

NAVSEA 05Z3

Electrical Systems Technical Update

National Shipbuilding Research Program
Electrical Technologies Panel Meeting

Schweitzer Engineering Laboratories (SEL)
Pullman, WA
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NAVAL SEA SYSTEMS COMMAND

Agenda



- NAVSEA 05Z3 Areas of Responsibilities
- Status of Standards and Specifications Projects of Interest
 - Specifications and standards project status
 - Cable Sealant, Multi-Cable Transits, Stuffing Tubes
 - Electrical Cable
 - Circuit Breakers / Switchboards
 - Other Electrical Projects
 - Insulation, Varnishes and Tape
 - Lighting
 - Instrumentation
- SEA 05Z3 Supported Electrical Technologies Panel Projects
 - Recent Past
 - Current
 - Future

NAVSEA 05Z3 *Provides Technical Competency, Standards and Expertise*

Areas of Responsibilities

- ☐ Electrical System Power Generation, Conversion and Propulsion
- ☐ Electrical System Architecture, Control and Interface
- ☐ **Electrical System Protection and Distribution**
 - Electrical System Components
 - Cables
 - Cable Transits
 - Penetrations
 - Connectors
 - Tape and Insulation
 - Enclosures
 - Safety
 - Installation Methods
 - Lighting and Lighting Power Distribution
 - Instrumentation
- ☐ Batteries
- ☐ Battery Certification Authority
- ☐ Future Power and Energy Storage Architecture
- ☐ Electronics (NSWC CRANE)

Recent Publications

- **NSTM 300 (S9086-KC-STM-010-300)** Naval Ship's Technical Manual Chap 300 Electric Plant
Separated into 2 volumes (New)
Volume 1 Electric Plant – General / Volume 2 Shipboard Electrical Safety
✓ Published – DISTRIBUTION STATEMENT C: U.S. GOVT AGENCIES AND CONTRACTORS
- **MIL-STD-1399-300-3** Low Voltage DC Interface
✓ Published 9 April 2026
- **MIL-HDBK-299** Electrical Cable Comparison Handbook
✓ **Complete Sent to Assist for Uploading in May 2026**
- **NAVSEAINST 9304.1E** Shipboard Cable and Cableway Inspection and Reporting Procedure
 - **Routing for Signature – Release Expected August**
- **MIL-S-16104 - Synchroscope –**
 - **Publication Sept 2026**
- **MIL-DTL-24174 /2 and /5** Control, Navigation Lights
✓ Published 19 March 2026
- **MIL-DTL-24175 /2 and /5** Panels Power Supply and Control for Navigation Lighting
 - Publication 14 July 2026
- **MIL-PRF-24282** Lighting, Signal, Multipurpose, Kit, Nonmagnetic, Symbol 106.1
✓ Published 14 July 2026

High Priority Projects

Current

- **NSTM 320 (S9086-KY-STM-010/320 Rev 8)** Naval Ship's Technical Manual Chap 320 Electric Power Distribution Systems
 - ✓ SRB review and comment adjudication complete
 - Publication expected in FY26
- **MIL-DTL-917** Detail Specification Electric Power Equipment, Basic Requirements for
 - In progress of review of and update to requirement
 - Publication expected in FY26
- **MIL-PRF-17773** Switch, Bus Transfer, Electric Power, Automatic (ABT)
- **MIL-PRF-32150** Static Automatic Bus Transfer (SABT) Switch Surface and Submarine Vessels
- **MIL-DTL-24705 /1, /3, /4** Penetrators, Multiple Cable, for Electric Cables
- **MIL-STD-X743 LIGHTING ON NAVAL SHIPS**
 - DoD-HDBK-289 being converted to MIL-STD-X743
 - Publication in 2027

New Starts

- **MIL-DTL-32656** Arc Fault Protection System, General Specification for (Update)
- **DDS 305-1 NAVSEA Design Data Sheet, "Design and Marking of Electric System"** (Re-Activate)
 - DPC MANUAL

