DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

ARC WELDING ON WATER-BORNE VESSELS

Headquarters. Department of the Army, Washington, D.C.
10 April 1974

1. Purpose. The intent of this bulletin is to provide information and guidance to personnel involved with the use of arc welding machines when used on watercraft.

2. Scope. This bulletin applies to all active US Army units, installations and activities; reserve units and national guard units involved in the maintenance and repair of watercraft. This bulletin does not apply to Corps of Engineer Units but may be used by them for guidance.

3. Recommendation for Maintenance Publications Improvements.

You can help to improve this manual by calling attention to errors and by recommending improvements. Your letter or DA Form 2028 Recommended Changes to Publications and Blank Forms) should be mailed direct to: Commander, US Army Troop Support Command, ATTN: AMSTS-MPP, 4300 Goodfellow Blvd., St. Louis, MO 63120. A reply will be sent directly to you.

4. Procedure. *a.* This bulletin outlines the procedure for properly grounding the welding leads to avoid serious damage, by electrolysis, to the underwater hull, shafting, propellers and other underwater appurtenances.

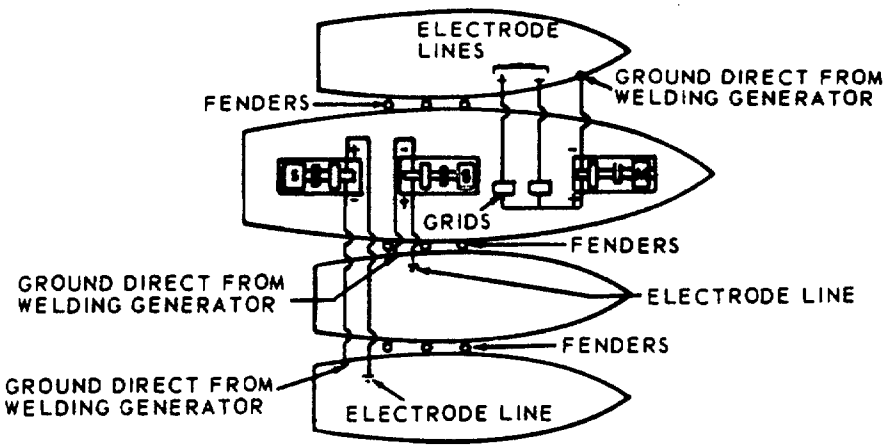
b. Welding motor-generator sets or rectifiers shall be so installed that the welding and ground leads from shores to ship or from repair ship to ship or ships alongside shall be connected only to the vessel on which welding is to be done. The welding lead as well as the ground lead shall be thoroughly insulated and at no time shall be allowed to become submerged in the intervening water. Welding shall be done on but one ship from one source of welding current. The ground lead shall not be electrically connected to any object ashore or to the repair ship or other vessel except the one on which welding is being done. The ground cables should have an area of at least one

* This bulletin supersedes TB TC 11, 10 March 1953

million CM per 1000 amperes of welding current and be secured by metal-to-metal contact to an integral part of the vessel on which the welding is done.

