

INCH-POUND

J-W-1177/27B

June 10, 1988

SUPERSEDING

J-W-1177/27A

September 27, 1976

## FEDERAL SPECIFICATION SHEET

WIRE, MAGNET, ELECTRICAL, CLASS 220, TYPE M2DgGM,  
POLYESTER-GLASS AND GLASS-FIBER, POLYIMIDE TREATED, RECTANGULAR

This specification is approved by the Commissioner, Federal Supply Service,  
General Services Administration, for the use of all Federal agencies.

The requirements for acquiring the wire described herein shall consist of this  
specification and the latest issue of J-W-1177.

Classification: Class 220;  
type M2DgGM (heavy film, single polyester-glass  
fiber, single glass fiber, polyimide varnished);  
rectangular.

Insulating materials: The fiber covering and application of the covering  
shall be as specified in J-W-1177. If an under-  
lying film coating is used, it shall have a class  
220 rating. The varnish used in treating fibrous  
covered wire shall conform to the requirements of  
class 220 of MIL-I-24092, or an alternate selected  
on the basis of equivalent test data. The varnish  
shall be a modified polyimide insulating varnish  
to provide a tough outer finish. The varnish used  
shall be identified in the qualification test  
report. The glass covering shall be bonded with  
class 220 varnish, and the polyester-glass covering  
shall be either fused or bonded with class 220  
varnish.

NEMA/ANSI equivalent: There is no NEMA/ANSI equivalent.

General requirements: See J-W-1177 for general requirements, quality  
assurance provisions, and packaging.

AMSC N/A

FSC 6145

DISTRIBUTION STATEMENT A Approved for public release; distribution unlimited

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## Requirements:

| Characteristics           | Test procedure,<br>see J-W-1177 | Wire sizes,<br>AWG | Requirements  |
|---------------------------|---------------------------------|--------------------|---|
| Dimensions                | 4.7.1.2                         | All                | <p>Rectangular wire:</p> <p>(a) Conductor dimensions and radii - see table I.</p> <p>(b) Conductor tolerances - see table II.</p> <p>(c) Increase in thickness - see table III.</p> <p>(d) Increase in width due to the glass fiber covering shall be equal to or less than the increase in thickness.</p> <p>Square wire:</p> <p>(a) Conductor dimensions, radii and tolerances - see table IV.</p> <p>(b) Increase in thickness and width - see table IV.</p> |
| Adherence and flexibility | 4.7.2                           | All                | No cracks visible in the film coating after 20 percent elongation. Examine with normal vision without removal of the glass fiber covering.  |
| Elongation                | 4.7.5                           | All                | Not less than 32 percent for thickness of 0.049 inch and greater, or 30 percent for thicknesses less than 0.049 inch.   |
| Dielectric strength       | 4.7.9                           | All                | Not less than 90 volts/mil of the minimum thickness of the fiber covering on one side (one-half the minimum specified under "Dimensions") plus the minimum breakdown for type M film coated wire.   |
| Thermal endurance         | ----                            | All                | Class 220. Insulating materials shall meet the thermal class ratings as described above.  |



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TABLE III. Maximum increase in thickness, inch, due to single-polyester-glass-fiber and single-glass-fiber covering and heavy-film coating over rectangular wire.

