



Shore Power Compliance:

Are You On The Right Path?

Shore Power

What is Shore Power?

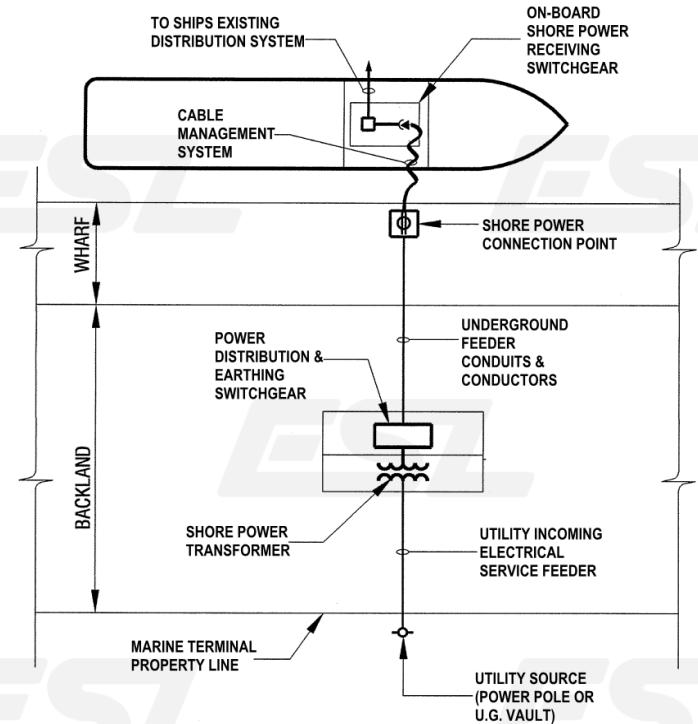
Shore Power also known by its variety of trade names and acronyms:

- Cold Ironing
- Shore-to-Ship Power
- Alternative Maritime Power (A.M.P.)
- On-shore Power Supply (O.P.S.)

Shore Power

What is Shore Power?

- Shore Power is the electrical power distribution, delivery and connection system enabling a ship to connect to shore-based electrical source, while at berth.
- Shore Power system is comprised of three (3) major sub-systems:
 1. Shore side power infrastructure
 2. Cable management system
 3. Ship side power infrastructure



SHORE POWER SCHEMATIC DIAGRAM

PREPARED BY: H3 ENGINEERING SOLUTIONS, INC.
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Shore Power

Why shore power?

The purpose of shore power is to reduce at-berth emissions and associated health impacts from diesel auxiliary engines on-board vessels calling the ports.

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Shore Power for various vessel types

Container & refrigerated cargo vessels

- Two receptacles per vessel connection
- Up to 7.5 MVA per berth capacity
- System voltage of 6.6 kV 3-phase
- On-board vessel cable management system
- Low impedance neutral resistance grounding system



Cable management system on board container vessel



Typical container vessel



Container vessel connection point on-board



Container vessel connection box at shore

Shore Power

Shore Power for various vessel types

Cruise vessels

- Four power receptacles per vessel connection
- Up to 24 MVA per berth, per vessel capacity
- System voltage of 6.6 or 11 kV, 3-phase
- On-shore vessel cable management system
- Low impedance neutral resistance grounding system



Typical cruise vessel



Shore based mobile cable management system



Cruise vessel connection box at shore



Cruise vessel connection point on-board vessel

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Shore Power for various vessel types

Ro-Ro vessels

- One power receptacle per vessel connection
- Min of 3 MVA per berth, per vessel capacity
- System voltage of 11 kV, 3-phase
- On-shore vessel cable management system
- Low impedance neutral resistance grounding system



Shore Power

Shore Power International Standards

IEC/ISO/IEEE High Voltage Shore Connection (HVSC) Standard

- 80005-01 High Voltage vessels 6.6 kV, 3-phase & 11 kV, 3-phase, larger than 1 MVA load (Published by IEC, currently in use)
- 80005-03 Low Voltage vessels up to 690 V, 3-phase and 1 MVA load (Standard under development)

Future standards under consideration:

- Electric vessel DC connection/charging
- Automatic and autonomous vessel connection

Shore Power

Which vessels are to connect to shore power systems?

The following ocean-going vessels are required to comply with CA Air Resources Board (CARB) 2020 Revised At-Berth regulation:

- Container vessels
- Reefer vessels (Refrigerated cargo vessels, reefer container vessels, etc.)
- Cruise vessels
- Roll-On Roll-Off vessels (such as car carriers, farming eqpt. & machinery carriers)
- Tankers

Shore Power

Where is At-Berth regulation currently enforced?

- USA – California ports – Required, other states – Voluntary
- Canada – Voluntary (Currently installed in Port of Vancouver, BC, Prince Rupert, Montreal, etc.)
- European Union has similar regulation – mandatory by 2035
- Asia and other countries - Voluntary

Shore Power

Is compliance mandatory or voluntary?

In California 2020 CARB At-Berth Regulation is MANDATORY!

Shore Power connection as a method to reduce emissions in CA ports has been mandatory in progressive vessel call frequency percentage since early 2000's.

