

NAVSEA  
STANDARD ITEM

FY-15

ITEM NO: 009-18  
DATE: 17 JAN 2013  
CATEGORY: I

1. SCOPE:

1.1 Title: Magnetic Material; control

2. REFERENCES:

- 2.1 801-5844249, Location of Magnetic Material MCM-1
- 2.2 800-5977033, Location of Magnetic Material MCM-2
- 2.3 801-6134737, Location of Magnetic Material MCM-3
- 2.4 800-6135526, Location of Magnetic Material MCM-4
- 2.5 801-6134737, Location of Magnetic Material MCM-5
- 2.6 801-6356761, Location of Magnetic Material MCM-6
- 2.7 800-6787960, Location of Magnetic Material MCM-7
- 2.8 801-6356761, Location of Magnetic Material MCM-8
- 2.9 801-6645302, Location of Magnetic Material MCM-9 thru 14
- 2.10 524-7048237, IF Engine Emergency Cutout Valve
- 2.11 S9086-CJ-STM-010/CH-075, Fasteners
- 2.12 508-6644926, Insulation and Lagging Schedule, Pipe and Machinery

3. REQUIREMENTS:

3.1 Provide and implement a procedure for maintaining a maximum permeability factor of 2.0 on board mine warfare ships and craft for material and equipment installed, repaired, or relocated during the accomplishment of work required by the Job Order. The procedure shall have been reviewed and accepted by the SUPERVISOR prior to the implementation.

3.1.1 The procedure requires a one-time submittal/acceptance unless Standard Items and/or references change or are updated.

3.1.2 Describe a receipt inspection system to verify Government, contractor, and subcontractor furnished material is in compliance with the permeability limits.

3.1.3 Describe controls used in fabrication work to ensure compliance with the permeability limits after fabrication.

3.1.4 Describe the method used to determine magnetic content of materials removed from or brought on board the ship or craft including monitoring station locations.

3.1.5 Identify type of instrumentation, conforming to Method 3 of ASTM A 342, used to measure the magnetic permeability of material.

3.1.6 Describe the record and reporting system utilized to list material required, but determined to have exceeded the permeability factor 2.0 after fabrication and the maximum dimension of the part exceeds 2 inches or the maximum dimension of all parts having a similar function in a 30 foot section of the ship exceeds 60 inches. This list shall include material and equipment removed, repaired, installed, or relocated. The record and reporting system shall contain description, magnetic dimensions, approximate weight, location installed on board ship or craft, and a record verifying that the item is contained in the current Location of Magnetic Material electronic database, a new database entry made for previously NAVSEA-approved items missing an entry or both a new entry made and waiver granted for new items or substitutions. Use 2.1 thru 2.9 as applicable, and the electronic database to determine if the 60 inches in 30 foot rule above is met.

3.2 Maintain or reduce permeability of items at or below 2.0, including proposing alternative materials for existing designs to the SUPERVISOR. Where alternatives are not possible or practical, submit one legible copy, in approved transferrable media, of a report in the format of Attachment A, to document repaired or replaced items in excess of the magnetic material control limit of 3.1.6. Ensure the part number, permeability range, and magnitude and location match component material and design. Equipment which is magnetic and not currently authorized by applicable NAVSEA drawing or technical manual (i.e., substitution or new item) additionally requires evaluation and acceptance by the SUPERVISOR prior to installation.

3.3 Verify the following attributes on all reinstalled magnetic material, whether in accordance with current design or not, to minimize magnetic signature.

3.3.1 Vendor or stock number matches or crosses to NAVSEA document, if per current design.

3.3.2 Magnetic field location is limited to areas appropriate to the component (e.g., solenoids).

3.3.3 Magnetic permeability is appropriate for the specified material. Measured permeability will be affected by material, geometry, location temperature and degree of magnetization.

3.3.4 400 Series Monel and 304 CRES can be weakly magnetized by machining or welding; permeability must be less than 5 in accordance with Note 3.07 of 2.10.

3.3.5 Material Upgrades: Technical documentation may be used in lieu of surveys for identification for items that could become magnetic even if not when installed.

3.3.5.1 Upgrade low energy, non-safety critical system fasteners which are magnetic or potentially so, such as carbon steel, 304 CRES and 400 Series Monel to 500 Series Monel or 316L CRES as appropriate for the working environment. Replacement fasteners must be of identical thread size, type, shape and fit.

3.3.5.2 Submit one legible copy, in approved transferrable media, of a list of all proposed replacement fasteners with costs and sizes to the SUPERVISOR for approval prior to procurement.

