MIL-C-55036A(EL)

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SUPERSEDING
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MILITARY SPECIFICATION

CABLE, TELEPHONE, WM-130( )/G

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope.- This specification covers the requirements of a 26 pair telephone cable, insulated with polyethylene, armored with a galvanized steel braid, and covered with a polyvinylchloride low temperature jacketing compound. This cable is designated as Cable, Telephone WM-130( )/G. (See 6.5).

2. APPLICABLE DOCUMENTS

2.1 Documents.- The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

SPECIFICATIONS

FEDERAL

L-P-390	Plastic, Molding and Extrusion Material, Polyethylene and Copolymers, (Low, Medium and High Density).
QQ-W-343	Wire, Electrical and Non-electrical, Copper (Uninsulated).

MILITARY

MIL-I-631	Insulation, Electrical, Synthetic-Resin Composition, Nonrigid.
MIL-C-12000	Cable, Cord, and Wire, Electric, Packaging and Packing of.

STANDARDS

MILITARY

MIL-STD-105 Sampling Procedures and Tables for Inspection by Attributes.

(Copies of specifications, standards, drawings and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer. Both the title and number or symbol should be stipulated when requesting copies.)

2.2 Other publications.- The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or requests for proposal shall apply.

AMERICAN SOCIETY FOR TESTING MATERIALS

D-573 METHOD OF TEST FOR ACCELERATED AGING OF VULCANIZED RUBBER BY THE OVEN METHOD.

D-1248 POLYETHYLENE MOLDING AND EXTRUSION MATERIALS.

A 90 WEIGHT OF COATING ON ZINC-COATED (GALVANIZED) IRON OR STEEL ARTICLES.

A 239 UNIFORMITY OF COATING BY THE PREECE TEST (COPPER SULFATE DIP) ON ZINC-COATED (GALVANIZED) IRON OR STEEL ARTICLES.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.)

3. REQUIREMENTS

3.1 Cable construction.- The cable shall be constructed in accordance with the following requirements.

3.1.1 Conductor.- Each conductor shall consist of 6 strands of coated copper wire concentrically stranded around 1 strand of galvanized steel wire. (See 4.6.1).

3.1.1.1 Copper strands.- Each copper strand shall be #32 AWG, Coated, Type C, Class B, in accordance with QQ-W-343. (See 4.6.1.1).

3.1.1.2 Galvanized steel strand.- The steel strand shall have a diameter of 0.008 inch ± 5 percent and shall be covered with a coating of commercial pure zinc (galvanized). The strands shall meet the following requirements: (See 4.6.1.2).

(a) Tensile strength.- Each strand shall have a minimum breaking strength of 300,000 pounds per square inch. (See 4.6.1.2(a)).

(b) Weight of coating.- The weight of the zinc coating shall be not less than 25 grams per kilogram of coated strand. (See 4.6.1.2(b)).

(c) Uniformity of coating.- The zinc coating shall be smooth, continuous, free of pin holes and splits, and shall adhere firmly to the steel wire. It shall withstand 1 or more immersions before the end point is reached when tested as required in 4.6.1.2(c) but the number of immersions shall be approximately the same for all specimens from the same sample.

3.1.2 Conductor insulation.- Each conductor shall be insulated with 0.010 inch of high density polyethylene having a nominal wall thickness of 0.010 inch. The minimum wall thickness shall be not less than 0.008 inches. The insulation shall be smooth, and free from holes and occlusions. The polyethylene shall be in accordance with L-P-390, Type II, Class H, Grade 1 except that density shall be .941 - .965 and melt index shall be .50 maximum. Pigments used to color the insulation shall be compatible with the insulation antioxident. (See 4.6.2).

3.1.2.1 Thermal stress cracking.- Six specimens of insulated conductor removed from a finished cable shall be subjected to the test specified in 4.6.2.1. Following the test there shall be no evidence of cracking of the insulation when examined under a magnification of 3 diameters (focal distance 8 cm).

3.1.3 Color code.- The conductors shall be fully color coded. The different colors used shall conform to Table I and shall be readily distinguished. The base color shall be an integral part of the insulation. The color band shall be applied using a nonconductive ink over the insulation with a minimum circumferential coverage of 80 percent. The width of the band shall be approximately 1/8 inch. Spacing between the 2 bands shall be approximately 1/16 inch. The color coding of the wire shall repeat every 3/4 inch. (See 4.6.3).

Table I.- Color code

Pair No.	Layer	Wire		Mate	
		Base color	Band	Base color	Band
1	Center	Blue	1 White	Blue	2 White
2	Center	Orange	1 White	Orange	2 White
3	Center	Green	1 White	Green	2 White
4	First	Brown	1 White	Brown	2 White
5	First	Gray(Slate)	1 White	Gray(Slate)	2 White
6	First	Blue	1 Red	Blue	2 Red
7	First	Orange	1 Red	Orange	2 Red
8	First	Green	1 Red	Green	2 Red
9	First	Brown	1 Red	Brown	2 Red
10	First	Gray(Slate)	1 Red	Gray(Slate)	2 Red
11	First	Blue	1 Black	Blue	2 Black
12	First	Orange	1 Black	Orange	2 Black
13	Second	Green	1 Black	Green	2 Black
14	Second	Brown	1 Black	Brown	2 Black
15	Second	Gray(Slate)	1 Black	Gray(Slate)	2 Black
16	Second	Blue	1 Yellow	Blue	2 Yellow
17	Second	Orange	1 Yellow	Orange	2 Yellow
18	Second	Green	1 Yellow	Green	2 Yellow
19	Second	Brown	1 Yellow	Brown	2 Yellow
20	Second	Gray(Slate)	1 Yellow	Gray(Slate)	2 Yellow
21	Second	Blue	1 Violet	Blue	2 Violet
22	Second	Orange	1 Violet	Orange	2 Violet
23	Second	Green	1 Violet	Green	2 Violet
24	Second	Brown	1 Violet	Brown	2 Violet
25	Second	Gray(Slate)	1 Violet	Gray(Slate)	2 Violet
26	Second	Red	1 White	Red	2 White

3.1.4 Pair twist.- The insulated conductors shall be twisted into pairs. The average length of lay in any pair of finished cable shall not be less than one inch or more than six inches when measured in any ten-foot length. Each pair should have a varied lay. (See 4.6.4).

