

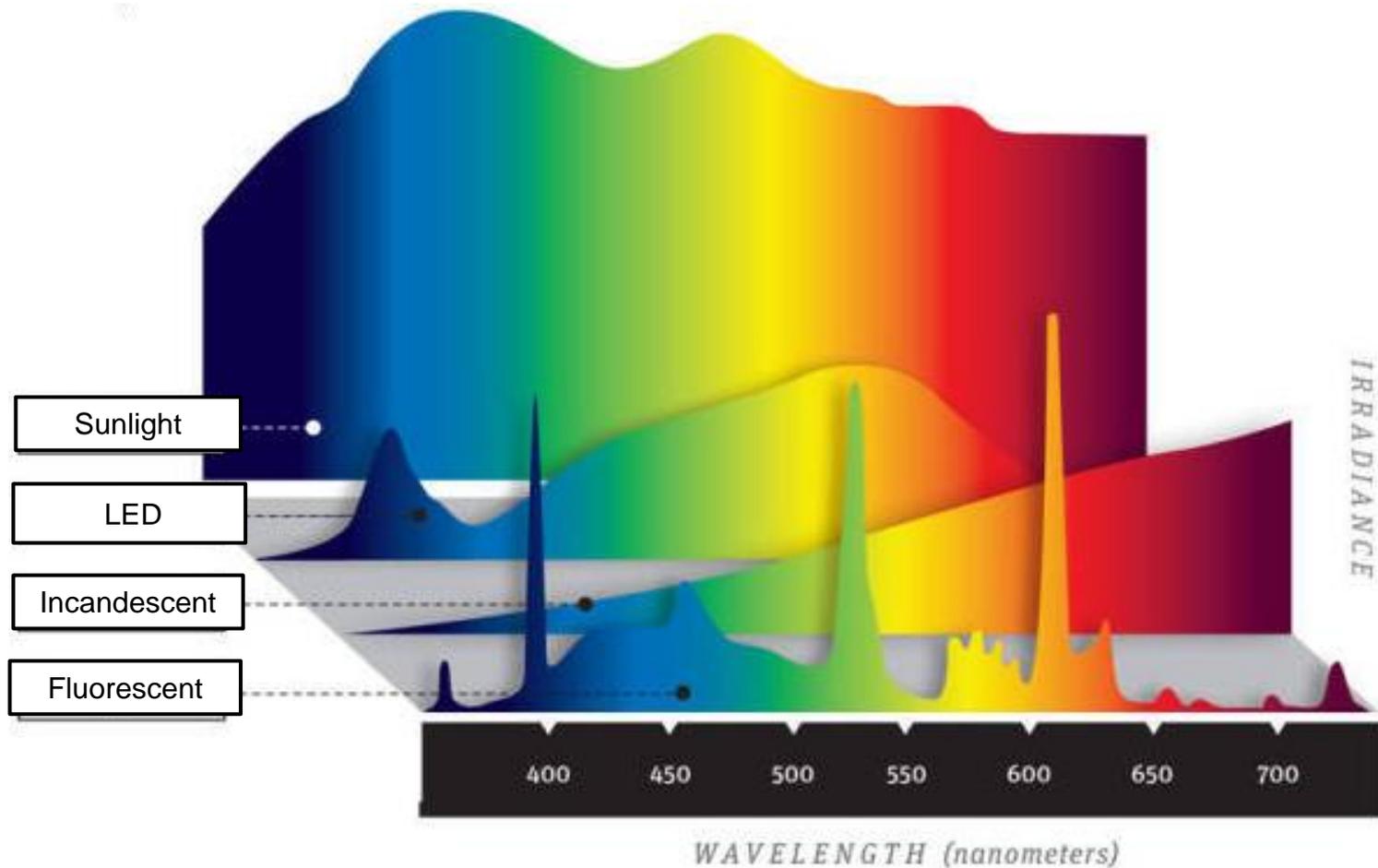


Department of Energy Solid State Lighting Research and Development Workshop

Naval Sea Systems Command Navy Shipboard Transition to LED lighting

Presented By:
LCDR Matthew Legler

LED light spectrum is closest to natural

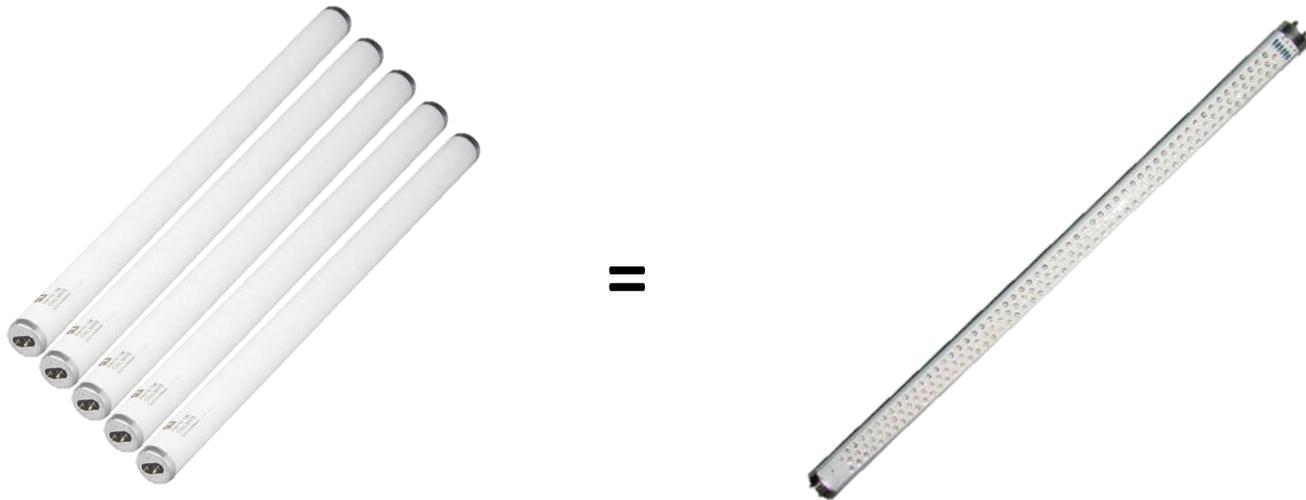


LED Lights have no HAZMAT



Removes requirement to store and carry lamps back from deployment

LED Lights Reduce Maintenance Labor



