STD.NEMA MW 760-ENGL 1996 ■ 6470247 0511056 76T ■

NEMA STANDARDS PUBLICATION

NEMA MW 760

TAPERED FLANGE MAGNET WIRE PLASTIC SPOOLS/REELS

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NEMA Standards Publication MW 760-1996

TAPERED FLANGE MAGNET WIRE PLASTIC SPOOLS/REELS

Published by

National Electrical Manufacturers Association
1300 N. 17th Street, Suite 1847
Rosslyn, VA 22209

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Foreword

This standards publication provides guidelines to magnet wire manufacturers and plastic spool/reel suppliers in the design and construction characteristics of commonly used plastic spools and reels; and to provide technical information and data on plastic spools/reels design to users wishing to select appropriate plastic spools/reels for a particular purpose.

The information contained in this publication has been thoroughly reviewed by all suppliers of plastic spools/reels known to be manufacturing these products at the time of publication. The issuance or existence of this Standards Publication does not, in any respect, prevent or restrict any member or non-member of NEMA from supplying customers with magnet wire spools/reels not in conformance with its contents.

This Standards Publication has been developed by the NEMA Magnet Wire Section, which periodically reviews it for any revisions necessary to keep it up to date with changes in technology. Comments or proposed revisions are welcomed and should be submitted to:

Vice President, Engineering
National Electrical Manufacturers Association
1300 N. 17th Street, Suite 1847
Rosslyn, VA 22209

This Standards Publication was developed by the Magnet Wire Section. Section approval of the standard does not necessarily imply that all section members voted for its approval or participated in its development. At the time it was approved, the Magnet Wire Section was composed of the following members:

Alcatel Magnet Wire, Inc.—La Grange, KY
American Wire Corporation—Sandy Hook, CT
Bridgeport Insulated Wire Company—Bridgeport, CT
Elektrisola, Inc.—Boscawen, NH
Essex Group, Inc., Magnet Wire Products—Fort Wayne, IN 46801
MagneTek, Inc.—Gallman, MS
Optec D D USA, Inc.—Mexico, MO
Phelps Dodge Magnet Wire Company—Fort Wayne, IN
Rea Magnet Wire Company, Inc.—Fort Wayne, IN

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Section 1
GENERAL

1.1 SCOPE

This Standards Publication covers the dimensional, physical, and visual characteristics of newly-molded, tapered flange plastic spools/reels for packaging of magnet wire.

1.2 NORMATIVE REFERENCES

The following normative documents contain provisions which, through reference in this text, constitute provisions of this Standards Publication. By reference herein, these publications are adopted in whole or in part as indicated in this Standards Publication, and are available from the organization listed below. They are also available from ANSI at the listed address.

Deutsche Elektrotechnische Kommission im DIN und VDE (DKE)
Stresemannallee 15
D – 6000 Frankfurt AM Main 70

American National Standards Institute (ANSI)
11 West 42nd Street
New York, NY 10036

DIN 46399-1 *Delivery Spools for Bare and Insulated Wires: Dimensions*
DIN 46399-2 *Delivery Spools for Bare and Insulated Wires: Technical Terms of Delivery for Spools of Plastic*

1.3 DEFINITIONS

Parts or features of a magnet wire spool/reel defined in this section, are also illustrated in Figure 1-1.

Arbor Hole—The hole in a flange through which the arbor shaft passes.

Double Taper Flange Tapered Barrel Reel—A spool/reel that contains two tapered flanges with a tapered barrel within the winding area, as shown in Figure 4-2.

Double Taper Flange, Straight Barrel Spool/Reel—A spool/reel that contains two tapered flanges with a straight barrel within the winding area, as shown in Figure 4-1.

Drive Slot—The hole or slot in either or both flanges, which serves as the means for driving the reel on the machine take-up.

Finger Holes—Holes in top flanges which serve as a means for lifting reels by using fingers.

Flange—The parts of spools/reels that are perpendicular to the barrel, which define the traverse distance.

Flashing—Excessive material projections that protrude at mold parting lines.

Inspection Slots—Slots in the flange which leave a portion of the winding exposed, in order to provide a means for visual inspection of the winding.