| Nominal thickness | Nominal width |        |       |        |      |        |      |        |       |        |      |        |       |        |      |        |       |        |      |        |      |        |       |        |      |        |       |        |      |        |      |        |      |      |       |      |
|-------------------|---------------|--------|-------|--------|------|--------|------|--------|-------|--------|------|--------|-------|--------|------|--------|-------|--------|------|--------|------|--------|-------|--------|------|--------|-------|--------|------|--------|------|--------|------|------|-------|------|
| Inch              | 0.079         | 1/.083 | .088  | 1/.093 | .098 | 1/.104 | .110 | 1/.118 | .124  | 1/.132 | .140 | 1/.148 | .157  | 1/.167 | .177 | 1/.187 | .197  | 1/.209 | .220 | 1/.236 | .248 | 1/.264 | .280  | 1/.295 | .315 | 1/.335 | .354  | 1/.374 | .394 | 1/.417 | .441 | 1/.465 | .492 | Inch |       |      |
| 0.025             |               |        |       |        |      |        |      |        |       |        |      |        |       |        |      |        |       |        |      |        |      |        |       |        |      |        |       |        |      |        |      |        |      |      | 0.025 |      |
| .028              |               |        |       |        |      |        |      |        |       |        |      |        |       |        |      |        |       |        |      |        |      |        |       |        |      |        |       |        |      |        |      |        |      |      |       | .028 |
| .031              |               |        |       |        |      |        |      |        |       |        |      |        |       |        |      |        |       |        |      |        |      |        |       |        |      |        |       |        |      |        |      |        |      |      |       | .031 |
| .035              |               |        |       |        |      |        |      |        |       |        |      |        |       |        |      |        |       |        |      |        |      |        |       |        |      |        |       |        |      |        |      |        |      |      |       | .035 |
| .039              |               |        |       |        |      |        |      |        |       |        |      |        |       |        |      |        |       |        |      |        |      |        |       |        |      |        |       |        |      |        |      |        |      |      |       | .039 |
| .044              |               |        | 0.016 |        |      |        |      |        | 0.017 |        |      | 0.018  |       |        |      |        |       |        |      |        |      |        | 0.020 |        |      |        |       |        |      |        |      |        |      |      | .044  |      |
| .049              |               |        |       |        |      |        |      |        |       |        |      |        |       |        |      |        |       |        |      |        |      |        |       |        |      |        |       |        |      |        |      |        |      |      |       | .049 |
| .055              |               |        |       |        |      |        |      |        |       |        |      |        |       |        |      |        |       |        |      |        |      |        |       |        |      |        |       |        |      |        |      |        |      |      |       | .055 |
| .063              |               |        |       |        |      |        |      |        |       |        |      |        |       |        |      |        |       |        |      |        |      |        |       |        |      |        |       |        |      |        |      |        |      |      |       | .063 |
| .071              |               |        |       |        |      |        |      |        |       |        |      |        |       |        |      |        |       |        |      |        |      |        |       |        |      |        |       |        |      |        |      |        |      |      |       | .071 |
| .079              |               |        |       |        |      |        |      |        |       |        |      |        |       |        |      |        |       |        |      |        |      |        |       |        |      |        |       |        |      |        |      |        |      |      |       | .079 |
| .088              |               |        |       |        |      |        |      |        |       |        |      |        |       |        |      |        |       |        |      |        |      |        |       |        |      |        |       |        |      |        |      |        |      |      |       | .088 |
| .098              |               |        |       |        |      |        |      |        |       |        |      |        |       |        |      |        |       |        |      |        |      |        |       |        |      |        |       |        |      |        |      |        |      |      |       | .098 |
| .110              |               |        |       |        |      |        |      |        |       | 0.018  |      |        | 0.019 |        |      |        |       |        |      | 0.020  |      |        |       |        |      |        | 0.021 |        |      |        |      |        |      |      | .110  |      |
| .124              |               |        |       |        |      |        |      |        |       |        |      |        |       |        |      |        |       |        |      |        |      |        |       |        |      |        |       |        |      |        |      |        |      |      |       | .124 |
| .140              |               |        |       |        |      |        |      |        |       |        |      |        |       |        |      |        |       |        |      |        |      |        |       |        |      |        |       |        |      |        |      |        |      |      |       | .140 |
| .157              |               |        |       |        |      |        |      |        |       |        |      |        |       |        |      |        |       |        |      |        |      |        |       |        |      |        |       |        |      |        |      |        |      |      |       | .157 |
| .177              |               |        |       |        |      |        |      |        |       |        |      |        |       |        |      |        | 0.020 |        |      |        |      |        |       |        |      |        |       |        |      |        |      |        |      |      |       | .177 |
| .197              |               |        |       |        |      |        |      |        |       |        |      |        |       |        |      |        |       |        |      |        |      |        |       |        |      |        |       |        |      |        |      |        |      |      |       | .197 |
| .220              |               |        |       |        |      |        |      |        |       |        |      |        |       |        |      |        |       |        |      |        |      |        |       |        |      |        |       |        |      |        |      |        |      |      |       | .220 |

1/ R-40 series numbers.  
Radii tolerance is plus  
or minus 25 percent.

EXAMPLE - Preferred sizes : 55 x 110 (R20 x R20)  
Intermediate sizes 55 x 118 (R20 x R40)

## NOTES:

1. The maximum increase due to the fiber covering may be exceeded provided the overall dimension of the covered wire does not exceed the sum of the maximum thickness of the bare or film-coated wire plus the maximum increase due to the fiber covering.
2. The increase due to the fiber covering for wire having dimensions not shown shall be the same as those for the next larger thickness or width.
3. The increase in thickness due to the heavy film coating, if any, shall be for film-coated wire.
4. The minimum increase shall be not less than 70 percent of the maximum increase for double-polyester-glass-fiber covering without an underlying film, rounded off to the nearest 0.001 inch.
5. Because it is impossible to separate accurately the fiber covering from the film coating, the total minimum increase in the thickness of film-coated double-fiber-covered rectangular wire shall be 70 percent of the maximum increase given in table III rounded off to the nearest 0.001 inch.

