

# **A TALE OF TWO FORTS**

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LIGHTING WIZARDS**

# **LOT'S OF SLIDES LITTLE TIME SO I WILL GO FAST**

- You should have electronic access to this ppt
- If you want contact me later, my contact info is on last slide

# BIO

- About 80% of retrofit projects have been T8 to better T8
- 20 years experience
  - Distribution, maintenance, installer, retrofit contractor, consultant, designer, researcher
- 500+ projects
- 30+ published articles
- 500 seminars
- IESNA and committees member 1995 - 2008
- CLEP by AEE
- CLEP Review Board
- Lighting Certified by NCQLP
- Project manager for California Lighting Technology Center
- Assisted on DOE spectrally enhanced lighting research
- DOE CALiPER Guidance Committee member
- Several IIDA Awards

# BACKGROUND

- In 2008 for CERL EEAP (Construction Engineering Research Laboratory's Energy Engineering Analysis Program), through Stanley Consultants, I did site inspections and follow-up lighting audits for
  - Fort Benning in Georgia
    - Vernon Duck
  - 4 Forts on Oahu, Hawaii (considered as 1 Fort)
    - Schofield, Shafter, Tripler and Wheeler
    - Keith Yamanaka and Robin Hibler

# COMPARISONS

- Fort Benning
  - Very important
    - \$.06 KWH rate
    - No rebates
  - Less important
    - Low shipping costs
    - Low labor rates
- 4 Forts on Oahu
  - Very important
    - \$.22 KWH rate (but fluctuates on oil prices)
    - Very good rebates
  - Less important
    - High shipping costs
    - High labor rates
- Most other Forts should be in between

# COMPARISONS

- Both have a combination of
  - Basic grade 735 and 741 T8s with generic electronic ballasts
  - Some T12s with magnetic ballasts
  - HPS & standard MH with magnetic ballasts
- Both were considering 25 or 28W F32T8s
  - As I stated at this conference, last year in NYC, if your lighting supplier, ESCO, retrofit contractor and/or consultant recommends these lamps, without at least providing options with highest lumen ‘super’ 32W F32T8s -- **find new lighting people**

# COMPARISONS

- Both have substantial air conditioning loads
  - Reduced lighting wattage reduces AC loads
- Both have a lot of overlit office and some other applications
  - I saw numerous offices with over 80 footcandles of light on desks
    - The IESNA (Illuminating Engineering Society of North America) only recommends 30 - 50 footcandles
      - Even fewer standard footcandles are more than sufficient with high Kelvin lamps
  - More light is not always better
    - Often less light is preferred, because with more light there is more glare on computer screens

# COMPARISONS

- After going through a feasibility study, discussing the pros and cons of each option
  - Both Vernon Duck and Keith Yamanaka decided on high lumen ‘super’ 32W 5000K F32T8s
    - DOE is highly recommending spectrally or scotopically enhanced 5000 Kelvin lamps
  - Both agreed on delamping were can, because that is the best potential for energy savings
    - With low KWH rates and no rebates, Vernon decided that reflectors, which increase parts and labor costs, were not necessary for most delamping applications
    - With high KWH rates and good rebates, Keith wanted reflectors in most delamping applications, to allow slightly more wattage savings and improve fixture appearance

# COMPARISONS

- After going through a feasibility study, discussing the pros and cons of each option
  - Keith on Oahu selected extra efficient parallel wired program start T8 ballasts, for better lamp life, especially in occupancy applications, even though the cost \$5 - \$6 more than equivalent instant start ballasts
  - With low KWH rate and no rebates, I only recommended extra efficient parallel wired instant start ballasts for Vernon at Fort Benning

# COMPARISONS

- Different recommendations to replace 400W HPS and MH hibays, because of differences in KWH rates and rebates
  - For Vernon at Fort Benning, I specified new hibays with 5 F32T8 850 lamps with 1.15 BF ballasts, which saves the most energy and costs the least, while still providing adequate light
  - For Keith on Oahu, the spec was new hibays with 6 F32T8s with 1.15 BF ballasts, because the financial return was still quite good with the extra wattage, which provides more light
- Although I recommended a few interior and exterior LED and new suspended indirect/direct fixtures for Vernon, I was able to do more for Keith

# PHOTOS OF BAD LIGHTING



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# PHOTOS OF BAD LIGHTING



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# PHOTOS OF BAD LIGHTING



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# SUMMARY TABLES

- Three following summary tables are for buildings that I was able to see during one week onsite visits
  - And do not include the many other buildings
  - So costs, savings, etc. would be much higher for all buildings
- Since paybacks do not include any benefit after payback periods, long term benefits, including reduced maintenance costs and increased worker productivity, is the most important financial criteria

<b>FORT BENNING LIGHTING SUMMARY</b>		
Number of fixtures	before	18,877
	after	18,877
KW Reduction	amount	934.695
	percentage	55%
KWH Reduction	amount	2,959,023
	percentage	54%
Annual Electrical Savings		\$213,050
Approximate Cost (No Rebate)		\$1,392,173
Payback (Years)	basic	6.5
	comprehensive	4.7
Long Term Benefit	basic	\$1,688,897
	comprehensive	\$4,059,381