Reel—A reel is defined as having a flange diameter of 8 inches or larger.

Single Tapered Flange Tapered Barrel Spool/Reel—A spool/reel that contains one tapered flange with a tapered barrel within the wiring area, as shown in Figure 4-3.

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Spool—A spool is defined as having a flange diameter of less than 8 inches.

Start Ribs—Indentations or molded ridges in the barrel of a spool/reel, which serve as a gripping surface for the wire on the initial layer of the winding.

Tare Weight—The weight of the empty spool/reel, with no wire applied.

Tie Off Holes—Holes at the junction of the barrel and flange, or on the outside edge of the flange, which serve as a means to tie off the start or end of a reel of wire.

Traverse Distance—The distance between the flanges parallel to the barrel.

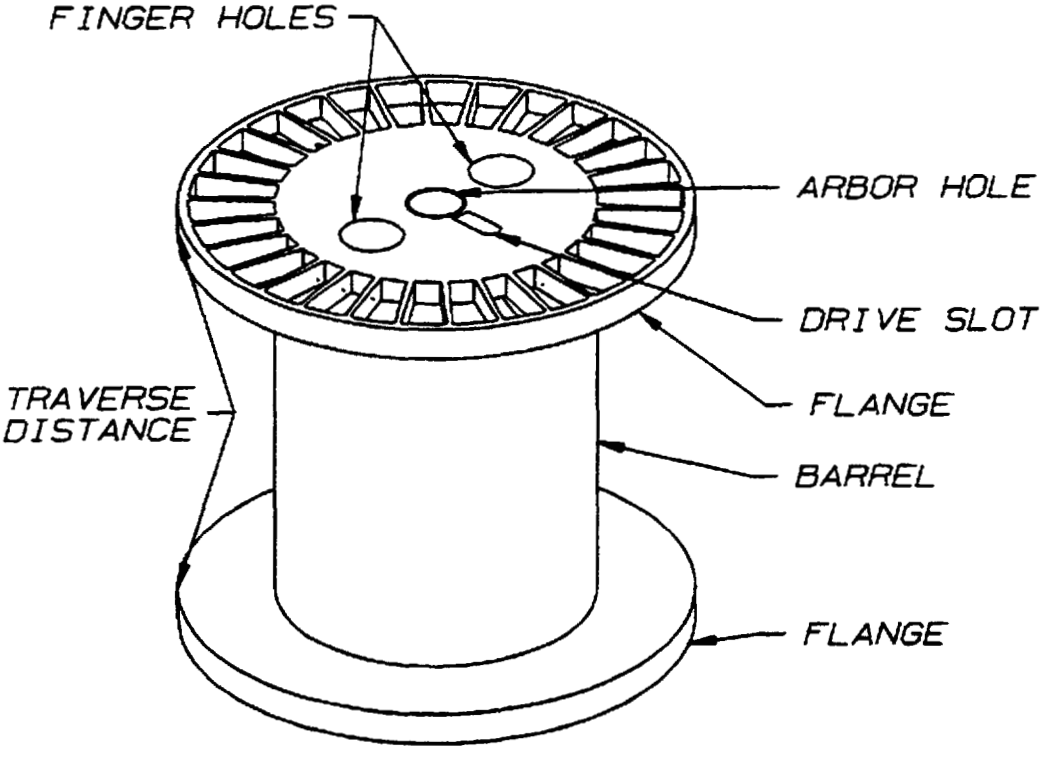


Figure 1-1
PARTS AND FEATURES OF TYPICAL MAGNET WIRE SPOOLS/REELS

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Section 2
RAW MATERIALS

2.1 MATERIALS

All spools/reels shall be fabricated from materials specified by the wire producer.

2.2 MARKINGS

Spools/reels shall be permanently marked in a visible location. The spool/reel shall also carry a marking denoting the country of origin.

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Section 3
PHYSICAL APPEARANCE

3.1 FLANGES

Flanges shall be smooth and free from all material flash which could interfere with over-the-flange de-reeling or cause wire damage.

3.2 FLASHING

Flashing shall be kept to a minimum in the arbor hole in order to prevent spool/reel removal problems on oven and rewind take-ups.

