

NSRP Panel Project PP 24-22

[ATI CONTRACT 2019-477-005]

LIGHTING ON NAVAL SHIPS DOD-HDBK-289(SH) MODERNIZATION SUPPORT EFFORT

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DOD-HDBK-289(SH) MODERNIZATION SUPPORT EFFORT

OBJECTIVE

Provide support to NAVSEA 05Z33 from an industry team comprised of multiple lighting manufacturers, shipyards, and Navy entities to expedite the revision process and accelerate the modernization of the U.S. Navy lighting.

PROBLEM(S) STATEMENT

- **Outdated Specifications: DOD-HDBK-289(SH) Last Revised November 1986.**
- Based on technological capabilities of 40 – 50 yrs. old lighting devices.
- Many legacy technologies becoming obsolete.
- New lighting technologies not retrofittable to legacy systems.
- New lighting technologies have different decay / failure mechanism than legacy lights.
- **HDBK does not address interaction of lights with other ship's systems.**

SOLUTION

- Re-define FUNCTIONAL REQUIREMENTS of lighting applications.
- Evaluate new, advanced lighting technologies and determine ability to meet FUNCTIONAL REQUIREMENTS.
- Create a set of recommendations for Navy effort to revise DOD-HDBK-289(SH) and evolve the document into a MIL-STD.

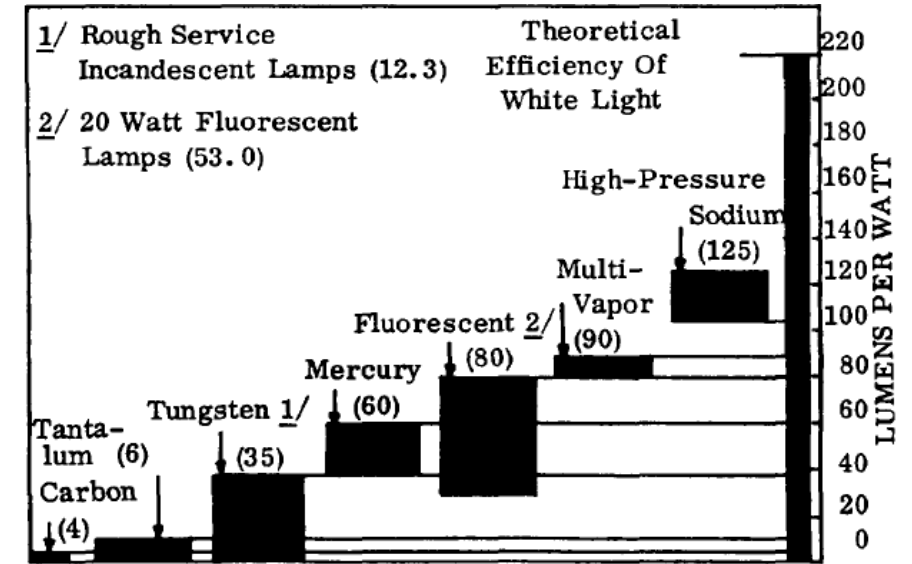


FIGURE 29. Light source efficiency in lumens per watt.



Vs.



DOD-HDBK-289(SH) MODERNIZATION SUPPORT EFFORT

TASKS

1. Select the most critical lighting applications to be analyzed for upgrade with the new technologies.
2. Identify functional requirements; compare to those stated in the DOD-HDBK-289. Identify requirements/guidelines that have become obsolete and should be deleted.
3. Evaluate new lighting technologies (i.e.: LEDs, OLEDs, diode lasers, and fiber optic lighting) to determine one(s) most suitable to meet the applications' requirements from a new build and retrofit standpoint.
4. Develop new set of performance requirements reflecting the functional needs of the applications and the capabilities of the available technologies.
5. Identify emerging lighting technologies that may be used once mature.
6. Estimate forward-fit new construction and retrofit costs.
7. Provide NAVSEA a document with recommendations for revisions to the DOD-HDBK-289(SH).

TEAM MEMBERS

- **Prime/Lead:** RSL Fiber Systems, LLC
- **Team Members:** HII – Ingalls Shipbuilding, HII – Newport News, Austal USA, U.S. Navy: **NAVSEA 05Z33**, SUPSHIP Gulf Coast; Phoenix Lighting, Signal Mate; PSU EOC.
- **ATI Project Manager:** Lydia Szydlo
- **Program Technical Representative:** Walt Skalniak (Ashby Co.)