3.1.5 Cabling.- The twisted pairs shall be arranged in layers, 1 pair thick, to form a cylindrical core. The center layer shall consist of 3 pairs: the 1st layer 9 pairs, and the 2nd layer 14 pairs: the twisted pairs shall be cabled with a left-hand lay of not more than 5.0 inches. (See 4.6.5).

3.1.6 Marker.- Manufacturer's markers are permitted. The use of markers shall have no deleterious effect on the finished cable. (See 4.6.6).

3.1.7 Binder.- An open binder of nylon yarn may be applied over the core with a right-hand lay, if necessary, in the production process. (See 4.6.7).

3.1.8 Core wrap.- The core shall be covered with an approved 0.001 inch polyethylene terephtalate tape, Type G, Forms F or T_f, Class I, in accordance with MIL-I-631. The tape shall be applied helically with an overlap to provide at least 2 thicknesses of material over the core. (See 4.6.8).

3.1.9 Inner jacket.- An inner jacket comprised of a tight fitting polyethylene compound, Type I, Class A, Category 5, Grade E4 or E5, as specified in ASTM D-1248-72 shall be applied over the core wrap. Minimum wall thickness shall be not less than 0.014 inch. (See 4.6.9).

3.1.10 Braid.- A galvanized steel braid shall be applied over the inner jacket. The braid shall consist of 16 carriers, 2 ends per carrier, 0.0126 $\pm$ 0.0005 inch wire applied with 2.33 $\pm$ 0.5 picks per inch; or 24 carriers, 2 ends per carrier, 0.010 $\pm$ 0.0005 inch wire applied with 3.50 $\pm$ 0.50 picks per inch; or 32 carriers, single end per carrier, 0.0126 $\pm$ 0.0005 inch wire applied with 4.67 $\pm$ 0.50 picks per inch. Tensile strength, type, weight and uniformity of coating shall be as specified in 3.1.1.2. Loose strands in the braid are not permitted. Joints in steel strands shall be welded or brazed. A brazed or welded joint shall be the same diameter as the original strand. Dressing of joints or removal of burrs is acceptable to meet these requirements. Welded joints shall be annealed to remove any brittleness. Joints in steel strands shall have an average tensile strength of not less than 35 percent of the average tensile strength of the strands adjacent to the joints, when tested on not less than 12 samples. Joints in the steel strands of the braid shall be so staggered so as to have no detrimental effects on the flexing and tensile properties of the cable. Steel strands which break during the braiding operation may be repaired. This may be accomplished by trimming and then soldering the loose ends to wires running parallel to themselves. A lead-tin alloy solder, a noncorrosive flux, and a fine soldering iron may be used. The length of the soldered section shall be not less than 1/4 inch. The free ends shall be trimmed flush so that no free ends exist. The soldered joint shall be dressed down with a file or other suitable means so that no appreciable increase in braid diameter nor a decrease in jacket thickness develops. (See 4.6.10).

3.1.11 Outer jacket.- A tightly fitting, seamless jacket of black, low temperature polyvinylchloride jacketing compound such as B.F. Goodrich GEON 8677, Bakelite Compound QFD-9924 or QFD-9975, Union Carbide W-919, or equal, shall be applied over the braid. The jacketing compound shall fill the interstices of the braid. The nominal thickness shall be 0.047 inch and the minimum thickness shall be not less than 0.042 inch. The diameter of the finished cable shall be not greater than 0.625 inch and not less than 0.600 inch. (See 4.6.11).

3.1.11.1 Tubing requirement of jacket.- To determine whether the extrusion process has caused strains in the jacket, a specimen of the cable shall be subjected to the test specified in 4.6.11.1. The jacket shall show no evidence of cracking when examined under a magnifying glass of approximately 3 diameters magnification (focal distance 8 cm).

3.1.11.2 Physical requirements of the jacket before aging.- The outer jacket removed from the cable or taken from a slab section shall meet the following requirements performed at an ambient temperature of 18° to 32° C. (See 4.6.11.2).

(a) Tensile strength.- The jacket specimen shall have a tensile strength of not less than 2,000 pounds per square inch of original cross sectional area at rupture.

(b) Elongation.- The jacket specimen shall have an elongation of 350 percent minimum at rupture.

3.1.11.3 Physical requirements of the jacket after aging.- The jacket specimen obtained as indicated in paragraph 3.1.11.2 shall meet the following physical requirements when tested at a temperature of 18°C to 32°C after the specimen has been subjected to the aging process specified in 4.6.11.3.

(a) Tensile strength.- The aged jacket specimen shall have a tensile strength not less than 90 percent of the value obtained on an adjacent specimen prior to artificial aging.

(b) Elongation.- The aged jacket specimen shall have an elongation of the 2 inch gauge marks, at rupture, not less than 90 percent of the value obtained on an adjacent specimen prior to artificial aging.

3.1.12 Identification marking.- The cable shall be marked on the outside with an inked marking. The outer surface of the cable shall be smooth and free from raised or indented markings. All letters and numbers shall be of the same height, inked markings shall be clear and legible. The inked marking shall consist in succession of the nomenclature, the specification number, manufacturer's company initials and year of manufacture ± 30 days. Three to five letter spaces shall be allowed between them. The marking shall be repeated at intervals along the cable not to exceed 1 foot. (See 4.6.12).