Cable Sealants / Multicable Transits / Stuffing Tubes

- **MIL-DTL-3064** INSULATION, ELECTRICAL, PLASTIC-SEALER COMPOUND (July 2025)
 - Reviewing Qualification Test Plans for several manufacturers.
- **MIL-DTL-24705 and 3 Slant Sheets -1, 3, 4** Penetrators, Multiple Cable, for Electric Cables, Needed to allow requalification of “block and frame” multicable transits.
 - Testing on 4’ x 6’ deck and bulkhead sections assemblies
 - ❖ Vibration
 - ❖ Shock
 - ❖ Watertightness (FA and FS frames only)
 - ❖ Fire resistance
 - ❖ Hose stream
 - ❖ EMC (when specified)
 - ❖ Intermixing of blocks
 - 24705/4 for enclosure penetrations – updating in coordination with Chris Good and NSWC DD
- Expect to send to SRB later in 1st QTR FY 27
- **MIL-DTL-24235 and 19 Slant Sheets** Stuffing Tubes, Metal, and Packing Assemblies for Electric Cables, General Specification for
 - SRB comment adjudication complete - waiting on figure updates
 - Publication expected in 4th Qtr. 26

Cables

MIL-DTL-24640 Cables, Lightweight, Low Smoke, Electric, for Shipboard Use, General Specification

- in progress – reviewing comments from cable manufacturers / requested feedback

MIL-DTL-24643/61B TYPES LSC5P, LSC5POS, AND LSC5POSR

- Corrected issues with Surface Transfer Impedance (type LSC5POS and LSC5POSR only)
- Corrected Smoke Index for fillers
- Published 12 March 2026

MIL-DTL-24643/70 1 kV Cable

- SRB comment period was extended by request.

MIL-DTL-24643/87 15kV Cable New

- Design in progress

S9320-AM-PRO-020/MLDG, Rev 3 Underwater Cable Assembly and Encapsulated Components, Fabrication, Repair, and Installation Manual, Volume II: Molding and Inspection Procedures

- ✓ Complete

Circuit Breakers / Switchboards

- **MIL-DTL-17587D and /3A, 5A, and 6A** – Circuit Breakers, ACB, Low Voltage, Electric Power, Air, Removable Construction, General Specification for
- **MIL-DTL-17588F** Breakers (Automatic - ALB-1) and Switch, Toggle (Circuit Breaker, Non-Automatic - NLB-1) Air, Insulated Housing, 125 Volts and Below AC and DC (Naval Shipboard Use)
- **MIL-DTL-32485** Amendment
- **MIL-DTL-32485/1** - MSVCB-4.76KV-1200 and MSVCB-4.76KV-1600 **NEW**
- **UL 2831, Rev. 1 Funding required**
US Naval COTS 3-Pole, Rated Vmax 4.76, 8.25, & 15kV, AC, VCBs, Drawout Type, Without Internal OC Protection, & Accessories/Components for Use on Non-Nuclear Naval Combatant Ships
- **MIL-DTL-17361H** - Circuit Breaker Types AQB/NQB, Air, Electric, Low Voltage, Insulated Housing (Shipboard Use), General Specification for
- **MIL-DTL-16036N** – Part 1 (Amendment); Part 2 (Revision) Switchgear, Power, LV, Naval Shipboard
- **MIL-DTL-XX663** - Switchgear, Power, Shock-Mounted, Low Voltage, Naval Shipboard
 - Will start when 16036 is complete.

FUNDING IS BEING REQUESTED TO SUPPORT WORK ON THESE DOCUMENTS IN FY 27

Other Electrical Projects

- **MIL-DTL-17059** Motor, 60 Cycle, Alternating Current, Fractional H.P.
 - Update in Progress
- **MIL-DTL- 17060** Motors, Alternating Current, Integral-Horsepower
 - Update in Progress
- **MIL-DTL-3124** Generator, Alternating Current, 60-Hertz
 - Start in 2026
- **MIL-R-2729** Regulator-Exciter Systems, Voltage, A.C. General
 - SEA 08 Review
- **MIL-PRF-XXX733** Multi-layer, Multi-Conductor Laminated Electrical Bus, AC / DC
 - SEA 08 Review
- **MIL-PRF-17773** Switch, Bus Transfer, Electric Power, Automatic
- **MIL-DTL-15108** Transformers, Power Step Down, Single Phase, 60 Hz, 1 KVA, Dry Type
- **MIL-R-23098** Regulator, Line Voltage, Single Phase, 400 Hz AC
- **MIL-T-17221** Transformers, Power, Distribution, Single Phase, 400 HZ, 220 Deg. C, Dry (Air Cool)
 - *New Start*