TABLE IV. Minimum increase and maximum overall dimensions of single-polyester-glass-fiber and single-glass fiber covering over heavy-film coated square wire.

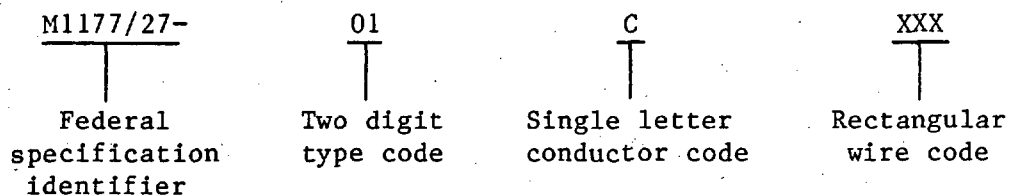
| AWG size | Bare wire dimension, inch |         |         | Radii inch <sup>1/</sup> | Type M2DgGM            |                                 |
|----------|---------------------------|---------|---------|--------------------------|------------------------|---------------------------------|
|          | Minimum                   | Nominal | Maximum |                          | Minimum increase, inch | Maximum overall dimension, inch |
|          |                           |         |         |                          |                        |                                 |
| 1        | .2864                     | .2893   | .2922   | .040                     | .015                   | .313                            |
| 2        | .2550                     | .2576   | .2602   | .040                     | .015                   | .281                            |
| 3        | .2271                     | .2294   | .2317   | .040                     | .015                   | .253                            |
| 4        | .2023                     | .2043   | .2063   | .040                     | .015                   | .227                            |
| 5        | .1801                     | .1819   | .1837   | .040                     | .014                   | .204                            |
| 6        | .1604                     | .1620   | .1636   | .032                     | .014                   | .184                            |
| 7        | .1429                     | .1443   | .1457   | .032                     | .013                   | .165                            |
| 8        | .1272                     | .1285   | .1298   | .032                     | .012                   | .148                            |
| 9        | .1133                     | .1144   | .1155   | .026                     | .012                   | .134                            |
| 10       | .1009                     | .1019   | .1029   | .026                     | .011                   | .120                            |
| 11       | .0897                     | .0907   | .0917   | .020                     | .011                   | .108                            |
| 12       | .0798                     | .0808   | .0818   | .020                     | .011                   | .098                            |
| 13       | .0710                     | .0720   | .0730   | .016                     | .011                   | .089                            |
| 14       | .0631                     | .0641   | .0651   | .016                     | .011                   | .081                            |

<sup>1/</sup> Tolerance is plus or minus 25 percent.

NOTES:

1. The increase due to the heavy film coating or fiber covering for wires having dimensions not shown in table IV shall be the same as those for the next larger size.
2. The increase in thickness due to the heavy film coating, if any, shall be for film-coated wire.

Part number: Magnet wire covered by this specification shall be defined by the following part numbering system. Example:  
M1177/27-01CXXX.



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The following codes shall apply:

| Type   | Type code | Conductor            | Conductor code |
|--------|-----------|----------------------|----------------|
| M2DgGM | 01        | Copper               | C              |
|        |           | Aluminum             | A              |
|        |           | Nickel-coated copper | N              |
|        |           | Silver-coated copper | S              |

Intended use: Type M2DgGM rectangular magnet wire is intended for use in 220°C applications similar to those for which type Dg magnet wire is used. Type M2DgGM magnet wire has been standardized for the repair of shipboard electrical power equipment.

Revision letters are not used to denote changes due to the extensiveness of the changes.

**MILITARY INTERESTS:**

**Custodians:**

Army - CR  
Navy - SH  
Air Force - 85

**Review activities:**

Army - AR, ER, MI  
DLA - IS

**User activities:**

Army - ME  
Navy - AS, CG, MC, OS

**CIVIL AGENCY COORDINATING ACTIVITIES:**

GSA - FSS, PBO, PCD  
INTERIOR - BLM  
HHS - FDA  
DCCOVT - DCG  
NASA - JFK  
COMMERCE - NBS  
TRANSPORTATION - APM, FAA

**Preparing activity:**

Navy - SH  
(Project 6145-1111-23)