3.2 Electrical requirements.- (See 4.7).

3.2.1 DC resistance.- The direct current resistance of each conductor shall not exceed 62 ohms per 1,000 ft. loop at 20°C. (See 4.7.1).

3.2.2 Dielectric strength.- There shall be no evidence of voltage drop when tested in accordance with 4.7.2.

3.2.3 Insulation resistance.- When tested in accordance with 4.7.3 the insulation resistance shall be not less than 10,000 megohms per 1,000 ft. of cable at 20°C.

3.2.4 Conductor resistance unbalance.- The conductor resistance unbalance for each pair shall not exceed 4 percent except that not more than 2 pairs per length may have values between 4 and 8 percent. The conductor resistance unbalance in each pair is expressed as a percentage as follows: (See 4.7.4).

$$\frac{(\text{Higher Value} - \text{Lower Value}) \times 100}{\text{Lower Value}}$$

3.2.5 Mutual capacitance.- In each length of cable the mutual capacitance of each pair measured at 60°F at a frequency of 1,000 cycles, ± 100 cycles per second, shall not exceed 0.090 microfarads per mile, when tested in accordance with 4.7.5.

3.2.6 Capacitance unbalance.- In every length of cable, the 1,000 cycle pair-to-pair capacitance unbalance shall not exceed 160 micro-microfarads for any length of 1,000 feet or less. The average pair-to-pair capacitance unbalance shall not exceed 40 picofarads for any length of 1,000 feet or less. For other lengths of cable, the values shall not exceed the value obtained by multiplying the value for 1,000 feet by the square root of the ratio of the length in question to 1,000 feet. (See 4.7.6).

3.2.7 Attenuation.- The attenuation at 1,000 cycles per second at 20°C shall be not greater than 2.7db per mile of cable terminated with 600 ohms of resistance or when computed from measured primary cable characteristics: resistance and capacitance. (See 4.7.7).

3.2.8 Spark test.- The jacket shall withstand a spark test of 7,500 volts RMS when tested as specified in paragraph 4.7.8.

3.3 Mechanical requirements.- (See 4.8).

3.3.1 Extreme temperatures (Aging).- Following the tests specified in 4.8.1, there shall be no visible evidence of cracking of the jacket or the steel braid when examined under a magnifying glass of approximately 3 diameters magnification (focal distance 8 cm). The first and last turns shall be discounted.

3.3.2 Breaking strength.- The breaking strength of the completed cable shall be not less than 800 pounds without visible rupture of the jacket of the cable. Cable shall meet the requirements of 3.2.1 DC resistance, 3.2.2 Dielectric strength, and 3.2.3 Insulation resistance. (See 4.8.2).

3.3.3 Flexing.- After being subjected to 2,000 cycles of the flex test of 4.8.3 the cable shall meet the requirements of 3.2.1 DC resistance, 3.2.2 Dielectric strength, and 3.2.3 Insulation resistance. In addition, there shall be no physical damage to the cable. Upon completion the portion of cable tested shall be discarded.

3.3.4 Twisting.- After being subjected to 2,000 cycles of the twist test of 4.8.4 the cable shall meet the requirements of 3.2.1 DC resistance, 3.2.2 Dielectric strength, and 3.2.3 Insulation resistance. In addition, there shall be no physical damage to the cable. Upon completion the portion of cable tested shall be discarded.

3.3.5 Impact.- After being subjected to 200 cycles of the impact test of 4.8.5 the cable shall meet the requirements of 3.2.1 DC resistance, 3.2.2 Dielectric strength, and 3.2.3 Insulation resistance. In addition, there shall be no physical damage to the cable. Upon completion the portion of cable tested shall be discarded.

3.4 Repairs.- No repair splices shall be made in the finished cable as a whole. Repairs made in the cable components during manufacture shall conform to the following requirements. (See 4.9).

3.4.1 Stranded conductor splices.- When splices are required in the individual strands, they shall be of the butt type. A brazed or welded joint shall be the same diameter as the original wire. Dressing of splices or removal of burrs is acceptable to meet this requirement. Multiple strand splices may be made in the stranding operation by joining the individual strands provided that the individual strand splices are spaced a minimum of 1 foot apart. No strands shall be kinked. There shall be no splices or joints in the conductor as a whole. (See 4.9.1).

3.4.1.1 Copper strands.- Copper strand splices shall be of the butt type, brazed with silver solder. (See 4.9.1.1).

3.4.1.2 Steel strands.- Steel strand splices shall be of the butt type, welded or brazed with silver solder. Joints shall be annealed to remove any brittleness. The repaired strand shall be not less than 35 percent of the average tensile strength of the strand adjacent to the joint. (See 4.9.1.2).

3.4.2 Insulation repairs.- All insulation repairs shall be made with a suitable heat stabilized, non-oxidizing polyethylene compound and shall be of the heat molded type. In making such repairs, the original insulation shall be removed by smooth tapering cuts, extending on each side of the defect without nicking the conductor. The finished repair shall be cylindrical and smooth with no flash of excess patching compound. The minimum wall thickness requirements of 3.1.2 shall be maintained as closely as possible. The maximum overall length of a repair shall be 4 inches. Insulation repairs shall be sufficiently flexible to meet the low temperature requirements of 3.3.1 using a mandrel of 0.160 $\pm$ 0.005 inch. There shall be no evidence of cracking of the patch or of the joint between the patch and the original insulation. (See 4.9.2).

3.4.3 Jacket repairs.- If repairs are required in the inner or outer jackets, the materials and methods used shall be subject to the approval of the contracting officer. (See 4.9.3).