Insulation, Varnishes and Tape

- **MIL-DTL-19166** Insulation Tape, Electrical, High-Temperature, Glass Fiber, Pressure-Sensitive
 - Update of Qualification Flammability Test Requirements in progress
 - Allowance for additional widths
 - SRB Review Sept 26
 - Publication Expected in 1st QTR FY 27
- **MIL-I-24092** Insulating Varnishes & Solventless Resins 11 Slant Sheets
 - Cancelled
- **MIL-I-24718 & Slant Sheets** - Insulating Resins, Solventless, Vacuum-pressure-impregnating
 - *New Start*
- **MIL-I-24391** Insulation tape, electrical, plastic pressure sensitive
 - Update of Qualification Flammability Test Requirements in progress
- **MIL-I-3505** Insulation Sheet and Tape, Electrical, Coil and Slot, High Temperature
 - Update of Qualification Flammability Test Requirements in progress

Lighting

- **NSTM 422 S9086-N2-STM-010/422, Rev 4, Navigation and Signal Lights**
 - Figures Updated
 - SRB Expected 1st QTR FY 27
- **16377/27D** 50W Watertight SYM 92.2, 93.2, 93.4, 93.5, 92.2SSL, 93.2SSL, 93.4SSL, 93.5SSL
Action needed to reinstate plastic housing for non-topside installations (DLA request)
- **16377/60B** Incandescent Floodlights 150W Sym 316 & 317 **25-Jan-2022**
Developing requirements for dimmable SSL floodlights compatible with ship lighting distribution.
Address topside nighttime security minimum lumen requirements.
- **16377/61A** Incandescent & LED Floodlights 300W Sym 303.2 303.3 303.4 303.2SSL 303.3SSL 303.4SSL **02-Nov-21**
Action needed to add electrical ground check test for Type III (SSL) fixture.
- **16377/86B** Lamp SSL for use as Replacement for Commercial Fluorescent Lamp **02-Nov-21**
Action needed to address electrical safety tests for LED tubes.
- **MIL-STD-X743 LIGHTING ON NAVAL SHIPS**
 - DoD-HDBK-289 being converted to MIL-STD-X743
 - In progress publication late 2026 / early 2027

Instrumentation

- **MIL-DTL-16034 - and /1-18** Meters, Electrical Indicating (Switchboard and Portable Types)
 - Cancel all portable meter and 6" Switchboard Meters Spec Slant Sheets
 - Incorporate requirements for and then cancel:
 - **MIL-V-23151** - Voltmeter, Expanded Scale Switchboard Type
 - **MIL-M-19261** - Meter, Power Factor 4-1/2 Inch, Switchboard Type
 - **MIL-W-19088** - Wattmeter, Switchboard Type, 4-1/2 inch
 - **MIL-M-23167** - Frequency Meter, Expanded Scale Switchboard Type
- **MIL-I-16103** - Phase Sequence, Indicator, Switchboard and Panel
 - SRB Review
 - Publication expected 1st QTR FY27
- **NSTM Chapter 504** Pressure, Temperature and Other Electromechanical Measuring Instruments
 - *New Start in FY 27*
- **MIL-HDBK-801 Pressure Gages**



Recent Past

- Evaluation of Self-Sealing Cable Transit Devices
- Low Voltage Lighting
- Solid State and Remote Source Navigation Lighting
- Thermal Imaging Windows Evaluation for MV Switchboards
- **DOD-HDK-289 Shipboard Lighting**
Report delivered to SEA 05Z3 and NSWC PD c/447
Information collected by the project will be used in the development of the new MIL-STD-X743 Standard Lighting for Ships and Submarine that will replace the Lighting Handbook.

Current

- **Distributed Temperature Sensor for Electrical Switchboards**
SEA 05Z3 and NSWC PD working on project to demonstrate a prototype on LBES.
- **MIL-DTL-24643/ 87 15KV cable design and specification development**
- **Evaluate Nord-Lock Wedge Washers for Electrical Applications on Navy Ship**
- **Multiphysics-Driven Arc-Fault Detection for Shipboard Electrical Systems**
- **Shore Power Connector Testing Prototype System Project Teams - delayed**

QUESTIONS ?