DASMA STANDARD

STANDARD FOR LIFTING CABLES FOR SECTIONAL TYPE DOORS

DASMA 110-2010

Door & Access Systems Manufacturers' Association, International

Sponsor:

DASMA
Door & Access Systems Manufacturers Association

1300 Sumner Ave
Cleveland, Ohio 44115-2851

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Suggestions for improvement of this standard will be welcome.
They should be sent to the Door & Access Systems Manufacturers' Association, International.

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Foreword (This foreword is included for information only and is not part of DASMA 110-2010, *Standard for Lifting Cables for Sectional Type Doors.*)

This standard was developed by the Technical Committee of the DASMA Commercial & Residential Garage Door Division. It incorporates years of experience applying standards and performance specifications to lifting cables for sectional garage doors when used as an integral component of a counterbalance system.

The DASMA Commercial & Residential Garage Door Division approved the standard as a DASMA standard on January 6, 2010.

DASMA recognizes the need to periodically review and update this standard. Suggestions for improvement should be forwarded to the Door & Access Systems Manufacturers' Association, International, 1300 Sumner Avenue, Cleveland, Ohio, 44115-2851.

DASMA 110-2010

Standard for Lifting Cables for Sectional Type Doors

1.0 SCOPE

1.1 This standard defines the minimum standards and performance specifications for lifting cables for sectional type doors when used as an integral component of a counterbalance system. Counterbalance systems may be composed of torsion spring(s), extension spring(s) or counter weights, as described in ANSI/DASMA 103.

1.2 Minimum standards and performance specifications included in this standard shall be intended to address lifting cable aspects including but not limited to strength, flexibility, durability and safety.

1.3 Inclusions: This standard is intended to address lifting cables used in residential, commercial and industrial sectional type doors generally used for vehicular access to buildings and facilities.

1.4 Without limitation, DASMA does not represent or imply that this standard relates to any component or system other than lifting cables as described herein.

2.0 DEFINITIONS

2.1 Aircraft Cable: See Cable.

2.2 Button Stop: The termination fitting used to anchor the cable into the cable drum in counter balance systems which use torsion springs. The button stop is typically made from an aluminum alloy which is mechanically crimped or cast on the end of the cable. See figure C5.

2.3 Cable: A group of 3 or more strands, helically twisted.

2.4 Cable Assembly: Consists of cable cut to the appropriate effective length for a specific door application and includes all required button stops, sleeves, thimbles, spools, etc.

2.5 Cable Construction / Type: Describes the number of individual wires that make up a strand and the number of strands that make up the cable. May also denote the lay of the wire in the strand and the lay of the strands in the cable.

2.6 Cable Loop: The end of a cable assembly which is formed when a sleeve is used. This loop is typically used as the means of attaching the cable assembly to the bottom bracket attachment point of the door. See figure C5.

2.7 Cable Eyelet: See Cable Loop.

2.8 Cable Size: The diameter of cable is the diameter of the circumscribing circle, or the distance across opposite strands.

2.9 Cable Stop: see Button Stop.

2.10 Cord: See Strand.

2.11 Core: The center Strand. Can be metal or polymer material. See Figure C1.

2.12 Counter Balance System: A system, which counteracts the weight of a garage door to allow a balanced force to open and close the door. Typical application is a spring.

2.13 Counter Balance Tension: Force of the counterbalance approximately equal to the weight of the garage door.

2.14 Cycle: One complete movement of a door beginning with the door in the closed

position, then moving to the open position and back to the closed position.

2.15 Cylindrical Mandrel: Test fixture used for the ductility test. The cylindrical mandrel is a gauge pin with a diameter of two times the diameter of a single cable wire to be tested.

2.16 End Fittings: General term describing the fittings on each cable end. Typically the end fitting at the door bottom bracket is called a Sleeve (see Sleeve) and the end fitting at the counterbalance drum is called a Button Stop (see Button Stop).

2.17 End Stop: See Button Stop.

2.18 Effective Length: The overall working length of a garage door cable as measured from the bottom of the attachment point to the face of the button stop, in torsion spring applications. Measured from the bottom of the attachment point to the cable end for extension spring applications. See Figure C5.

2.19 Extension Spring System: A counterbalance system, which provides a lifting force by the stretching of an extension spring using pulleys with lift cables attached.

2.20 Floating Stop: An un-crimped button stop which is assembled on a cable assembly used for torsion counter balance system. This “floating stop” is loose on the cable and located between the fixed button stop and the loop end. The purpose is to allow the cable assembly to be cut down, field adjusted, and re-secured by a professional installer This enables cable length adjustment thus allowing wider range of applications for the cable assembly. See Figure C5.