The following is 100% connection effective date for various vessel categories:

- Container & refrigerated cargo vessels January 1, 2023
- Cruise (passenger) vessels January 1, 2023
- Roll-on Roll-off vessels January 1, 2025
- Tanker vessels visiting (POLA & POLB) January 1, 2025
- All remaining tanker vessels January 1, 2027

Shore Power

What to do now?

1. Port authorities and marine terminal operators to secure funding
2. Plan ahead – takes about 2 years from design to commissioning
3. Prepare complete detailed design plans and specifications.
4. Utilize professional engineers experienced in the design & construction of shore power systems and expert in the international shore power standards.
5. Specify products and services of reputable manufacturers who have experience in this field.
6. Start NOW!!!

ESL

ESL

ESL

ESL has been designing and providing shore power solutions for over 15 years.

We pride ourselves in providing custom solutions for our customers.

COAST GUARD



NAVY



COMMERCIAL



SAFETY-INTERLOCKED MODULES

ESL believes in SAFETY first.

Therefore, we go out of our way to safety interlock the output receptacle, such that the receptacle cannot be energized, unless the plug(s) are properly mated first and will “trip” the feeder breaker if a plug is removed with the power still ON.



400A Mil-C Module

150A Russellstoll Module



200A Russellstoll Module

690A Single Pole Cam Plate Assembly



ANCILLARY EQUIPMENT

While providing power to the vessel is the primary function, quite often ancillary equipment is needed/desired. Such as:

- Surge Protection Devices (SPD)
- Phase monitoring
- Power metering
- Communications
- Fiber Optics (FO)
- Indicating lights
- Line Insulation Monitoring (LIM)
- Battery back-up for controls
- Industrial receptacles for maintenance personnel
- Controls for upstream feeder breakers
- Cable supports



(3) 200A Russellstoll Modules
Color coded for vessel connection

Examples of ESL Ship-to-Shore solutions



(10) 400A MIL-C receptacles
Breaker compartment and Industrial receptacles



"Submarine Hook-up Box"
Designed to minimize load imbalance

More examples of ESL Ship-to-Shore solutions

(7) 400A MIL-C receptacles
With remote breaker control ON/OFF
pushbutton and indicator lights



700A, 6.6kV
With grounding switch, and fiber optic



“Hotel Station”
With feeder breaker Open/Close indicator lights





(8) MIL-C modules + (1) 200A module

Still more examples



With Industrial receptacles



(8) Single pole outlet cam plates
With provision for future install of (8) more



Pass-through Box



25kV unit with Paton & Cooke receptacles

ESL HAS EXTENSIVE EXPERIENCE IN PROVIDING SHIP-TO-SHORE POWER

USCG FRC Homeport Base Boston Juliet Pier	Boston, MA	USCG San Pedro Pier	San Pedro, CA
USCG Cape May	Sasebo, Japan	USCG Sector Jacksonville	Mayport, FL
DD2 Cassion Norfolk Naval Shipyard	Cape May, NJ	Naval Station Newport	Newport, RI
USCG Base Galveston	Portsmouth, VA	USCG OPC Homeporting Base LA/LB	San Pedro, CA
Colonna's Shipyard	Galveston, TX	NAVFAC EXWC Muse Division	Port Hueneme, CA
Portsmouth Naval Shipyard	Norfolk, VA	Naval Air Warfare Center AD	Patuxent River, MD
USCG Homeport NSC Base	Kittery, ME	Naval Submarine Base New London	New London, CT
USCG Base Portsmouth North Pier	Honolulu, HI	Naval Nuclear Power Training Center	Goose Creek, SC
USCG Base Portsmouth South Pier	Portsmouth, VA	Reconfigure Shore Power Bravo 26/Mike 4	Pearl Harbor, HI
USCG Alameda Pier 3	Portsmouth, VA	USCG Sector Mobile	New Orleans, LA
Joint Base Pearl Harbor-Hickam	Alameda, CA	USCG Station Fort Pierce	Fort Pier, FL
Guam Naval Base Sierra Wharf	Pearl Harbor, HI	USCG GRMI Cutter Pier	Portland, ME
Norfolk Naval Shipyard Berths 16/17	Guam	USCG Base Curtis Bay Shiplift Expansion	Baltimore, MD
Norfolk Naval Shipyard Berths 18/19	Portsmouth, VA	USCG Corpus Christi	Corpus Christie, TX
USCG MSU Cleveland	Portsmouth, VA	USCG Base Homeport Sector Charleston	Charleston, SC
Naval Base Kitsap Explosive Handling Wharf	Cleveland, OH	Naval Base Kitsap Seawolf Class Service Pier	Silverdale, WA
Naval Base San Diego	Silverdale, WA	USCG Waterfront Facilities	New London, CT
P-447 DD4 & Pier 3 Modernization	San Diego, CA	Joint Base Charleston Pier X-Ray North-South	Goose Creek, SC
NASSCO Shipyard	Bremerton, WA	Guam Naval Base Repair to Sierra Wharf	Guam
USCG Sector Guam Homeport Victor Wharf	San Diego, CA	Guam Naval Base Repair to Victor Wharf	Guam
FRC Center Homeport Sector Guam	Tamuning, Guam	USCG Homeporting FRC Miami	Miami, FL
	Apra Harbor, Guam	USCG Alameda Coast Guard Island	Alameda, CA

Questions?

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