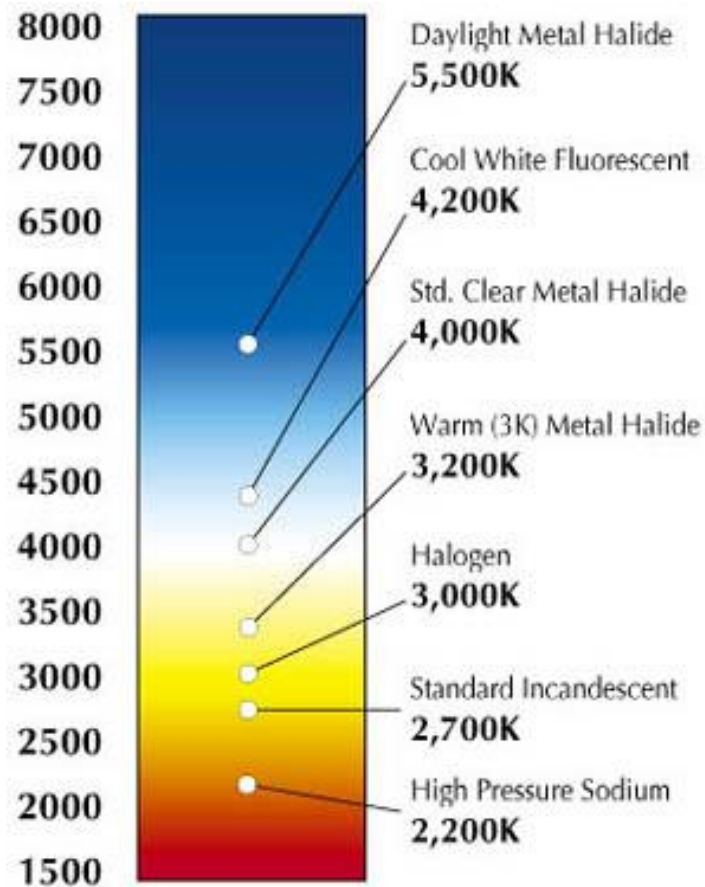
How is lighting quality measured?

Uniformity



How is lighting quality measured?

Color Temperature (Kelvin)



How is lighting quality measured?

Color Rendition Index (CRI)



CRI 75

CRI 95

Benefits of a [Good] Lighting Audit & Project

Correct excessive glare + flicker



Benefits of a [Good] Lighting Audit & Project

Energy conservation



Benefits of a [Good] Lighting Audit & Project

Safety



Benefits of a [Good] Lighting Audit & Project

Reduced A/C Loads



Benefits of a [Good] Lighting Audit & Project

Clarified cost & savings projections



Benefits of a [Good] Lighting Audit & Project

Energy savings



**Questions?
Comments?**



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