2.21 Gage Pin: See Cylindrical Mandrel.

2.22 Lay (twist): The helical form taken by the wires in the strand and by the strand in the wire rope is characterized as the lay (twist) of the strands or wire rope, respectively. In a right-hand lay, the wires of strands are the same direction as the thread on a right-hand screw, and for a left-hand lay, the strands or wires lay in an opposite direction. See Figure C3.

2.23 Length of Lay (pitch): The distance parallel to the axis of the strand or cable, in which a wire or strand makes one complete turn about the axis, is designated as the length of lay (pitch) of the strand or wire rope. See Figure C3.

2.24 Lifting Cable: A cable assembly used in residential, commercial and industrial sectional type doors generally used for vehicular access to buildings and facilities.

2.25 Minimum Breaking Strength (MBS): The minimum tension load that a complete cable assembly must support excluding the stop button.

2.26 Manufacturing ID: Permanent means to identify the manufacturer of cable and or cable assembly. Methods include a color coded tracer filament which is wound into the cable during the manufacturing process. Other options include marked cable stops or sleeves.

2.27 Maximum Balanced Load: the maximum door weight on the cable for a fully counterbalanced door with wound springs.

2.28 Rope: An assembly consisting of a series of interwoven strands surrounding a core. See Figure C1.

2.29 Sectional Type Door: Doors made of two or more horizontal sections hinged together so as to provide a door large enough to close the entire opening and which is guided into the horizontal position, or into the vertical position, by means of an extended vertical track system.

2.30 Sleeve: The cable fitting used to form a loop at one end of the cable assembly. The sleeve is typically made from an aluminum alloy which is mechanically crimped or cast on the end of the cable. See Figure C5.

2.31 Spool: A bushing made to fit into the loop end of the cable assembly, typically made of aluminum or polymer material. It is used to prevent wear to the cable as the cable loop rotates about the cable attachment point during door operation. See Figure C5.

2.32 Stop Button: See Button Stop.

2.33 Strand: Each group of wires helically twisted is designated as a strand. See Figure C1.

2.34 Strand Core: See Core.

2.35 Terminal: The end fitting at either cable end. See Button Stop / End Stop, and Sleeve.

2.36 Thimble: A wear strip made to fit into the loop end of the cable assembly which is typically made from steel or polymer. It is used to prevent wear to the cable as the cable loop rotates about the cable attachment point during door operation. See Figure C5.

2.37 Torsion Spring System: A counterbalance system, which provides a lifting force through a torsion spring, a torsion shaft and cable drums, with lift cable attached.

2.38 Tracer Filament: A color coded strip of polymer or fiber which is wound into the cable during manufacturing. This is used to identify the manufacture of the cable.

2.39 Weighted System: A counterbalance system, which provides a lifting force by means of weights using pulleys with lift cables attached.

2.40 Wire: Each individual cylindrical element is designated as a wire as a part of a strand. See Figure C1.

2.41 Wire Rope: See Cable. See Figure C1.

3.0 GENERAL REQUIREMENTS FOR GARAGE DOOR CABLE

3.1 Material: Wire material is typically either high carbon steel meeting ASTM A1023 or stainless steel meeting ASTM A492.

3.2 Construction: Construction is typically right regular lay (sZ).

3.3 Coating: Cable shall include a corrosion resistant coating.

3.4 Wire rope size and minimum thickness: Common wire rope sizes and corresponding minimum thicknesses shall be as shown in Table 1.

Table 1, Wire Rope Sizes and Minimum Thicknesses

Wire Rope Size	Minimum Thickness, inches
1/16	.062
3/32	.093
1/8	.125
5/32	.156
3/16	.187
1/4	.250

3.5 End Fittings: The bottom cable end fitting shall be designed to allow the cable loop to fit onto the attachment point and to remain on the attachment point during the full travel of the door. This attachment point is typically the bottom bracket. The top cable end fitting should be designed to terminate the cable on the counterbalance drum for torsion spring counterbalance applications.

3.6 Manufacturer Identification: Manufacturing ID shall be located on the cable assembly. This is typically achieved by a color-coded filament or by a stamped designation onto sleeve and/or stop button.

4.0 TESTING REQUIREMENTS FOR GARAGE DOOR CABLE

4.1 General: Testing described in Sections 4.2 through 4.5 shall be conducted at least quarterly. Testing described in Section 4.6 shall be conducted at least annually. Cable manufacturer's instructions shall govern.