3.5 Workmanship.- The cable shall be manufactured in such a manner as to be of uniform quality and free from any defects that would affect life, serviceability, or appearance. (See 4.10).

3.6 Material.- Only virgin material shall be used in the manufacture of insulation or jacket compounds used in the fabrication of this cable.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection.- Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Classification of inspections.- The inspection requirements specified herein are classified as follows:

(a) First article inspection. (See 4.3). Does not include preparation for delivery.

(b) Inspections covered by subsidiary documents. (See 4.4).

(c) Quality conformance inspections.

(1) Quality conformance inspection of equipment before preparation for delivery. (See 4.5).

(2) Quality conformance inspection of preparation for delivery. (See 4.11).

4.3 First article.- Unless otherwise specified in the contract or purchase order, the first article inspection shall be performed by the contractor.

4.3.1 First article inspection.- The first article inspection shall consist of the inspections specified in subsidiary documents covering the items listed in 4.4, and the inspections specified for Group A, Group B, and Group C (see Tables II, III, and IV, respectively). The inspection shall be performed in the following order: Paragraph 4.4, Group A and Group B for all units; and Group C as specified in the contract or purchase order. After completion of Group C environmental tests, conforming units shall be reinspected and shall pass all Group A inspection.

4.3.2 First article data.- The first article test plan and test report(s) shall be as required in the contract or purchase order.

4.4 Inspection covered by subsidiary documents.- The following shall be inspected under the applicable subsidiary documents as part of the inspection before preparation for delivery:

Item	Where required
Copper strands	3.1.1.1
Galvanized steel-strand	3.1.1.2(b),(c)
Conductor insulation	3.1.2
Core wrap	3.1.8
Inner jacket	3.1.9

4.5 Quality conformance inspection of equipment before preparation for delivery.- The contractor shall perform the inspection specified in 4.4 and 4.5.1 through 4.5.4. This does not relieve the contractor of his responsibility for performing any additional inspection which is necessary to control the quality of the product and to assure compliance with all specification requirements. The Government will review and evaluate the contractor's inspection procedures and examine the contractor's inspection records. In addition, the Government--at its discretion--may perform all or any part of the specified inspection, to verify the contractor's compliance with specified requirements.

4.5.1 Group A inspection.- Each length of cable (100%) of each lot shall be inspected for conformance to all the inspection and test requirements of Table I. Each lot will be subject to verification, utilizing the procedures of MIL-STD-105 using the general inspection levels and the AQLs indicated in Table II. Group A inspection shall be performed in any order which is satisfactory to the Government.

Table II.- Group A inspection

Inspection	Req. Para.	Insp. Para.	AQL	
			Major	Minor
Visual and mechanical	3.5	4.10	1.0%	4.0%
Conductors	3.1.1	4.6.1		
Color code	3.1.3	4.6.3		
Pair twist	3.1.4	4.6.4		
Cabling	3.1.5	4.6.5		
Marker	3.1.6	4.6.6		
Binder	3.1.7	4.6.7		
Braid	3.1.10	4.6.10		
Outer jacket	3.1.11	4.6.11		
Identification marking	3.1.12	4.6.12		
Electrical				
DC resistance	3.2.1	4.7.1	1.0% for the group. All electrical defects are considered major.	
Dielectric strength	3.2.2	4.7.2		
Insulation resistance	3.2.3	4.7.3		
Conductor resistance unbalance	3.2.4	4.7.4		
Mutual capacitance	3.2.5	4.7.5		
Capacitance unbalance	3.2.6	4.7.6		
Attenuation	3.2.7	4.7.7		
Spark test	3.2.8	4.7.8		

4.5.2 Group B inspection.- This inspection, including sampling, shall conform to Table III and to the special procedure for small-sample inspection of MIL-STD-105. The inspection level shall be S-3 for normal, tightened and reduced inspection. Group B inspection shall be performed on inspection lots that have passed Group A inspection on samples selected from units that have been subjected to and met the Group A inspection. The AQL shall be as shown in Table III.

Table III.- Group B inspection

Inspection	Req. Para.	Insp. Para.	
Physical requirement of jacket before aging	3.1.11.2	4.6.11.2	1.0% for the group

4.5.3 Group C inspection.- This inspection shall be as listed in Table IV and shall be performed on sample units that have been subjected to and met Group A and Group B inspection. These units shall be taken from the first cable produced and from every million feet produced or every 60 days whichever occurs first. These samples shall be selected without regard to their quality.

Table IV.- Group C inspection

Inspection	Req. Para.	Insp. Para.
Thermal stress cracking	3.1.2.1	4.6.2.1
Physical requirement of jacket after aging	3.1.11.3	4.6.11.3
Low temperature test after aging	3.3.1	4.8.1
Breaking strength	3.3.2	4.8.2
Flexing	3.3.3	4.8.3
Twisting	3.3.4	4.8.4
Impact	3.3.5	4.8.5
Repairs	3.4	4.9

4.5.3.1 Noncompliance.- The contractor shall immediately report, in writing, each Group C failure occurrence, including details of the failure and characteristics affected. The contractor shall immediately investigate the cause of failure and further report the results of investigation and details of the proposed corrective action on (i) the process and materials, as applicable, and (ii) all units of produce which were manufactured under the same conditions and which the Government considers subject to the same failure. Reports shall be forwarded to the responsible technical activity designated in the contract through the Quality Assurance Representative. After corrective action has been taken, additional sample units shall be subjected to Group C inspection (all inspections, or the inspections which the sample failed, at the option of the Government) and groups A and B inspection may be reinstituted; however, final acceptance and shipment will be withheld until the Group C reinspection results have shown that the corrective action was effective. (See 6.4).