3.3 FLANGE DIAMETER AND INNER FLANGE SURFACES

Flange diameter and inner flange surfaces, and the related radius between these two surfaces shall be free of nicks, scratches, burrs, solvent splash, or solvent runs which will interfere with wire de-reeling and automatic winding.

3.4 BARREL

3.4.1 Surface Condition

The barrel of the spool within its winding area shall be smooth in order to prevent damage to the product. For tapered barrel reels, the barrel of the reel within its winding area may contain a surface and/or ribs, to prevent pulldown.

3.4.2 Solvent/Adhesive Runs

Solvent/adhesive runs along the barrel shall not raise or depress the as-molded surface of the barrel in excess of 0.002 inch.

3.5 SOLVENT/ADHESIVE WELD LENGTH

The solvent/adhesive weld length shall be such that it shows signs that at least 90 percent of the bond area has been covered and solvent applied.

3.6 BUTT SURFACES AND BOND LINE

There shall be no gap between the butt surfaces and the bond line. The line at this butt area shall not exceed an outward extension of 0.002 inch or recess of 0.002 inch for spools, or 0.005 inch and 0.002 inch respectively for reels.

3.7 SINKS

Sinks in the winding area shall be kept to a minimum and shall not be greater than 0.010 inch deep for 3-inch and larger spools, except that 3-inch and smaller spools used for 44½ AWG and finer wire applications shall be 0.005 inch maximum. Sinks in the 60-degree cone area which will affect barrel concentricity or flange run-out, shall not be acceptable. Sinks in the non-winding area shall be acceptable as long as other properties of the spool are within specified limits.

3.8 APPEARANCE AND COLOR

Appearance and color of spools/reels shall be as specified by the wire producer.

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Section 4
DIMENSIONS

4.1 DIMENSIONS AND TOLERANCES

4.1.1 Dimensions—Tapered Flange Spools/Reels

Typical dimensions for commercially available tapered flange barrel spools/reels are in accordance with Figures 4-1 through 4-3 and Tables 4-1 through 4-3.

4.1.2 Reel Sizes

Reel sizes are defined nominally in Tables 4-1 through 4-3.

4.2 MEASUREMENT METHODS

Measurement methods used by spool/reel manufacturers shall be such that they ensure adequate reproducibility.

4.2.1 Flange Thickness

For measuring flange thickness, the spool/reel shall be placed on a surface plate in the vertical position. The flange thickness measurement shall be taken 0.25 inch from the barrel, by suitable equipment capable of measurements to within 0.001 inch.

4.2.2 Barrel Concentricity

Barrel concentricity, with the exception of 1000-pound reels, shall be measured by engaging the 60 degree countersink of the bore with 60 degree conical centers. The pick-up point of a calibrated measuring device shall rest on the barrel, approximately 0.125 inch away from the flange. The spool/reel shall be rotated using "live" conical centers.

4.2.2.1 Spools Less Than 8 Inches

Barrel concentricity for spools greater than 6 inches but less than 8 inches shall not exceed a total indicator reading (TIR) of 0.015 inch.

4.2.2.2 Reels Less Than or Equal to 12 Inches

Barrel concentricity for straight and taper barrel reels sizes 8 through 12 inches, shall not exceed a TIR of 0.020 inch.

4.2.2.3 Reels Greater than 12 Inches

Barrel concentricity for reel sizes greater than 12 inches shall not exceed a TIR of 0.025 inch.

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4.2.3 Flange Wobble

Flange wobble, with the exception of 1000-pound reels, shall be measured using the same holding fixtures as described in 4.2.2. The pick-up point of the calibrated measuring device shall track on the traverse side of the flange 0.25 inch down from the flange outer diameter.

4.2.3.1 Spools 3 Inches and Greater

Flange wobble for spools greater than 3 inches shall meet a requirement of 0.010 inch TIR. For 3-inch spools, the TIR shall not exceed 0.005 inch.

4.2.3.2 Reels 8 Inches and Greater

Flange wobble for reels with flange diameters 8 inches through 11 inches shall not exceed a TIR of 0.015 inch. Flange wobble for reels with a flange diameter greater than 11 inches shall be determined by agreement between the wire producer and reel supplier.