4.2 Endurance Test of Cable Rope

4.2.1 Testing shall be conducted in accordance with the applicable provisions of MTL-DTL-83420M.

4.2.2 Endurance testing shall be accomplished by using one of the following three methods.

a) For all methods, the cable shall wrap a minimum of 90 degrees around at least one pulley /sheave. The 90 degrees can not be an additive accumulation of multiple pulleys.

b) Pulley/Sheave Hardness: for test method 1, the pulley / sheave hardness shall be a minimum of 80 Brinell representing industry standard sectional door ounterbalance hardware. For test method 2, the pulley / sheave hardness shall be a minimum of 80 Brinell and be measured for wear and replaced if necessary before each test if using industry standard sectional door counterbalance hardware, otherwise the minimum pulley / sheave hardness shall be Rockwell C60. For test method 3, MIL-DTL-83420M specifies a minimum pulley / shave hardness of Rockwell C60.

c) For all methods, the cable shall contain the initial lubrication at the time of manufacturing the rope cable. No additional lubrication shall be applied throughout the cable endurance test.

1) Test using a complete door assembly with applicable counterbalance system and maximum balance load for that cable diameter.

2) Test using a counter weighted vertical test stand powered by a garage door operator or an equivalent motor / gear reduction system. The test stand shall replicate the worse case conditions of cable action during the opening and closing of a sectional type door (see Figure C6). The maximum balance load on the test cable can be linearly varied from 100% when the cable is fully extended to 20% when the cable is fully wrapped on the drum. This replicates the cable load when used on a standard lift sectional door. For maximum balance load see section 4.2.6.

3) Test using a test stand constructed in accordance with MIL-DTL-83420M (see Figure C7). Test sheave diameters to be no greater than the minimum drum or sheave diameter for the intended garage door application in accordance with ANSI/DASMA 102**.** The tension load on the test cable shall not exceed 20% of value in Table 2.

4.2.3 Cable being tested for vertical lift applications shall require the full maximum balance load on the cable during the entire testing cycle.

4.2.4 The cable shall be powered by an operator / motor that replicates that of the door opener for the intended cable application for test methods #1 and #2. For all test methods the operator / motor speed shall be consistent with the intended door application. The typical speed is a minimum of 7 inches per second as outlined in ANSI/DASMA 109, Section 7.5. Minimum speed of the fixture shall be the speed by which the garage door operator

used is designed for based on the intended application of the operator.

4.2.5 Any fitting shall be acceptable for use in the testing. The purpose of the Endurance test is to test the cable, not the end fittings.

4.2.6 Applied tension load per pair of cable shall be the maximum balanced load of the door for which the cable is intended. When tested using method #2 or #3 the applied tension load to a single cable shall be equal to the maximum balance load /2.

4.2.7 Cable movement shall simulate the full opening and closing of a sectional type door when testing using method #1 or #2 and a minimum of 7' of cable shall be tested for option 1 testing of a complete door. A minimum of 3' of cable shall be tested for option 2 testing of a sub-system. Upon reaching either the predetermined fully open point or fully closed point, a pause of a minimum of 5 seconds shall occur.

4.2.8 Cable shall meet a minimum of 10,000 door cycles in accordance with ANSI/DASMA 102. For method #3, a cycle shall be defined as the travel and return of cable over the test sheaves.

4.2.9 Endurance failure shall be defined as severing or fraying of at least one of the strands. Typical test fixture applications are tested until complete cable failure occurs.

4.3 Pull Test

4.3.1 Testing shall be conducted with the application specific cable loop end fitting. Stop Buttons shall withstand a minimum of 50% of the intended cable's MBS.

4.3.2 Testing shall be performed until the minimum breaking strength is achieved or until the cable breaks**.**

4.3.3 The test shall be completed within 30 seconds of applying the load.

4.3.4 Minimum breaking strength for one cable assembly shall be at least five times the maximum load for the intended cable application as outlined in ANSI/DASMA 102, section 9.4. As two cables are required to operate a door, the maximum door application is 2 times the single cable minimum breaking strength. The minimum breaking strength shall be per Table 2.

Table 2: Cable minimum breaking strength

Cable			Door max weight
Diameter	Construction	*MBS (lb)	(for 2 cables)
1/16	7x7	480	192
3/32	7x7	920	368
1/8	7x7	1700	680
1/8	7x19	2000	800
5/32	7x19	2800	1120
3/16	7x19	4200	1680

* MBS based on MIL-DTL-83420M, table I

4.3.5 Cable breaking shall be defined as a severing of at least one of the strands.

4.4 STRETCH TEST

4.4.1 Testing shall be conducted in accordance with the applicable provisions of ASTM E8. Differential cable stretch or too much cable strentch can result in slack cables.