- **Fluorescent lights last 9,000hrs vs. 50,000hrs+ for LED**
- **5X life means fewer replacements by sailors**
 - **Labor savings per ship per year is around a man-year (less for small ships, more for large ships).**
 - **Savings even greater for LED fixtures promising lamp life of 100,000hrs+**

Fluorescent lights consume twice the power of LED lights



X



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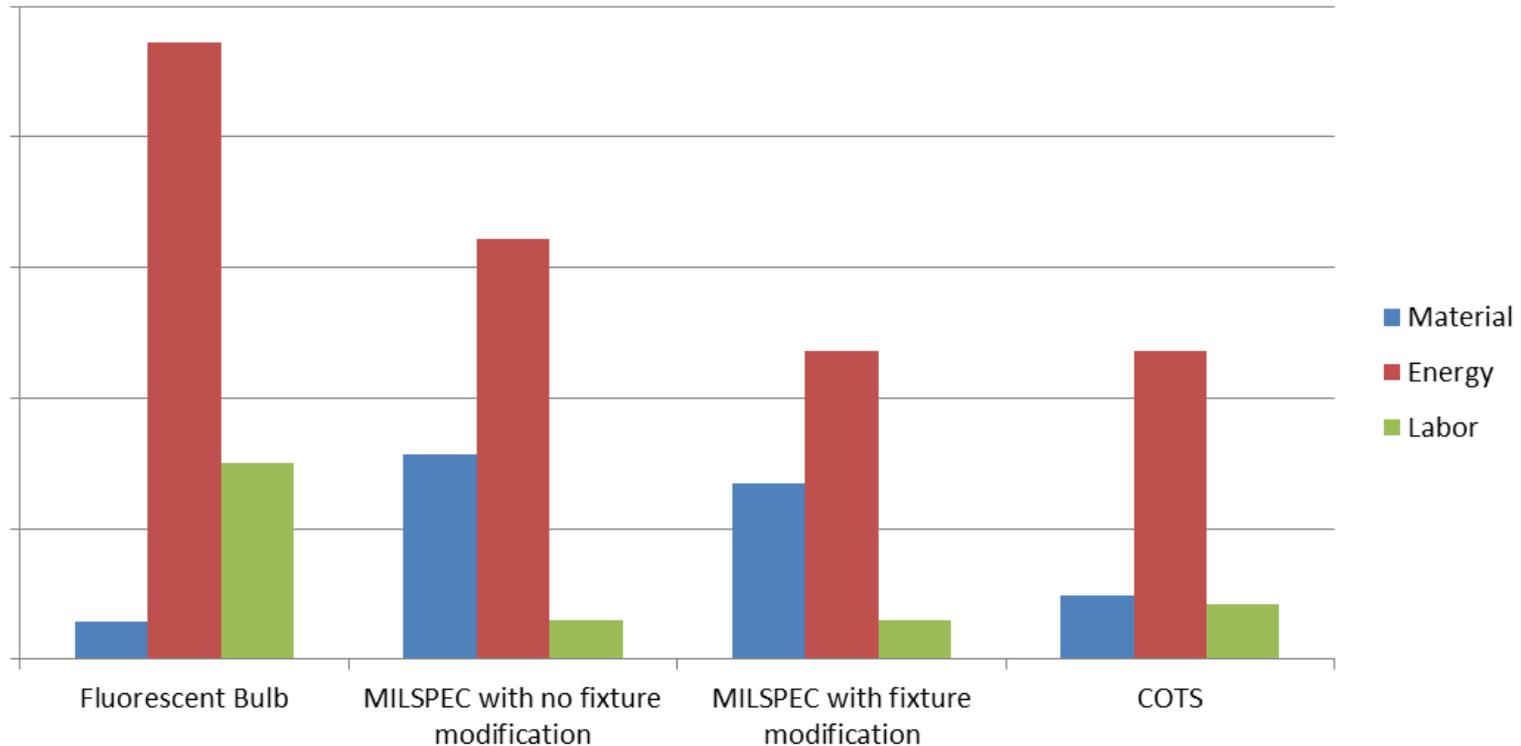
**\$5.8M
Savings**

