



United States Coast Guard
U.S. Department of Homeland Security



CG-5431
Office of Vessel Activities
Domestic Compliance Division

MI Notice 02-11
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Marine Inspection Notice

HIGH VOLTAGE SHORE POWER INSTALLATIONS ON U.S. FLAG SHIPS

Ref: (a) 46 CFR Subchapter J
(b) IEC/ISO/IEEE Draft International Standard (DIS) 80005-1: Cold Ironing Part 1: High voltage shore connection systems

1. Many vessels are increasingly required to shut down their ship's service generator engines in port and receive electrical power from shore, most often to comply with state or local environmental air quality regulations. Because of the vessel's large power requirements, the most practical way of receiving shore power is via high voltage, which reduces the number of power cables required for a given power level.
2. Ref (a), the electrical engineering regulations applicable to most large vessels, do not contain specific requirements for high voltage shore power systems.
3. Ref (b) is a draft standard for high voltage shore power systems being developed by the shipping industry, port authorities, classification societies, regulatory agencies, and electrical equipment and cable manufacturers, among others. U.S. Coast Guard Headquarters Systems Engineering Division (CG-5213) has also participated in the development of this document. It is likely that Ref (b) will serve in the future as a baseline reference for USCG high voltage shore power policy and regulations.
4. High-voltage installations have been successfully implemented on foreign flag vessels receiving shore power operating in major U.S. ports for 6-10 years. Typically these vessels will receive 6,600 or 11,000 volts from a shore side transformer via two or more power cables. There may be an additional step-down transformer on board the vessel to bring the voltage to the nominal vessel voltage (typically 450-480 volts).
5. Shore side port facility electrical installations are built to the code of the local jurisdiction, which typically adopts the National Electrical Code (NEC) versus a specific marine electrical or USCG standard. However, because the shore and ship systems are integrated and in fact operating in parallel for a short time during power transfer, **it is important that both the shore and ship sides be tested separately, prior to connection, and then tested as an integrated system.** This testing is essential to help identify any procedural or engineering issues. USCG personnel should be involved from both the technical review of the plans to the actual testing of the assembled system.

6. Based on the plan review requirements of 46 CFR 110.25 and the guidelines in Ref (b), in the interest of personnel safety both on the vessel and ashore, the local OCMI should work with vessel operators to ensure that the following steps are taken **prior** to high voltage shore connection (HVSC) testing:

- a) Plans for the required electrical modifications have been reviewed by the Marine Safety Center. Class societies may also review, but their involvement will likely be limited to the ship installation. Additionally, although class societies have participated in development of Ref (b), they do not yet have well defined HVSC Rules. The plans should include, at a minimum, the following:
 1. Diagrams of the system from the shore side to the ship's main switchboard, showing cable, plug, and transformer arrangement and connections;
 2. Ratings of protective elements of any new shipboard transformer and switchgear;
 3. Details of shore side protection devices;
 4. Design standard and rating of power cables;
 5. Design details of bonding and grounding systems;
 6. Calculation for sizing of high resistance ground;
 7. Verification that the fault current available from the shore power connection will not exceed the rating of the shipboard switchgear; and,
 8. Synchronization with shore power should be possible with only one of the ship service generators on line.
- b) The vessel should have a shore power operations manual that defines each step and requires a sign off verification of the connection, power transfer, and disconnection procedures.
- c) A person in charge (PIC) should be designated for the vessel, and the communications protocol between ship and shore must be defined and understood by both parties
- d) Any personnel scheduled to participate in the connection should be briefed on high voltage safety prior to the operation.
- e) Once connections are made, personnel access to energized plugs and receptacles should be prevented. Spaces that require no personnel access during normal operation should be locked. Other spaces that require access may be locked, or a combination of barriers and signs may be implemented to keep out non-essential personnel.
- f) Shore power cable and cable wheel should be protected and a warning sign for all personnel, e.g. CAUTION HIGH VOLTAGE POWER, should be provided in the vicinity of the cable.
- g) Means should be provided to monitor and allow safe shore power cable tension due to the movement of the ship.

Questions concerning this notice may be directed to Office of Vessel Activities, Domestic Compliance Division (CG-5431) at CG5431@uscg.mil or (202) 372-1224 or the Office of Design & Engineering Standards, Systems Engineering Division (CG-5213) at (202) 372-1383.