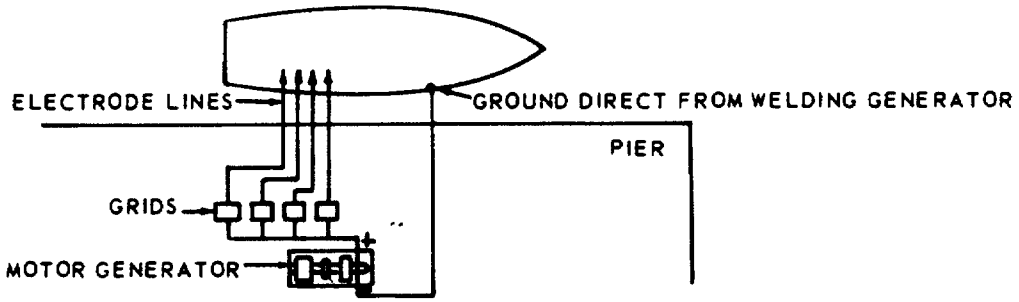
c. Figure 1, steps 1, 2 and 3 illustrate correct methods for installing welding generators. In all of these cases it should be noted that the only ground in the circuit is to the ship where welding is being done so there is no possibility of current flowing from the ship's hull into the water. It is entirely safe to place the welding generator on the pier, or have it installed permanently on a repair ship, provided both positive and negative welding cables to the ship are well insulated from ground and all other grounded structures, and that no welding cables are returned from the vessel to shore or adjacent vessels for welding in either location. Figure 2, steps 1, 2, 3, and 4 illustrate incorrect methods for installing welding generators. Steps 1 and 2 (fig. 2) illustrate the condition when a welding generator, placed on a vessel and with the negative cable grounded to that vessel, is used to weld on another vessel. This situation often occurs when a welding generator on a tender or repair ship is used to weld on another ship. Obviously, the way to correct this situation is to insulate the negative cable of the generator from ship A and run both positive and negative leads to the ship where the welding is being done as illustrated in figure 1. Step 3 (fig. 2) illustrates the condition when the negative side of the generator is grounded at the pier. This might occur if the negative leads are connected to crane tracks, pipe lines, or submerged or buried structures, or if the negative cables are immersed in water at some points. If the positive side of the generator becomes grounded to the vessel, of course, the situation would be considerably worse since the entire generator voltage would cause a continuous short circuit current to flow from the positive cable to the ship's hull. Step 4 (fig. 2) illustrates conditions when one generator is used to weld on two ships. There seems to be a general impression that if two ships are connected together with a cable of reasonable size--say 1,000,000 CM, and 100 feet long, that all of the current used on ship B will return to the generator through this cable. The resistance of the cable is of the same order as the resistance through the water, so part of the current will flow from ship B through the water to ship A, corroding the hull of ship B. Measurements show that the resistance of the water path between two vessels alongside each other is about .01 ohms. The resistance of the cable would be about .001 oh ms, hence about one-tenth of the welding current used on ship B would flow through the water.

d. In view of the foregoing, steps shall be taken to correct all unsatisfactory welding installations that are causing electrolytic corrosion resulting from welding.

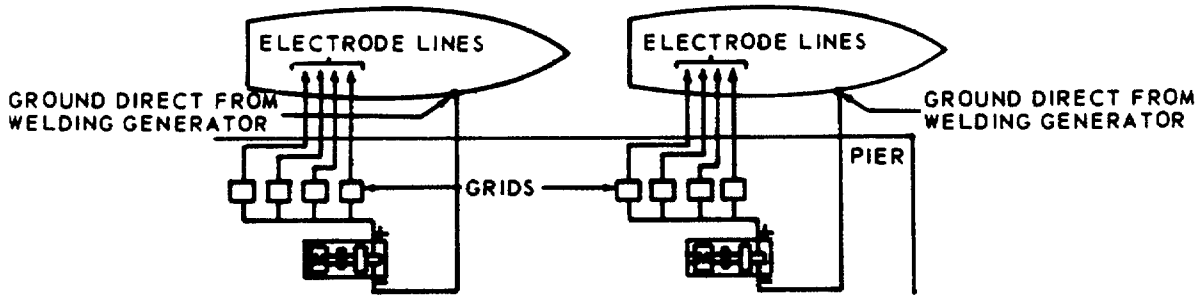


NOTE: CARE SHOULD BE TAKEN TO AVOID METALLIC CONNECTIONS BETWEEN VESSELS SUCH AS WIRE ROPE, PIPE ETC, WHEN WELDING IS BEING PERFORMED.

STEP 1



STEP 2



STEP 3

NOTE: FOR GROUND CABLES ALLOW AT LEAST 1,000,000 C. M. COPPER FOR 1,000 AMPERES GENERATOR CAPACITY

GENERAL NOTE: "S" INDICATES SINGLE OPERATOR SET, "M" INDICATES MULTIPLE OPERATOR SET.

CORRECT HOOK-UP OF WELDING LEADS FOR WORK ON WATER-BORNE VESSELS

ME 1900-204-24/1

Figure 1. Correct method of installing welding generators.