4.5.4 Reinspection of conforming group B and group C sample units.- Unless otherwise specified, sample units which have been subjected to and passed Group B or Group C inspection, or both, may be accepted on contract, provided that they are resubjected to and pass Group A inspection after repair of all visible damage.

4.6 Cable construction.-

4.6.1 Conductor.- Six samples of each conductor shall be tested in accordance with 4.6.1.1 and 4.6.1.2. (See 3.1.1).

4.6.1.1 Copper strands.- Copper strands shall be tested for compliance with the requirements of 3.1.1.1.

4.6.1.2 Galvanized steel strand.- Steel strand shall be tested in accordance with the following for compliance with the requirements of 3.1.1.2.

(a) Tensile strength.- Test the steel strand to determine that the breaking strength is as required in 3.1.1.2(a).

(b) Weight of coating.- Test the steel strand in accordance with ASTM A-90 to determine that the weight of the coating is as required in 3.1.1.2(b).

(c) Uniformity of coating.- Test several specimens from a single sample of the steel strand in accordance with ASTM A-239 to determine the number of 15 second immersions before the end point is reached as required in 3.1.1.2(c).

4.6.2 Conductor insulation.- Conductor insulation shall be tested for compliance with the requirements of 3.1.2.

4.6.2.1 Thermal stress cracking.- Specimens shall be looped back and tightly wound back on themselves for 5 close turns and the ends secured. The specimens shall be placed in an oven at a temperature of 100°C ± 1° for 14 days. Following the test, the specimens shall cool naturally to room temperature and then examined as specified in 3.1.2.1.

4.6.3 Color code.- The insulated conductors shall be inspected for compliance with the requirements of 3.1.3.

4.6.4 Pair twist.- Cable shall be inspected for compliance with the requirements of 3.1.4.

4.6.5 Cabling.- Cable shall be inspected for compliance with the requirements of 3.1.5.

4.6.6 Manufacturer's marker.- Cable shall be inspected for compliance with the requirements of 3.1.6.

4.6.7 Binder.- Cable shall be inspected for compliance with the requirements of 3.1.7.

4.6.8 Core wrap.- Cable shall be inspected for compliance with the requirements of 3.1.8.

4.6.9 Inner jacket.- Cable shall be inspected for compliance with the requirements of 3.1.9.

4.6.10 Braid.- Cable shall be inspected for compliance with the requirements of 3.1.10.

4.6.11 Outer jacket.- Cable shall be inspected for compliance with the requirements of 3.1.11.

4.6.11.1 Tubing test of outer jacket.- Six specimens of the jacketed cable shall be wound tightly on a mandrel having a diameter of 0.625 ± 0.005 inch, for 5 close turns. The ends shall be anchored securely and the specimen placed in an oven maintained at a temperature of 120°C ± 1° for 1 hour. The specimens shall meet the requirements of 3.1.11.1.

4.6.11.2 Physical test of jacket before aging.- The jacket shall be tested for compliance with the requirements of 3.1.11.2.

4.6.11.3 Physical test of jacket after aging.- Six samples of the jacket shall be tested for compliance with the requirements of 3.1.11.3. Aging shall be performed as follows: Place the specimen in an air oven, conforming to the requirements of paragraph 4 of ASTM Standard D573, and maintain at a temperature of 80°C ± 1° for a period of 14 days, and follow with a cooling period of at least 24 hours at room temperature.

4.6.12 Identification marking.- Cable shall be inspected for compliance with the requirements of 3.1.12.

4.7 Electrical tests.- (See 3.2).

4.7.1 DC resistance.- Each pair of cable length under test shall be tested for compliance with the requirements of 3.2.1.

4.7.2 Dielectric strength.- The insulation shall be capable of withstanding for not less than 3 seconds a DC potential of 3.0 kilovolts or an AC potential of 2100 volts RMS applied between each conductor and the remaining conductors connected to the braid. (See 3.2.2).

4.7.3 Insulation resistance.- Immediately following the dielectric strength test, the insulation resistance between each conductor in turn and the remaining conductors connected to the braid and grounded shall meet the requirements of 3.2.3. In making the insulation resistance test, an electromotive force of not less than 100 volts shall be used, the conductors being maintained negative with respect to ground. The insulation resistance shall be computed from the galvanometer deflection obtained after an electrification of 1 minute. As an alternate, a direct reading insulation resistance bridge may be used. In making the insulation resistance test, the test may be terminated in less than 1 minute if the galvanometer has ceased fluctuating and the reading indicates the required minimum insulation resistance has been obtained. However, tests results on 5 percent of the lengths after 1 minute electrification shall be recorded to permit a continuous check on quality.

4.7.4 Conductor resistance unbalance.- Each cable length shall be tested for compliance with the requirements of 3.2.4. One pair from the center layer, 2 pairs from the 1st layer, and 3 pairs from the 2nd layer shall be selected at random and tested for conductor resistance unbalance.

4.7.5 Mutual capacitance.- Each cable length shall be tested for compliance with the requirements of 3.2.5. One pair from the center layer, 2 pairs from the 1st layer, and 3 pairs from the 2nd layer shall be selected at random and tested for mutual capacitance. The capacitance shall be measured at a temperature not lower than 60°F. If the cable, when measured at a temperature higher than 60°F, fails to meet the requirements, no correction factor may be applied. In such case, the cable may be retested at a temperature not less than 60°F. The mutual capacitance of a pair is that measured between the 2 wires of a pair, the remainder of the conductors being connected to the braid which shall be grounded.

4.7.6 Capacitance unbalance.- Each cable length shall be tested for compliance with the requirements of 3.2.6. Capacitance unbalance shall be measured between each pair and its adjacent pairs in each layer, and between each pair in a layer and all other pairs in adjacent layers.