3.3.5.3 Upgrade mechanical wire which is magnetic or potentially so, such as carbon steel wire used for lagging pad installation in accordance with 2.11, to 500 Series Monel or 316L CRES lockwire in accordance with Paragraph 5.5.1 of 2.12. Replacement wire must be of equivalent size.

3.3.5.4 Select 500 Series Monel or 316L CRES as appropriate for the working environment for items with material not specified in NAVSEA documentation, such as the lagging pad hooks and washers of 2.12.

3.3.5.5 Upgrade non-critical load bearing hardware which is magnetic or potentially magnetic, such as carbon steel, 304 CRES and 400 Series Monel hinges, hasps, latches, chair swivels, corner reinforcements, etc., to 500 Series Monel or 316L CRES as appropriate for the working environment.

3.3.5.6 Upgrade electrical fittings which are magnetic or potentially magnetic, such as carbon steel, 304 CRES and 400 Series Monel stuffing tube packing nuts, cover plates, knockout plugs, etc., to 500 Series Monel, 316L CRES or Underwriter's Laboratory fire rated nylon or plastic as appropriate for the working environment.

3.3.6 Submit one legible copy, in approved transferrable media, of a report furnishing documentation provided by supplier, as required by 3.1.6.

#### 4. NOTES:

4.1 The magnetic field of mine warfare ships and craft consists of the superposition of the magnetic field from 4 basic sources: ferrous field,

eddy current field, ship service stray field, and minesweep generator stray field. The stray field sources are the electric currents in cables and wiring associated with the operation of the equipment of the ship or craft. The ferrous field and eddy current field sources are as follows:

4.1.1 Ferrous Field Source: The ferrous field sources are the items on or part of the ship or craft which use a material in their construction that exhibits a relative magnetic permeability different than 1.0, the relative magnetic permeability of air. Each ferrous field source acts like a bar magnet whose magnetic field depends upon the material's relative magnetic permeability, volume (not mass), and shape of the earth's magnetic field. At a point or location external to a ferrous field source, the magnetic field of this source is essentially the same whether the source is hollow (such as a block or pedestal). A material whose relative magnetic permeability is 2.0 or less is arbitrarily defined to be nonmagnetic when used in conjunction with mine warfare ships and craft; otherwise, the material is said to be magnetic. Whether the material of an item is classified magnetic or nonmagnetic, according to the above arbitrary definition, a change in relative magnetic permeability of the material will, in general, result in a change in the magnetic field associated with this item.

4.1.2 Eddy Current Field Source: The eddy current field sources are the items on or part of the ship or craft which use a material in their construction that exhibits an electrical conductivity. A material whose electrical conductivity is less than 10.0 percent of the electrical conductivity of copper ( $5.8 \times 10^5$ /cm at 20 degrees Centigrade) is arbitrarily defined to be nonconductive when used in conjunction with mine warfare ships and craft; otherwise, the material is said to be electrically conductive. Each eddy current field source acts like a generator when it oscillates in the earth's magnetic field due to the rolling and pitching of the ship or craft. The current in this source, resulting from the generator action, has associated with it a magnetic field - an eddy current field. The magnitude of this field is dependent upon the conductivity of the material, the size of the electrical path in the material, the cross-sectional area of the electrical path, and the orientation of the source with respect to the earth's magnetic field due to the rolling and pitching of the ship or craft.

4.1.3 If an item is both highly magnetic and electrically conductive, such as mild steel or steel, the ferrous field will mask out the eddy current field. If an electrically conductive item is located inside a highly magnetic enclosure, such as mild steel or steel, the enclosure will mask the magnetic effects of its contents and will appear as if it were a solid magnetic block.

4.2 The SUPERVISOR will provide written direction for accomplishment of one of the following prior to reinstallation of temporarily removed existing or new material/equipment as a result of the deviation request.

4.2.1 Authorization for deviation request.

4.2.2 Identification and authorization of an acceptable Contractor  
Furnished Material (CFM) substitute material or equipment.

4.2.3 Receipt of an acceptable Government Furnished Material (GFM)  
substitute material or equipment.

4.2.4 Technical direction and information for manufacturing of  
acceptable material or equipment.

4.2.5 Other direction as determined acceptable by the ship class  
planning yard or higher authority.

ATTACHMENT  
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MCM-xx	Date Installed/Noted	Magnetic Component	Permeability Range	System/ESWBS	Compartment #	Frame #	Port or Starboard	Location Description (distance from reference point)	Material	Size of Magnetic Portion	Authorizing Documents(s) (tech manual, DWG)	per plan (YES/NO)	Data Recorder Name	Data Recorder Company	Shipbuilding Specialist	Work Item #	IDR #	PN	NSN	Comments		