## OAHU ECIP LIGHTING SUMMARY

Number of fixtures	before	1,292
	after	1,292
KW Reduction	amount	251.047
	percentage	56%
KWH Reduction	amount	845,976
	percentage	64%
Annual Electrical Savings		\$186,115
Approximate Cost (Before Rebate)		\$555,160
Approximate Cost (After Rebate)		\$512,861
Payback (Years)	basic	2.8
	comprehensive	2.0
Long Term Benefit	basic	\$2,278,861
	comprehensive	\$4,341,597

## OAHU GENERAL LIGHTING SUMMARY

Number of fixtures	before	11,816
	after	11,816
KW Reduction	amount	537.191
	percentage	42%
KWH Reduction	amount	2,185,057
	percentage	44%
Annual Electrical Savings		\$528,784
Approximate Cost (Before Rebate)		\$1,285,366
Approximate Cost (After Rebate)		\$1,176,113
Payback (Years)	basic	2.2
	comprehensive	1.6
Long Term Benefit	basic	\$6,711,223
	comprehensive	\$9,901,977

# SO MUCH WASTE IN NEW BUILDINGS

- Both had quite new buildings
  - Which had way too high of lighting power density (watts per square foot)
- Both had new building plans
  - The Fort Benning one, which I attended a meeting for, had no listed maximum power density
  - The Oahu one, which I wrote a special report on, had over 1.5 watts square foot and outdated parabolic troffers
    - Did not even qualify for old ASHRAE requirements
    - No good and up to date lighting designer recommends parabolic troffers any more

# SO MUCH WASTE IN NEW BUILDINGS

- Yes, these buildings could be cost effectively retrofitted as soon as they open, but it would be so much better to do right the first time
  - As a tax payer, I get frustrated when I see this type of waste
  - From a confidential source:
    - In order to meet the rapid growth of the Army, the Corp of Engineers has had to adopt a "on time and on budget" project philosophy that does not allow the necessary time and money resources to provide even close to optimum lighting performance

# SO MUCH WASTE IN NEW BUILDINGS

- With commonly available high performance T8s, extra efficient fixed output ballasts, high performance kits or new ambient lighting fixtures, and LED task lights it is quite doable to get down to these power densities, including task lights, while providing good lighting quality and quantity
  - .4 - .6 watts per square foot in typical open and individual office areas
  - .5 - .7 watts per square foot in many classrooms
- Don't need expensive and complex dimming systems
- You also don't need T5 or T5HO systems
  - High performance T8 systems are over 15% more efficacious than T5HO systems

# **EXAMPLES OF PRODUCTS FOR VERY LOW INTERIOR POWER DENSITIES FOR NEW CONSTRUCTION, REMODELS & RETROFITS**

**SOME MAY BE DISPLAYED**

**LIGHTING**  
*for*  
**tomorrow**

## **2007 GRAND PRIZE WINNER**

QuickTime™ and a  
TIFF (Uncompressed) decompressor  
are needed to see this picture.

- **LR6 from Cree**
  - **11 watts, 600 lumens, 54 lm/W**
  - **2700 K, 92 CRI**

**LIGHTING**  
*for*  
*tomorrow*

## **WINNER – UNDERCABINET**

- **PLS Undercabinet by Finelite**
  - 8 watts, 344 lumens, 43 lm/W
  - 3500 K, 71 CRI

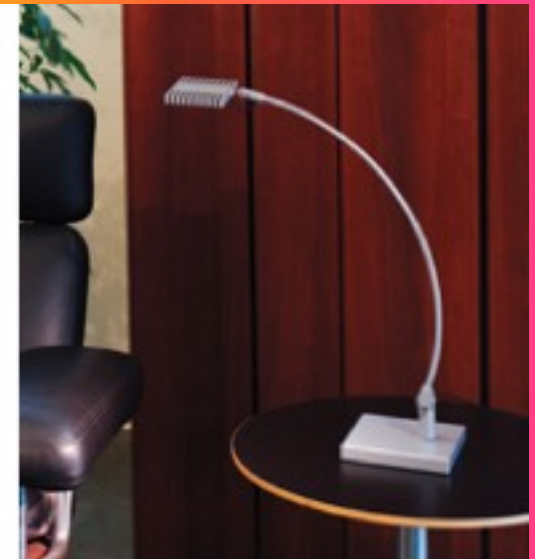
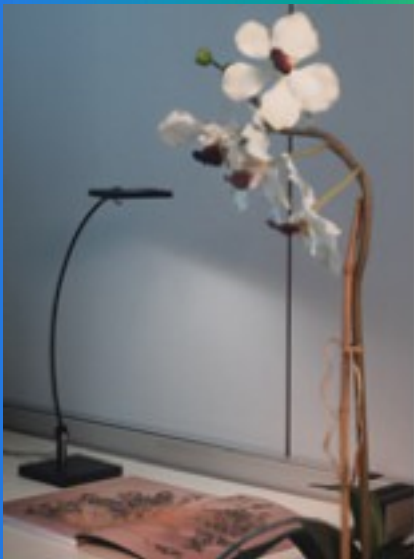