ESTIMATED ROI

\$ 1 M/year on CVN and \$ 500K/year on DDG 51

(NAVSEA 05Z33 estimates for topside navigation & signaling)

PROGRAM FUNDS

\$ 150,000

DURATION

12 Months

PROJECT OBJECTIVES

- Support creation of MIL-STD Document
 - Can be referenced in ship design documents.
 - Performance specifications vs. detailed design specifications.
 - Move lighting tutorials to appendices.
 - Let shipbuilder determine best technologies to meet performance.
- Include advanced lighting technologies.
 - Light Emitting Diodes (LEDs).
 - Laser Diodes.
 - Organic LEDs (OLEDs).
 - Fiber optic remote source lighting.
- Include consideration for other ship systems/requirements.
 - Electromagnetic Interference (EMI).
 - Low Radar Cross Section (RCS).
 - Night Vision Imaging Systems (NVIS) aided operations.
 - Interference with Intelligence, Surveillance, Target Acquisition, and Reconnaissance (ISTAR) devices.
 - Susceptibility to High-Altitude Electromagnetic Pulse (HEMP).

PROJECT METHODOLOGY

- Identify sections of HDBK stating functional requirements.
 - Do not follow guidelines on how to implement legacy lighting devices.
- Catalog the different lighting types by application.
 - Determine if requirements were defined by the capabilities of legacy lighting devices.
 - Identify any new requirements lights must meet based on advances in ships's systems.
- Identify differences in New vs. Legacy and effect on specifications/regulations.
 - Failure modes.
 - Light intensity / Dimming requirements.
 - Spectral emissions.
 - Interference with other devices.
 - Safety considerations.
- Configure the lighting systems with the advanced lighting technologies.
 - Include controls and monitoring requirements.
 - Add any additional features / capabilities required to meet functional needs.

PROJECT PROGRESS

- Prioritized Lighting Groups and Identified Lights to Address
- Defined Requirements for Consideration

Compliance to 72 COLREGS
Intensity Decay Monitoring (IDM)
Correlated Color Temperature (CCT)
No EMI/RFI with other devices
Susceptibility to High-Altitude Electromagnetic Pulse (HEMP)
Low Radar Cross Section Design (L-RCS)
Ability to Dim 0 / 50%
Ability to dim linearly from 0 to 100%
Ability to transmit in Morse Code (MC)
Full Spectrum Emission (FSE)
Corrosion Resistance (CR)
Salt Spray Resistance
Requirement for De-Icing
NVIS Compatibility

Priority Ranking	LIGHTING GROUP
1	Navigation
2	Signaling
3	Searchlights
4	RAS/FAS Lights
5	CIC / Mission Control (CIC/MC)
6	Medical / Operating Room (M/OR)
7	Waterline Security
8	Helo Hangar
9	Boat bay
10	Deckwash
11	Workshops / Repair
12	Interior Living Spaces

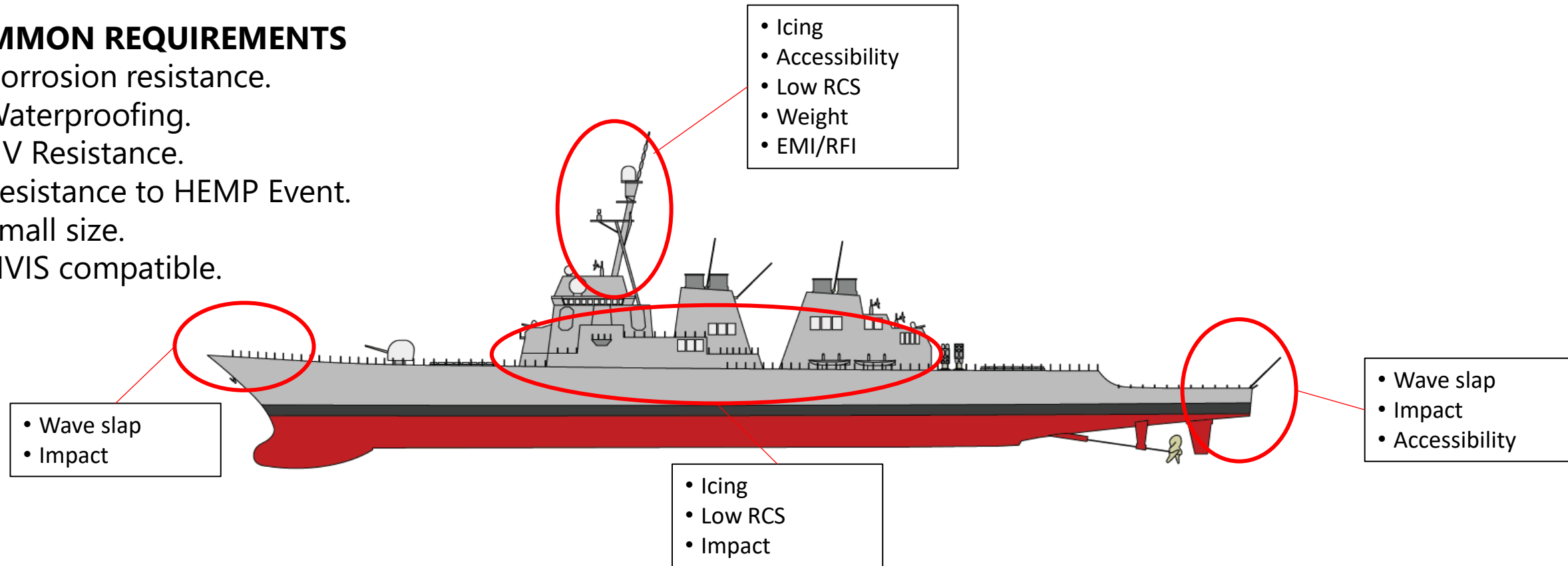
NOTES:

- 1) Lights in the top three (3) lighting groups are defined in Tables XXI, XXII, and XXIII of the HDBK.
- 2) The remainder of the effort will focus on groups from Tables XXI and XXII for surface ships and Aircraft warning, Stern (blue), and Wake from Table XXIII.

REQUIREMENTS BY LIGHTING LOCATION

COMMON REQUIREMENTS

- Corrosion resistance.
- Waterproofing.
- UV Resistance.
- Resistance to HEMP Event.
- Small size.
- NVIS compatible.



LIGHTING GROUP	COL REGS	IDM	CCT	EMI/RFI	HEMP	L-RCS	0 / 50% Dim	0-100 Full Dim	MC	FSE	CR	Salt Spray	De-Icing	NVIS
Navigation	X	X		X	X	X	X				X	X	X	X
Signaling	X	X		X	X	X	X				X	X	X	X
Searchlights					X			X	X	?	X	X		

LIGHTING TECHNOLOGIES BY APPLICATION

LIGHTING GROUP	LIGHTING TYPE	RECOMMENDED LIGHTING TECHNOLOGY (*)
Navigation DOD-HDBK-289 Table XXI	Anchor Light - Aft	LED
	Anchor Light – Fwd.	LED
	Clearance/Obstruction Light	LD/RSL
	Masthead - Aft	LD/RSL
	Masthead – Fwd.	LD/RSL
	Mine Sweeping	LED
	Task - Not under command	LD/RSL
	Task - Man Overboard	LD/RSL
	Task - Restricted maneuver	LD/RSL
	Side Lights	LED
	Towing - Masthead	LD/RSL
	Towing - Stern	LED
	Stern	LED
Signal - Visual Communication DOD-HDBK-289 Table XXII	Blinker	LD/RSL
	8 - inch searchlight	LED/LD/OTHER?
	12 - inch searchlight	LED/LD/OTHER?
Signal - Station or Operation DOD-HDBK-289 Table XXIII	Aircraft Warning	LD/RSL
	Stern Light (Blue)	LED
	Wake light	LED

NOTE: Provided for discussion only. Not reviewed by project team.

INPUT NEEDED FROM TEAM / INDUSTRY

- Review requirements for specific lighting applications.
- Recommend tutorials in appendices to address new lighting technologies.
 - Installation requirements.
 - Electrical system configuration.
 - Safety considerations.
 - Repair / maintenance.
 - Other...
- Advise of new lighting technologies / devices to consider.
 - Lights used in other industries / applications.
 - Lighting technologies under development.
- Advise of issues / failure modes to consider.
 - Experience from other applications.
 - Possible issues due to extreme conditions on Navy ships.

PROJECT SCHEDULE

DESCRIPTION	Date	2024											2025	
		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	
CONTRACT AWARD TO RSL	2/26/2024													
Project Plan & Schedule.	3/6/2024	D												
Project Kickoff.	3/15/2024	X												
TASK 1: Select most critical lighting applications for upgrade with the new technologies.		X	X	X										
TASK 2: Identify functional requirements and compare to those stated in the DOD-HDBK-289. Include obsolete requirements that should be deleted.			X	X	X	X								
Project presentation at Electrical Technologies Panel Meeting	4/3/2024		X											
Q1 Report: Progress update with most critical lights to be revised.	5/31/2024			D										
TASK 3: Evaluate new lighting technologies to determine most suitable for new build and retrofit.				X	X	X	X	X						
Q2 Report: Progress update with functional requirements and new lighting technologies.	8/30/2024						D							
TASK 4: Develop new set of requirements to functional needs and capabilities of the available technologies.							X	X	X	X	X			
Q3 Report: Progress update on new set of requirements.	11/27/2024										D			
TASK 5: Identify emerging lighting technologies that may be used once mature.											X	X		
TASK 6: Estimate forward-fit new construction and retrofit costs.												X	X	X
TASK 7: Final Report with recommendations to NAVSEA for revisions to the DOD-HDBK-289(SH).	2/26/2025													D

D = Deliverable

QUESTIONS?

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