~\$35 Additional
Fuel/ Tube

30yr Ship Life x 5500 Bulbs/Ship

- **If spaces are air conditioned ~30% additional energy is spent for waste heat removal**
- **Under same assumptions ~72 kilowatts of load would be removed from ship's generators**

Relative Cost Comparison



Takeaways:

- Fluorescent bulbs are the most cost prohibitive
- COTS is the optimal LED option
- MILSPEC bulbs are more expensive but achieve long-run cost avoidance

LEDs Produce Long-Term Cost and Energy Savings in Every Scenario

Existing interface



Existing interface



MILSPEC Finalization for Industry Review Challenges

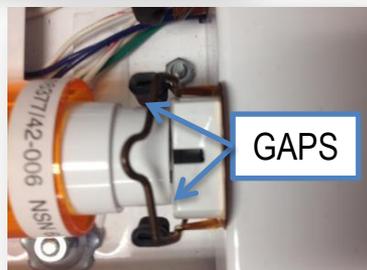


Commercial T8 LED w/T12 Filter

White light can escape from end cap Filter not secure around LED tube



No GAPS



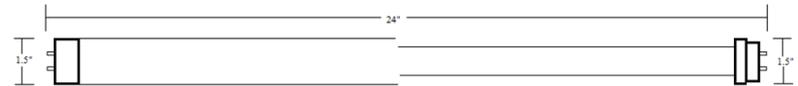
GAPS

Commercial T8 LED in T12 Fixture

May not have sufficient fit with shock clips

SOLUTIONS

- New end pieces with larger diameter to fit shock clips
- LED tubes with color LEDs
- Colored plastic from manufacturer over white LEDs
- Place existing plastic tubes over larger end pieces



*Allowance that only the end caps must be 1.5" diameter
Actual tube can be smaller diameter*

MIL-DTL-16377/86A

- Revised Specification takes into account:
 - Wiring configuration without ballast
 - Tubes that pass shock tests without clips
 - Colored LEDs vice filter tubes
- Expanded scope of revised specification to include 4' tubes for hangar bay use

INCH-POUND
MIL-DTL-16377/86A(SH)
24 February 2015
SUPERSEDING
MIL-DTL-0016377/86(SH)
30 June 2014

DETAIL SPECIFICATION SHEET

FIXTURES, LIGHTING; LAMP, SOLID STATE, FOR USE AS REPLACEMENT FOR COMMERCIAL FLUORESCENT LAMP

This specification is approved for use by the Naval Sea Systems Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

The requirements for acquiring the product described herein shall consist of this specification sheet and MIL-DTL-16377.

All dimensions are in inches. For tolerances other than those specified herein, see 3.5.2 of MIL-DTL-16377.



FIGURE 1. M16377/86-001 lamp dimensions (inches).



FIGURE 2. M16377/86-002 lamp dimensions (inches).



FIGURE 3. M16377/86-003 lamp dimensions (inches).