Source: U.S. Department of Energy

# LIGHTING *for* tomorrow

## WINNER – PORTABLE DESK/TASK

- **PLS Task by Finelite**
  - 10 watts, 430 lumens, 43 lm/W
  - 3500 K, 71 CRI

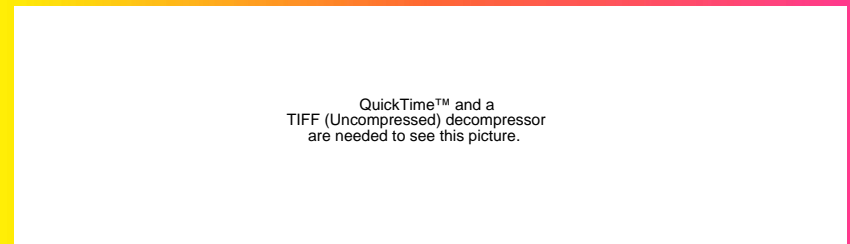
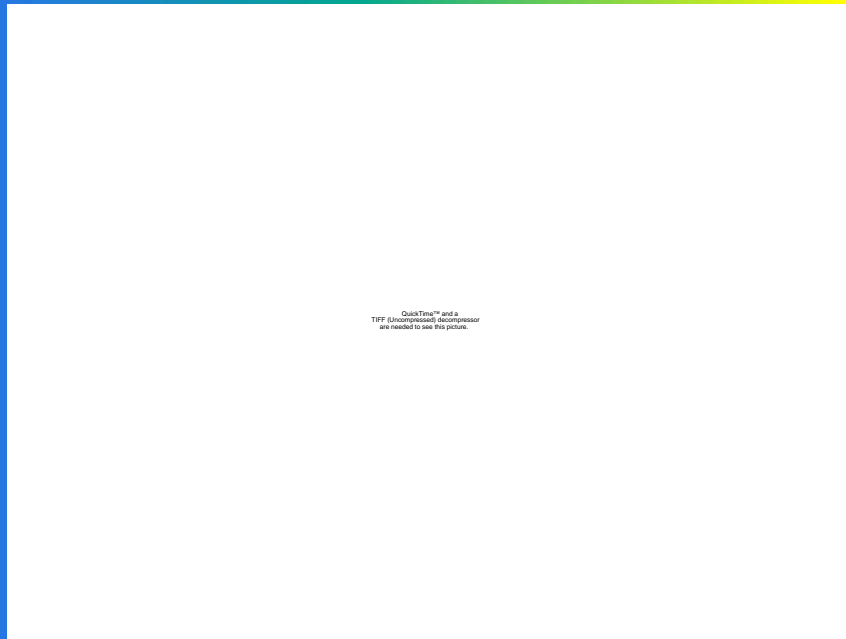


Source: U.S. Department of Energy

# **SUSPENDED DIRECT/INDIRECTS WITH 1F32T8 PER CROSS SECTION**

- Typically can use 1.00, .87, .77 or .71 BF extra efficient ballasting at 12' - 16' row spacing
- Much better fixture efficiency & optical control with 1 lamp per cross section than with 2 or 3
- For many applications want batwing distribution, so do not have zebra stripes on ceiling

# SUSPENDED DIRECT/INDIRECTS WITH 1F32T8 PER CROSS SECTION



# HIGH PERFORMANCE KITS

- These are much more than typical reflector kits
- Many are a great way get rid of parabolic louvers and delamp those fixtures without ruining proper cut-off angles
  - Although parabolic troffers were very popular in the late 80s through mid 90s, it can be generally agreed upon that parabolic troffers
    - Create the dreaded cave effect with dark ceilings and upper walls
    - Have only 70 - 75% fixture efficiency
    - Provide a lack of vertical footcandles
    - Cause overhead glare

# HIGH PERFORMANCE KITS

- Some manufacturers and kit models for T8s
  - Lithonia
    - ES8
    - Upcoming RT8
  - ALP
    - RDI AC HT
      - I have specified over 5000 of these and previous version with very happy customers
        - » Reduced wattage from 89 in 3F32T8 2x4 18 cell troffers to 48 with 2 F32T8 850 lamps and .77 BF extra efficient ballast or to 46 with 2 F32T8 850 lamps and .71 BF extra efficient ballast
    - RDI AC HTC
      - New 1-lamp kit for parabolic and lensed troffers, which can even reduce more wattage

# ALP RDI AC HTC KIT



**QUESTIONS**  
**COMMENTS**  
**APPLICATIONS**  
**???**

# ***THAT'S ALL FOLKS***

- **For further information**
  - **Stan Walerczyk**
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    - **www.lightingwizards.com**
- **Thanks for attending**
- **Hopefully more army bases in 2009**