4.2.4 Barrel Diameter

Barrel diameter on all 2-piece spools shall be measured 0.0625 inch from either side of the bond line, allowing for 0.004 inch bond built to be added to the diameter of the barrel.

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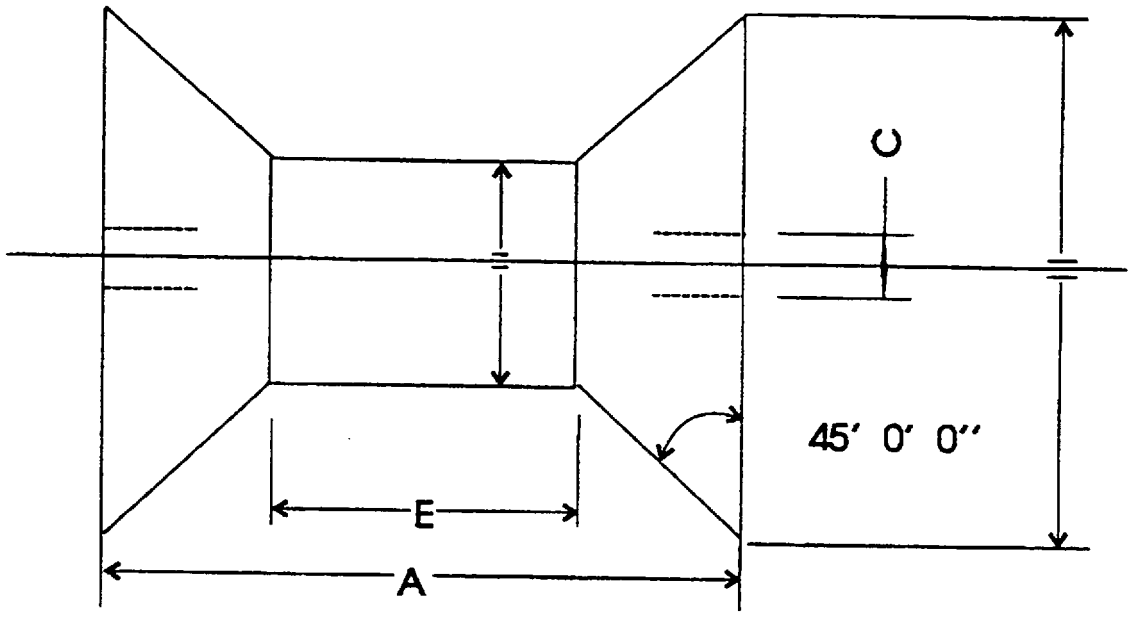