4.7.7 Attenuation.- Each cable length shall be tested for compliance with the requirements of 3.2.7. One pair from the center layer, 2 pairs from the 1st layer, and 3 pairs from the 2nd layer shall be selected at random and tested for attenuation.

4.7.8 Spark test.- The finished cable shall be run through a drag chain spark tester at a speed sufficient to enable any point of the cable to be subjected to the voltage as specified in paragraph 3.2.8 for 1/4 second minimum.

4.8 Mechanical tests.- (See 3.3).

4.8.1 Low temperature test after aging.- Twelve samples of Cable WM-130( )/U shall be subjected to air oven aging and cooling as outlined in paragraph 4.6.11.1. The samples shall then be subjected to the tests of 4.8.1.1 and 4.8.1.2. (See 3.3.1).

4.8.1.1 Low temperature requirement at -40°C.- Six samples of the completed cable and a test mandrel whose diameter shall be 1.688 inches ± 0.005 inch shall be placed in a cold chamber maintained at a temperature of -40°C ± 1° for 24 hours. At the end of this time, and while still in the cold chamber, the cable shall be wound around the mandrel for 7 close turns. No object having a higher temperature than -40°C ± 1° shall come within 12 inches of the part of the specimen which is under test. (See 3.3.1).

4.8.1.2 Low temperature requirement at -55°C.- Six samples of the completed cable and a test mandrel whose diameter shall be 3.75 inches ± 0.010 inch shall be placed in a cold chamber maintained at a temperature of -55°C ± 1° for 24 hours. At the end of this time, and while still in the cold chamber the cable shall be wound around the mandrel for 3 turns at a slow rate. No object having a higher temperature than -55°C ± 1° shall come within 12 inches of the part of this specimen which is under test. (See 3.3.1).

4.8.2 Breaking strength.- Six samples of cable shall be tested for compliance with the requirements of 3.3.2.

4.8.3 Flexing.- The end of one cable length shall be subjected to the flex test as described in Figure 1 using a bending diameter of 5/8 inch ± 1/64. The test shall be conducted at room temperature. The samples shall meet the requirements of 3.3.3.

4.8.4 Twisting.- The end of one cable length shall be subjected to the twist test as described in Figure 2. The test shall be conducted at room temperature. The sample shall meet the requirements of 3.3.4.

4.8.5 Impact.- The end of one cable length shall be subjected to the impact test as described in Figure 3. The test shall be conducted at room temperature. The sample shall meet the requirements of 3.3.5.

4.9 Repairs.-

4.9.1 Stranded conductor splices.- Conductor strand splices shall conform to the requirements of 3.4.1.

4.9.1.1 Copper strands.- Copper strand splices shall conform to the requirements of 3.4.1.1.

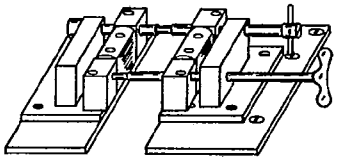
4.9.1.2 Steel strands.- Test the steel strand joint to determine that the tensile strength of the strand containing the joint is equal to not less than 35 percent of the average tensile strength of the strand adjacent to the joint. (See 3.4.1.2).

4.9.2 Insulation repairs.- Test specimens of repaired insulation to determine compliance with the requirements of 3.4.2.

4.9.3 Jacket repairs.- Jacket repairs shall be in accordance with contracting officer's written approval. (See 3.4.3).

NOTES:

1. DURING TEST A 60 CYCLE AC CURRENT OF NOT LESS THAN 0.5 AMPS FLOW THROUGH CONDUCTORS.
2. 1 CYCLE SHALL CONSIST OF 90° BEND EACH SIDE & RETURN TO ORIGINAL POSITION.