4.4.2 Applied load shall be $1/5^{th}$ of the maximum breaking strength. The maximum breaking strength includes a 5 to 1 Safety Factor per ANSI/DASMA 102. Therefore, the actual maximum balance weight of the intended cable application will be $1/5^{th}$ of the maximum breaking strength from Table 2.

4.4.3 The elongation measurements shall be completed a minimum of 30 seconds after the load has been applied and a maximum of 300 seconds after the load has been applied.

4.4.4 Percent stretch shall be calculated as elongation of cable length under load, divided by original cable length, then multiplied by 100.

4.4.5 Maximum allowable stretch shall be 1.5%.

4.5 Ductility Test

4.5.1 Testing shall be conducted in accordance with the applicable provisions of MTL-DTL-83420L. Insufficient cable ductility may prevent the cable from wrapping around the intended counterbalance drum.

4.5.2 A cylindrical mandrel (gage pin) fixture shall be used, the diameter of which shall be two times the diameter of a single cable wire to be tested. Note: the single cable wire used for Ductility testing should be obtained either prior to manufacturing the cable wire into a cable rope or unwrapped from the center core.

4.5.3 Testing shall consist of wrapping the single cable wire around the cylindrical mandrel (gage pin).

4.5.4 Testing shall be considered successful if the single cable wire is wrapped two complete turns around the cylindrical mandrel (gage pin), the single cable wire is tight on the cylindrical mandrel (gage pin), and the single cable wire resembles a concentric circle when wrapped on the cylindrical mandrel (gage pin)

4.6 Corrosion Resistance

4.6.1 Cable shall be subjected to a salt spray test in accordance with ASTM B117 for a period of 24 hours.

4.6.2 Cable shall not sustain any visible red rust upon the completion of the testing.

5.0 REFERENCES

ANSI/DASMA 102-2004, *Specifications for Sectional Doors*

ANSI/DASMA 103-2006, *Standard for Counterbalance Systems on Residential Sectional Garage Doors*

ANSI/DASMA 109-2007, *Determination of Life Cycle Performance*

ASTM A492-95(2004), *Standard Specification for Stainless Steel Rope Wire*

ASTM A1023 – 07, *Standard Specification for Stranded Carbon Steel Wire Ropes for General Purposes*

ASTM E8-08, *Standard Test Methods for Tension Testing of Metallic Materials*

ASTM B117-07a, *Standard Practice for Operating Salt Spray (Fog) Apparatus*

DASMA TDS-160, *Garage Door Terminology*

MIL-DTL-83420L

MIL-DTL-83420M

C1. Cable elements. Figure C1 illustrates core, rope, strand and wire, as each term is defined in Section 2 of the standard.

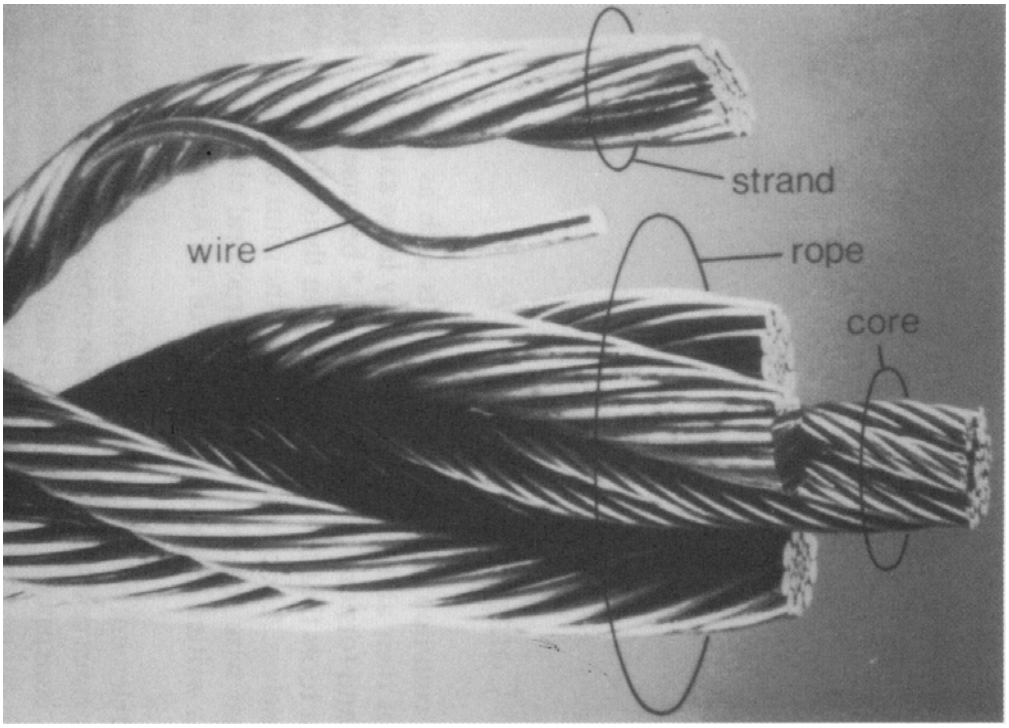


Figure C1
(Reference: Theory Of Wire Rope, second edition, George A. Costello, 1997)

C2: Cable construction type. Figure C2 illustrates cable construction / type, as defined in Section 2 of the standard. 7x7 is commonly associated with 1/16", 3/32" and 1/8" wire rope sizes, and 7x19 is commonly associated with 5/32", 3/16" and 1/4" wire rope sizes.