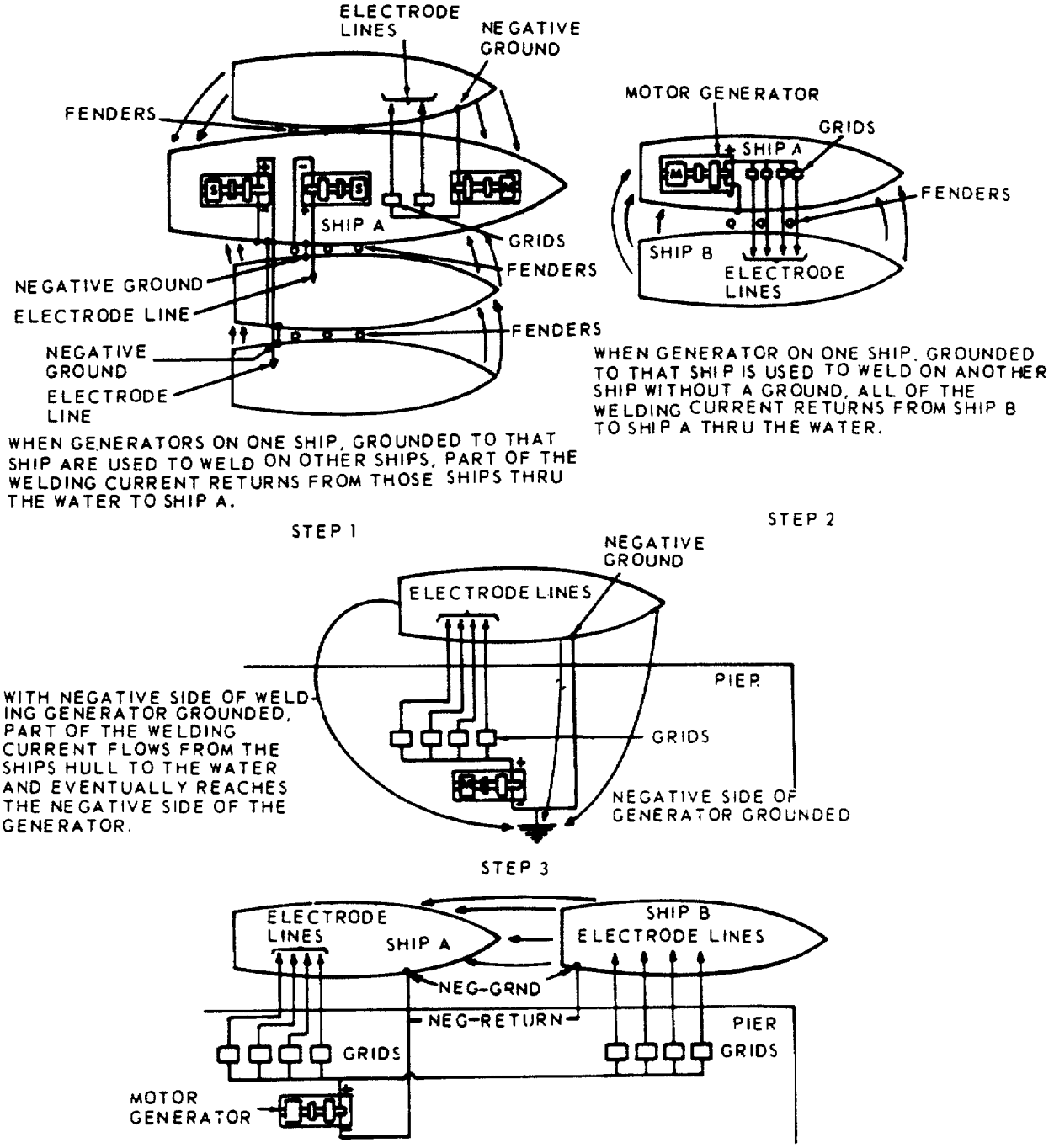


Figure 2. Incorrect method of installing welding generators.

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