Figure 4-1
DOUBLE TAPERED FLANGE, STRAIGHT BARREL SPOOL

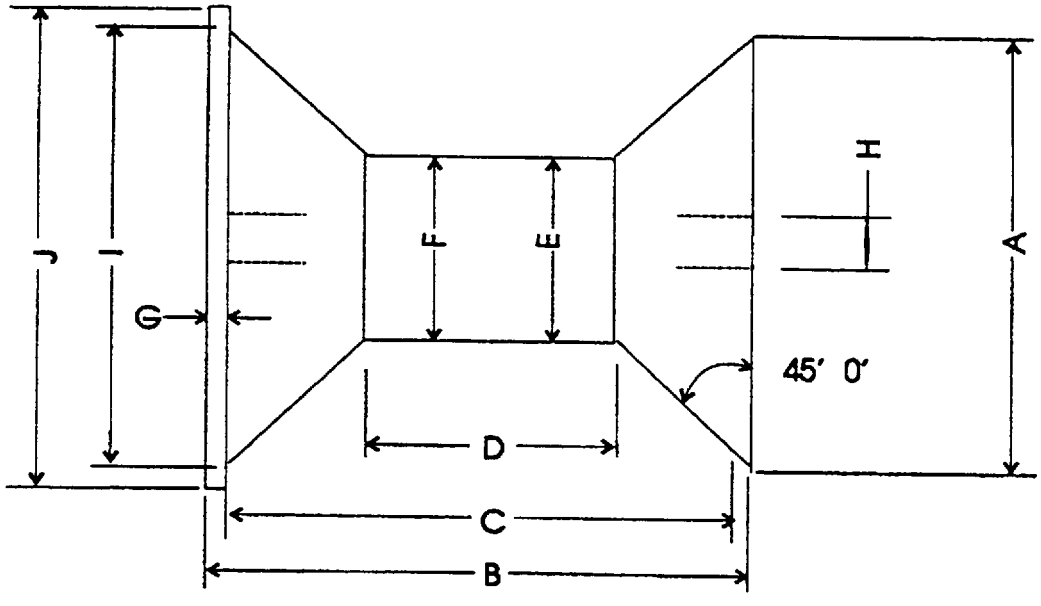


Figure 4-2
DOUBLE TAPERED FLANGE, TAPERED BARREL

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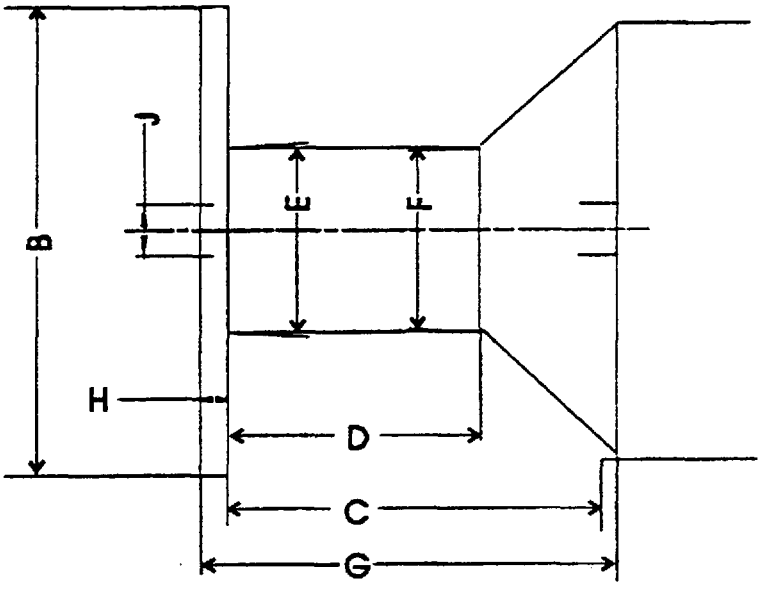


Figure 4-3
SINGLE TAPERED FLANGE, TAPERED BARREL

Table 4-1
COMMERCIALLY AVAILABLE DOUBLE TAPERED/STRAIGHT BARREL SPOOL/REEL DIMENSIONS AND TOLERANCES*
(REFERENCES FIGURE 4-1)

Standard Nomenclature (inches)	Supplier	Nom. Wt. Cu** Wt. (lbs.)	Nom. Tare Wt. (lbs.)	Flange Diameter (inches)	Barrel Diameter (inches)	Barrel Length (inches)	Nominal Overall Length (in.)	Flange Angle	Bore Diameter (inches)
Figure 4-1 Reference				B	D	E	A		C
6 x 6/3 x 3	A	15	0.38	6.000 ±0.020	3.000 ±0.020	3.000 ±0.010	6.265	45º ±2º	0.630 (+0.010, -0.000)
DIN 160/45	A	15	0.49	6.299 ±0.020	3.150 ±0.020	2.854 ±0.010	6.299	45º ±2º	0.630 (+0.010, -0.000) 0.866 (+0.010, -0.000)
DIN 200/45	A	30	0.94	7.874 ±0.020	3.937 ±0.020	3.646 ±0.010	7.874	45º ±2º	0.630 (+0.010, -0.000) 0.866 (+0.010, -0.000)

* This table does not in any way indicate an endorsement of any individual supplier products, rather it reflects known products at the time of printing.
** For aluminum, divide by 3.3

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Table 4-2
COMMERCIALLY AVAILABLE DOUBLE TAPERED FLANGE/TAPERED BARREL SPOOL/REEL DIMENSIONS AND TOLERANCES*
(REFERENCES FIGURE 4-2)