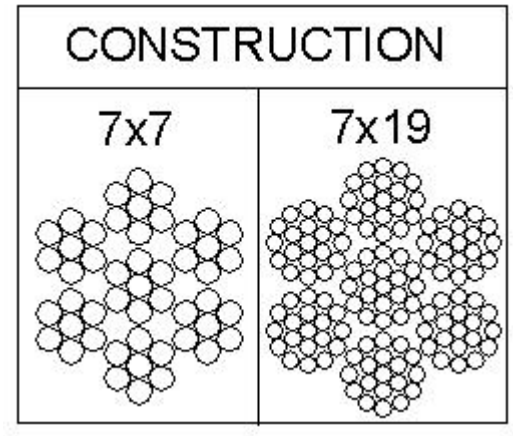


Figure C2

C3. Figures C3 and C4 illustrate lay, as defined in Section 2 of the standard.

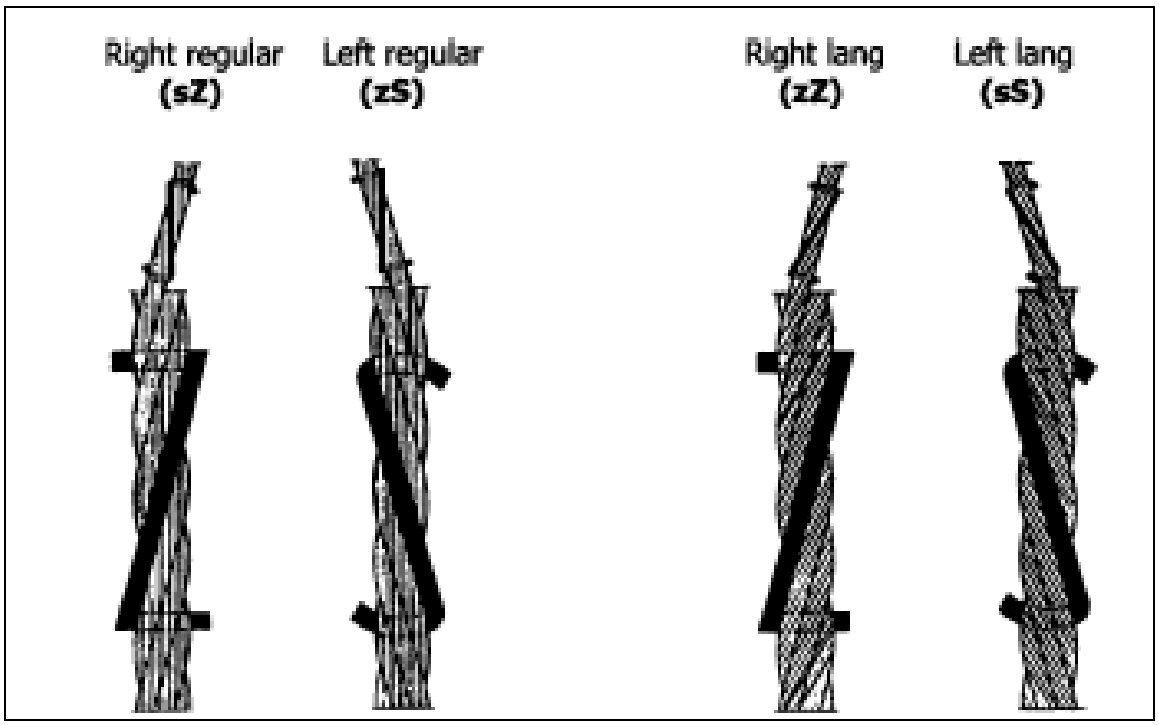


Figure C3
(Reference: ASTM 1023A)