INSERT VIEW
WITHOUT CABLE

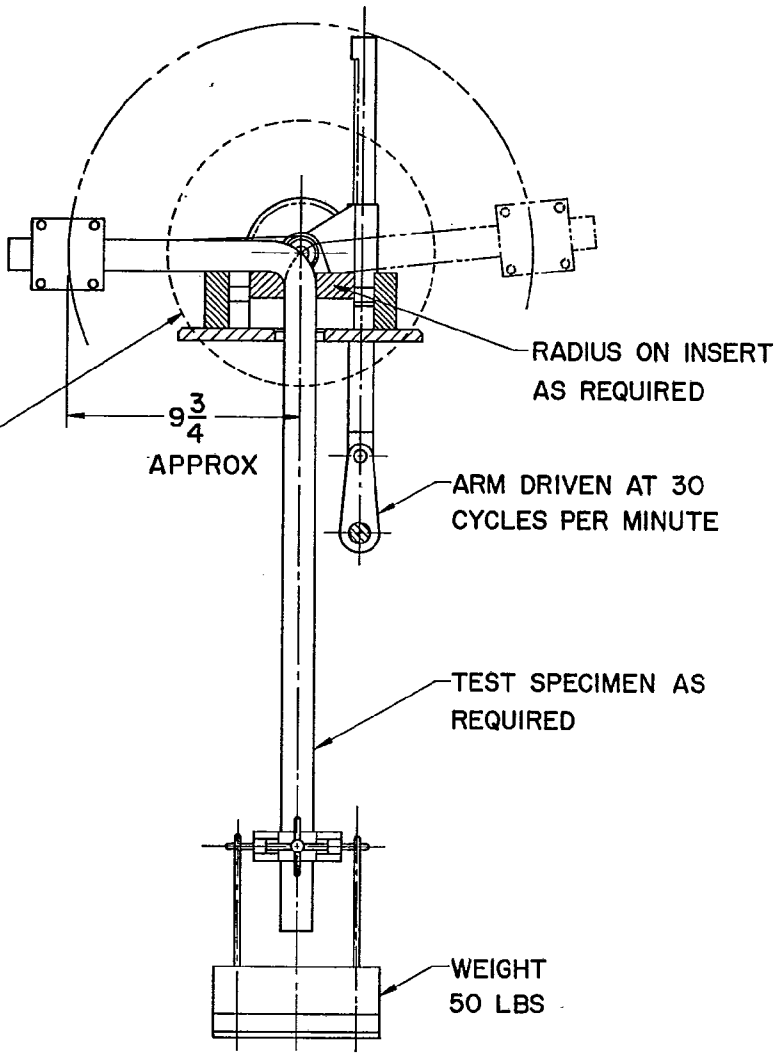


FIGURE 1

FLEX TEST
FIXTURE, CABLE TESTING

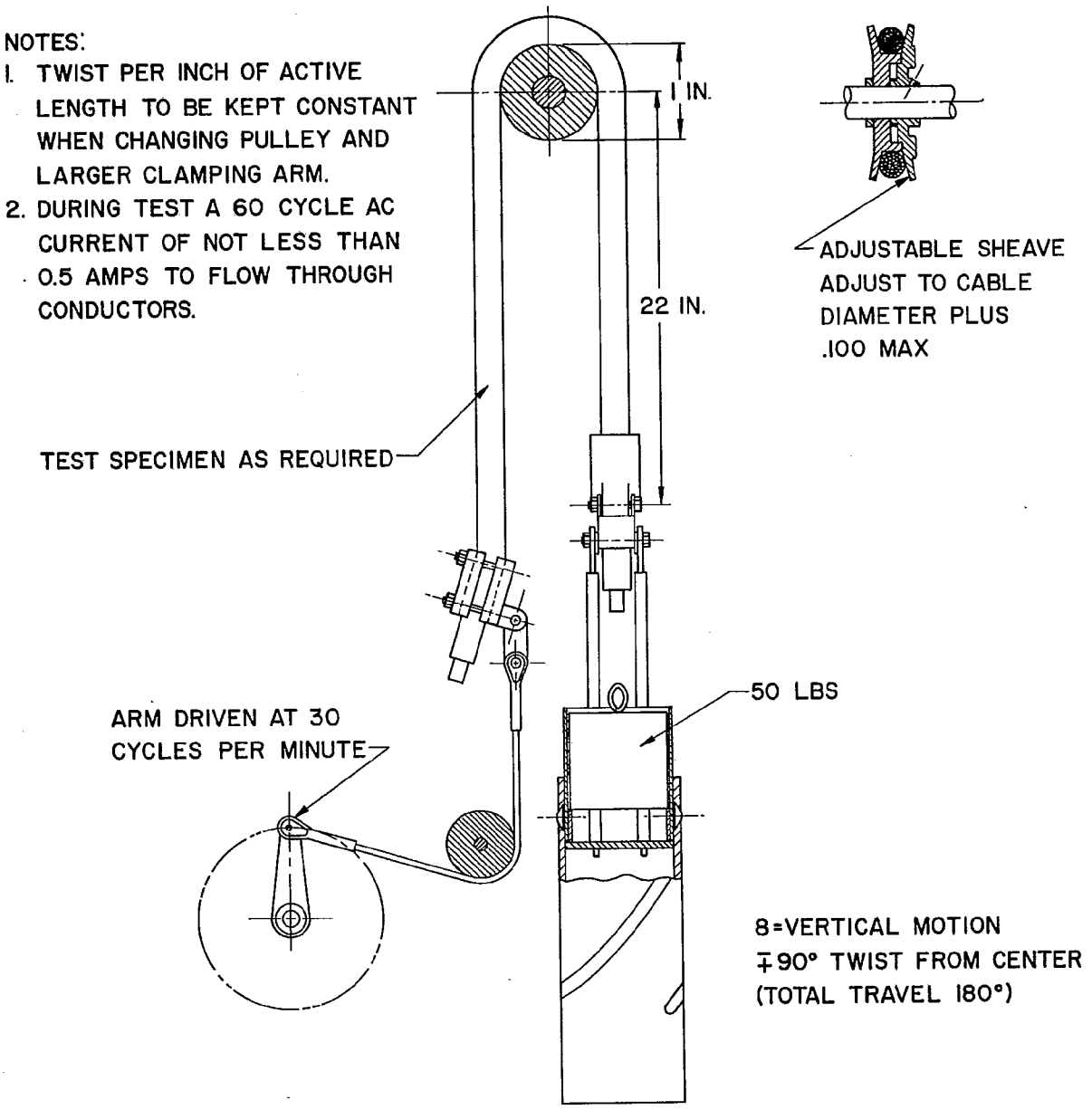


FIGURE 2
TWIST TEST
FIXTURE, CABLE TESTING

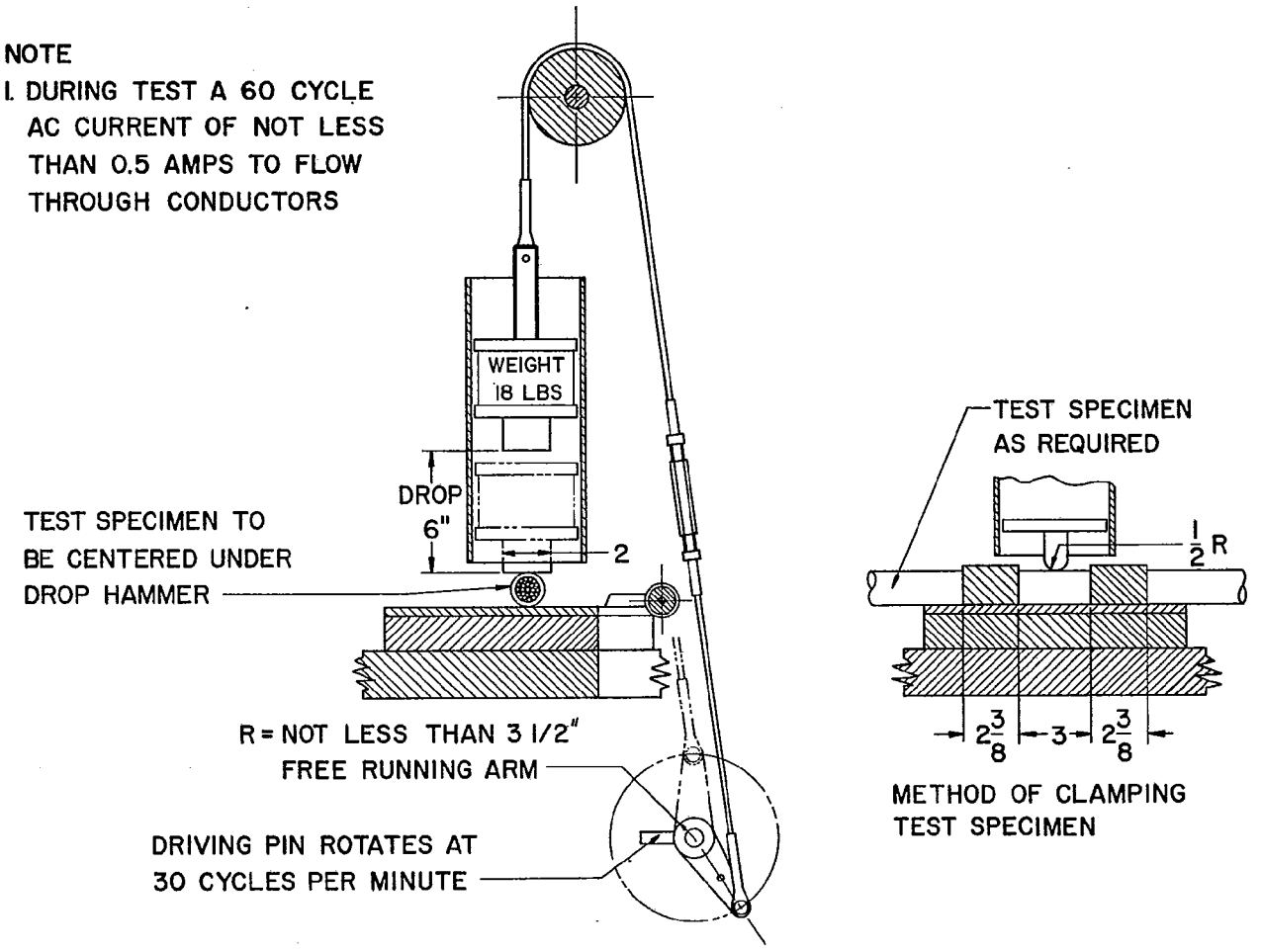


FIGURE 3

IMPACT TEST, FIXTURE, CABLE TESTING

4.10 Visual and mechanical inspection.- Equipment shall be examined for the defects listed in Table V and meet the requirements of 3.5.

Table V.- Classification of visual and mechanical defects

Classification	Defect
Major	Incorrect number of strands.
	Copper strands not correct size.
	Steel strands not correct size.
	Color code not correct or clear.
	Pairing not correct.
	Cabling not correct.
	Inner jacket not correct thickness.
	Braid not correct size or adequate.
	Outer jacket not correct thickness.
	Cable diameter not correct.
Minor	Conductor not centered within insulation.
	Core wrap inadequate or not correctly wound.
	Inner jacket not centered.
	Braid contains loose strands.
	Outer jacket not centered.
	Identification marking not correct.

4.11 Quality conformance inspection of preparation for delivery.- Preparation for delivery shall be inspected in accordance with MIL-C-12000.

5. PREPARATION FOR DELIVERY

5.1 Packaging, packing and marking shall be in accordance with the requirements of MIL-C-12000.

6. NOTES

6.1 Intended use.- The cable is intended for use in field telephone voice frequency applications.

6.2 Ordering data.- Procurement documents should specify the following:

(a) Title, number, and date of this specification and any amendment thereto.

(b) Type required.

(c) Level of packaging and level of packing required for shipment. (Level A, level B, or level C).

6.3 Definitions.-