Standard Nomenclature Figure 4-2 Reference	Supplier	Nom. Wt. Cu** Wt. (lbs.)	Nom. Tare Wt. (lbs.)	Top Flange Diameter (inches) A	Bottom Flange Diameter (inches) I	Bottom Flange Thickness (inches) G	Top Barrel Diameter (inches) E	Bottom Barrel Diameter (inches) F	Max. Base Diameter (inches) J	Nominal Overall Length (inches) B	Traverse (inches) C	Flange Angle	Bore Diameter N
TF 80	C	80	2.03	10.032 ±0.030	10.032 ±0.030	.44 ±0.020	6.00 ±0.020	6.800 ±0.020	10.66	12.634	8.23	45º ±2º	1.530 (+0.010, -0.000)
TF 600	C	600	22.0	17.81	19.36	NA	7.96	9.00	NA	22.79	12.00	45º ±2º	1.530 (+0.010, -0.000)
TF 1000B**	C	1000	17.6	17.81 ±0.020	19.36 ±0.020	NA	7.96 ±0.020	9.000 ±0.020	NA	29.18	18.19	45º ±2º	1.530 (+0.010, -0.000)

* This table does not in any way indicate an endorsement of any individual supplier products, rather it reflects known products at the time of printing.
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Table 4-3
COMMERCIALLY AVAILABLE SINGLE TAPERED/TAPERED BARREL SPOOL/REEL DIMENSIONS AND TOLERANCES*
(REFERENCES FIGURE 4-3)

Standard Nomenclature	Supplier	Nom. Wt. Cu** Wt. (lbs.)	Nom. Tare Wt. (lbs.)	Top Flange Diameter (inches)	Bottom Flange Diameter (inches)	Top Flange Edge Radius	Bottom Flange Thickness (inches)	Overall Length (inches)	Barrel Length (inches)	Top Barrel Diameter (inches)	Bottom Barrel Diameter (inches)	Flange Angle	Bore Diameter
85#	B	85	2.9	9.062 ±0.020	10.250 ±0.020	0.250	0.630 ±0.020	11.344	7.750 ±0.010	4.250 ±0.010	5.000 ±0.010	45º	1.281 ±0.010
325#	B	325	14.54	18.95 ±0.010	20.000 ±0.020	0.500	1.500 ±0.020	13.317	6.360 ±0.010	9.020 ±0.015	9.934 ±0.015	45º	1.531 ±0.015
650#	B	650	17.92	19.00 ±0.020	20.000 ±0.020	0.500	1.500 ±0.020	21.004	13.796 ±0.015	9.020 ±0.015	9.953 ±0.015	45º	1.531 ±0.015
1000#	B	1000	23.26	19.05 ±0.010	20.000 ±0.020	0.500	1.500 ±0.020	26.366	19.150 ±0.015	9.020 ±0.015	9.985 ±0.015	45º	1.531 ±0.015

* This table does not in any way indicate an endorsement of any individual supplier products, rather it reflects known products at the time of printing.
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Section 5
STRENGTH OF SPOOLS/REELS

5.1 STRENGTH OF SPOOLS/REELS

Barrel strength, flange impact, and flange deflection are the three most critical factors since poor performance in any of these three areas can lead to spool/reel failure. The following are factors that spool/reel users and suppliers should address to ensure required strengths:

a. Users will recommend spool/reel size ranges needed for various wire sizes and types.
b. Users will require survival of spools/reels under normal shipping and storage conditions.
c. Flange deflection must be minimized to prevent wire entrapment during spooling, which eventually inhibits the de-reeling process.
d. Users will work with suppliers to establish minimum performance requirements of spools/reels used for various purposes.
e. Any certification of mechanical performance of spools/reels is left to the discretion of the user and supplier.
f. Users shall specify strength requirements and tests to be performed as required.
g. Spools/reels shall be constructed in a manner that ensures safety during normal in-plant handling operations.

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Section 6
GENERAL FEATURES

6.1 LIFTING OF SPOOLS/REELS

All spools/reels constructed in conformance with this specification shall provide a means for lifting.

6.2 DRIVING OF SPOOLS/REELS

All spools/reels shall have a method for driving by means of a pin through the spool/reel flange or hub, or by another suitable means as agreed upon between the magnet wire producer and the spool/reel supplier.

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