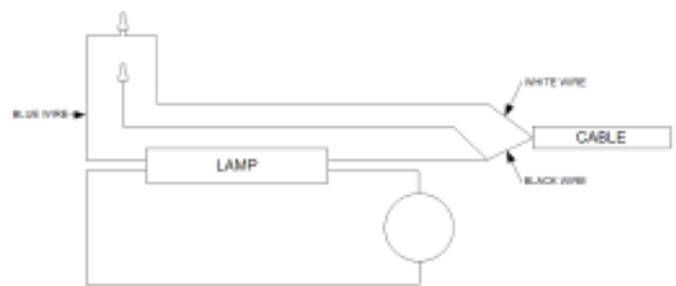
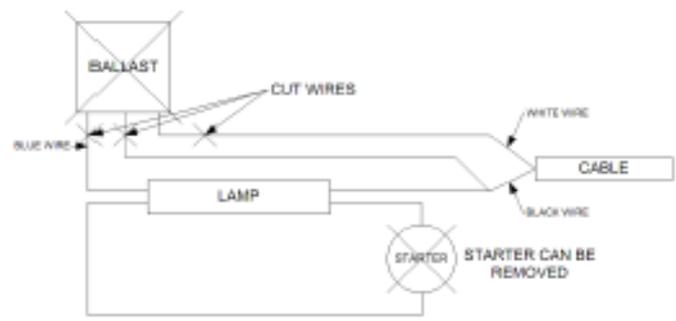
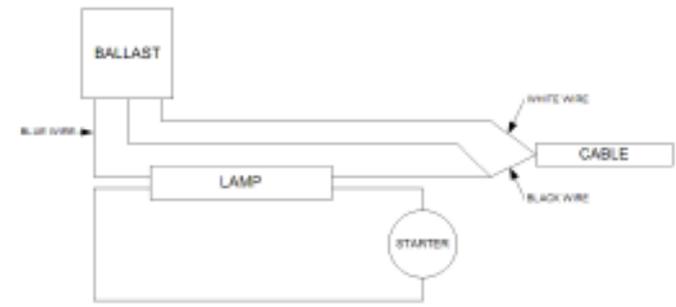


FIGURE 5. Ballast and starter removal for fixtures utilizing M16377/72, 3-wire ballast and M16377/81-002 ballast for 115-VAC operation of solid state lamp.

Significant Positive Fleet feedback on the quantity/ quality of light from LEDs

Passageway 1

Legacy F20T12 Fluorescents



Passageway 2

LED Lamps



Before and After Legacy vs LED Fixture





LEDs: Everyone wants LEDs (PART 2) <https://www.youtube.com/watch?v=rzs-DV4uvFo>



DEPARTMENT OF THE NAVY
OFFICE OF THE ASSISTANT SECRETARY
(RESEARCH, DEVELOPMENT AND ACQUISITION)
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FEB 24 2015

MEMORANDUM FOR DISTRIBUTION

SUBJECT: Authorization for Light-Emitting Diode Lighting

Enclosure: (1) NAVSEA white paper "Status of Shipboard LED Lighting Implementation" dated August 14, 2014

The Navy has several efforts underway to implement Light-Emitting Diode (LED) lighting into the Fleet. The installation of LED shipboard lighting will reduce shipboard fuel usage, decrease maintenance requirements and remove some hazardous materials from the shipboard environment. The benefits of LED shipboard lighting are described in enclosure (1).

Effective immediately, program managers should pursue installation of LED lighting on all new construction ships. Program managers are authorized to expend up to \$2 million per ship from the ship's change order funding (subject to availability) for LED lighting installation. Program Executive Officer approval is required if the estimated additional costs for LED lighting installation on a particular ship are more than \$2 million but less than \$10 million. Any additional costs approved by the program manager or Program Executive Officer for LED lighting installation should be reported at the program's annual Gate 6/Configuration Steering Board review (CSB) review.

Configuration Steering Board approval will be required in any instance where the additional costs for LED lighting installation on a particular ship are estimated to be \$10 million or more.



P. A. Grosklags
Vice Admiral, U.S. Navy
Principal Military Deputy

Congressional attention



DEPARTMENT OF DEFENSE APPROPRIATIONS BILL, 2015

Shipboard Lighting Systems.—The Committee commends the Navy for its increasing use of light-emitting diode [LED] lighting and encourages it to continue these activities. The Committee urges the Navy to consider updating lighting specifications for ships so LED use is not prohibited, developing an approved products list for LEDs that is broadly available for use in all vessels, using “total lifecycle costs” to determine the value of LEDs, and making the installation of LEDs in vessels a priority when appropriate, such as during ship retrofits and new builds.

- Reduce Weight
- Increased Light (No Glare)
- Improve Efficiency
- Improve Longevity
- Ease of Installation