6.3.1 Unit of product.- The unit of product shall be defined as a length of cable.

6.3.2 Length.- The length shall be defined in the invitation for bid and contract.

6.3.3 Lot size.- The lot size shall be the number of units of product as determined in 6.3.1 offered for inspection.

6.3.4 Sample.- The sample shall consist of that number of sample units required by the sampling plan for the lot size determined as in 6.3.3.

6.3.5 Selection of sample.- The number of sample units required for inspection shall be chosen by selecting 1 coil, spool, or reel for each sample unit required, after which the coil, spool or reel shall be treated as the sample unit for purposes of inspection.

6.3.6 Specimen.- A specimen is an individual piece of cable taken from a sample unit.

6.4 Group C inspection.- Approval to ship may be withheld, at the discretion of the Government, pending the decision from the contracting officer on the adequacy of corrective action. (See 4.5.3.1).

6.5 Nomenclature.- The parentheses in the nomenclature will be deleted or replaced by a letter identifying the particular design: for example, WM-130W/G. The contractor should apply for nomenclature in accordance with the applicable clause in the contract.

6.6 Verification inspection.- Verification by the Government will be limited to the amount deemed necessary to determine compliance with the contract and will be limited in severity to the definitive quality assurance provisions established in this specification and the contract. The amount of verification inspection by the Government will be adjusted to make maximum utilization of the contractor's quality control system and the quality history of the product.

CUSTODIAN

ARMY EL

Preparing Activity

ARMY EL

Project No. 6145-0626