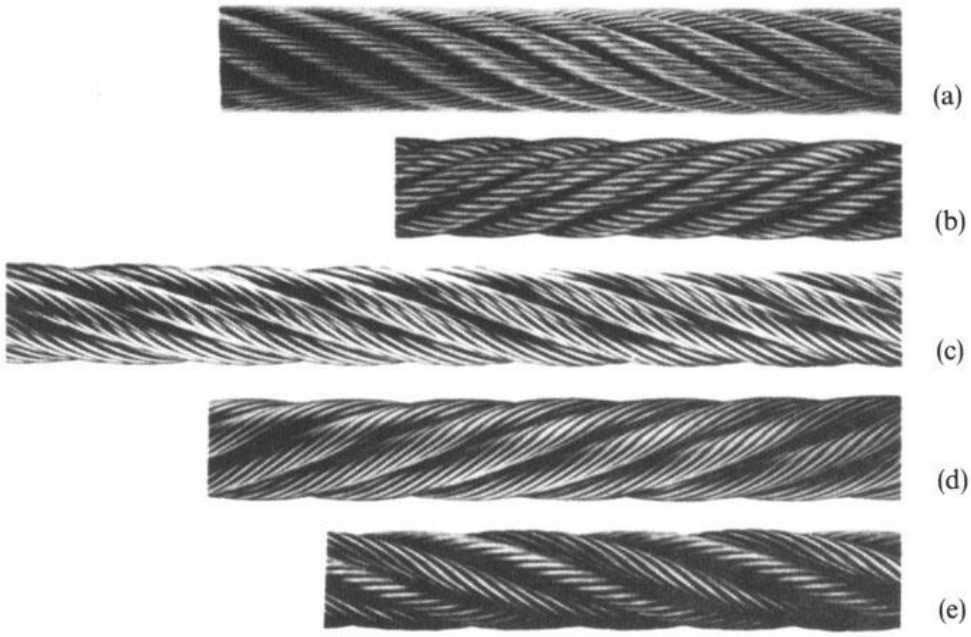


FIGURE 1.2. Typical wire rope lays: (a) right regular lay, (b) left regular lay, (c) right lang lay, (d) left lang lay, (e) right alternate lay.

Figure C4
(Reference: Theory Of Wire Rope, second edition, George A. Costello, 1997)

C4. Endurance test. There are two purposes for the endurance test:

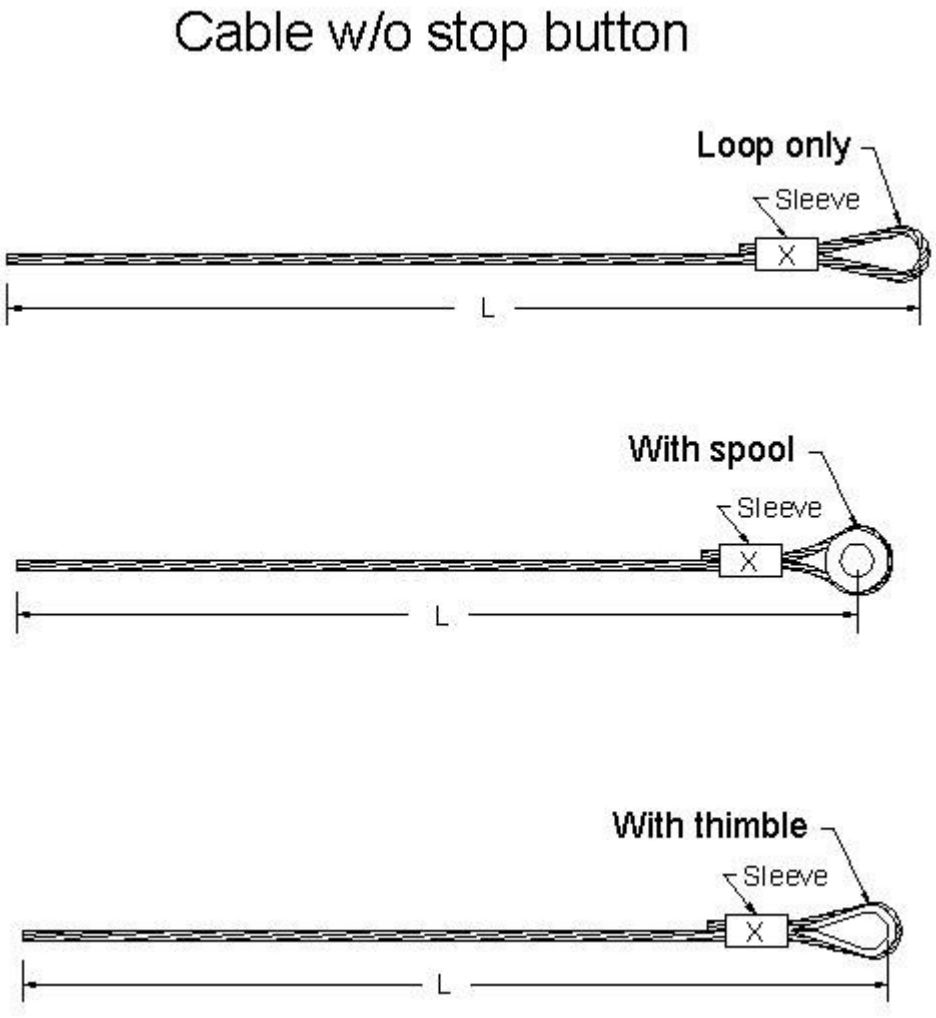
1. Test **frictional wear** of the cable going over a sheave / drum.
2. Test the **fatigue** cyclic properties of the cable to bend around a sheave / drum, straighten, then bend again.

Therefore, the same section of cable shall wrap around 90 degrees of one pulley or sheave to mimic cable wrapping in a typical door application. It is suggested that constant cable tension is difficult to maintain in 4.2.2 test methods 2 & 3 if the cable is wrapped more than 360 degrees around the pulley / sheave. Therefore, the ideal cable wrap around a pulley / sheave is minimum of 90 and maximum of 360.

C5. Stretch test. The applied load as described in the standard shall approach the anticipated service load, i.e.. opening and closing force, of the door and counterbalance system for which the cable is intended. Differential cable stretch or too much cable stretch can result in slack cables.

C6. Cable components. Figure C5 illustrates cable without stop buttons, and cable with stop buttons and floating stop buttons

C7. Pull test. The Stop Button cable end is typically wrapped around a counterbalance drum for torsion spring applications and therefore does not experience the full load. Therefore, the cable can be pull tested with or without the intended stop button as specified by the manufacturer.



Cable with stop button and floating stop button

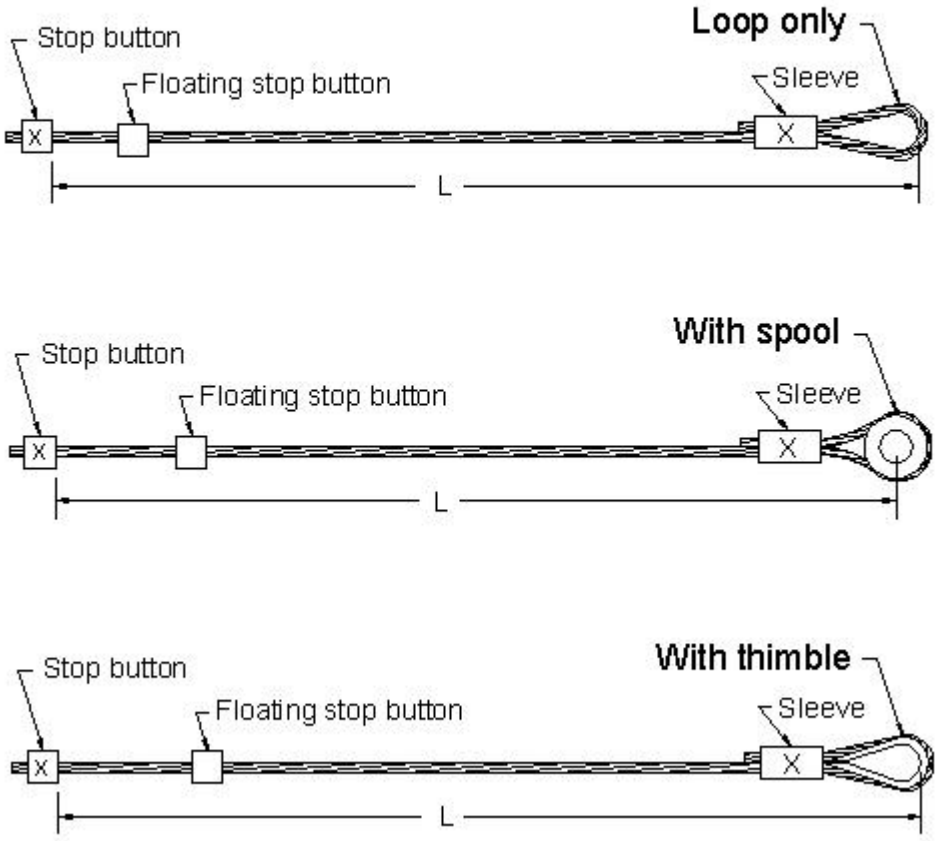


Figure C5

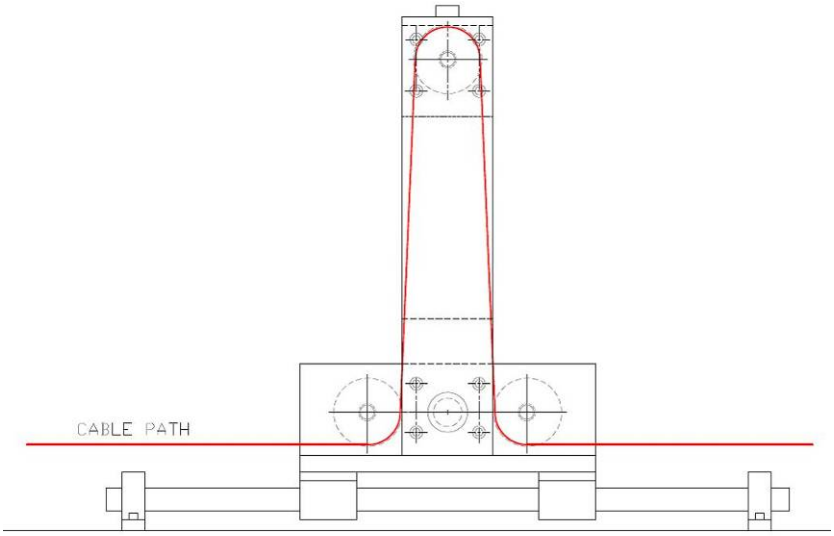


Figure C6
Alternative Cable Endurance Test Equipment

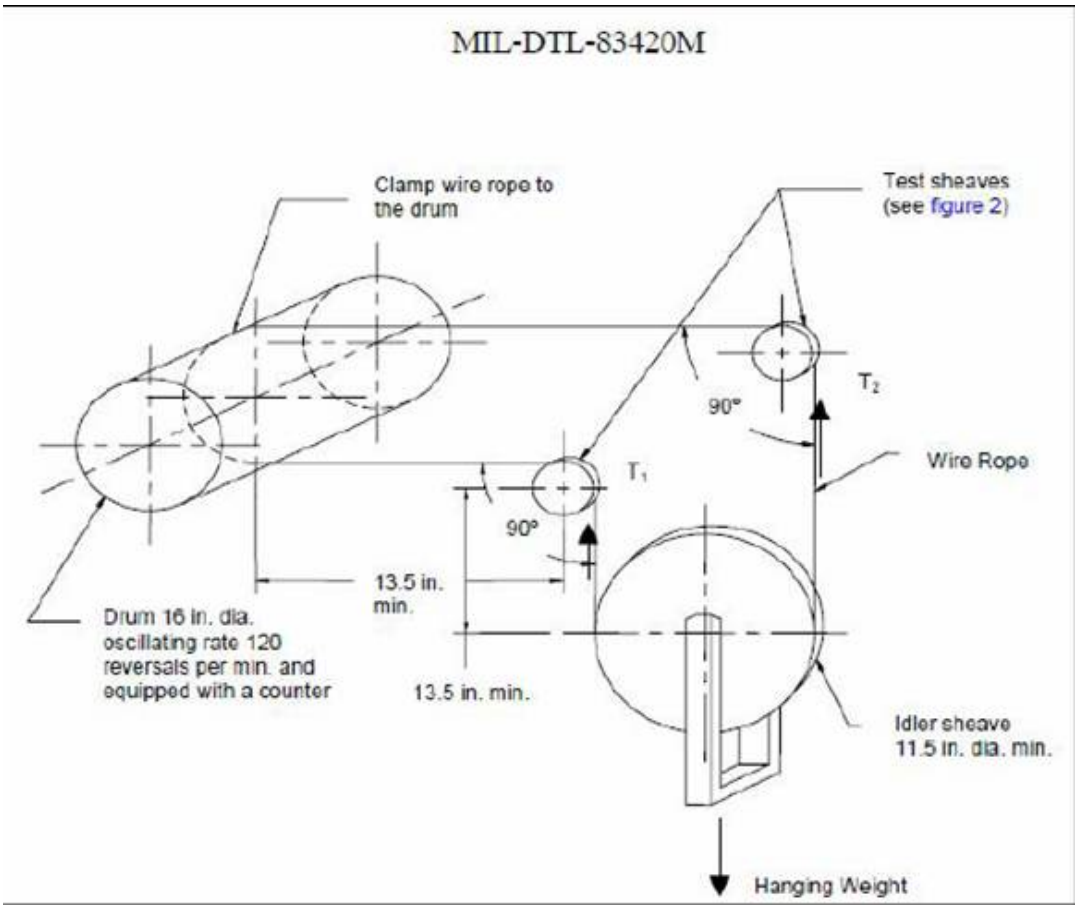


Figure C7
(Reference: MIL-DTL-83420L and MIL-DTL-83420M)