OUTER PROTECTION
BURIED, UNDERGROUND, AND AERIAL
DESCRIPTION AND USE

CONTENTS PAGE

1. GENERAL

1.01 This section describes the various types of outer protection used over the basic lead or plastic sheath of buried, underground, and aerial cables. These outer protections provide the cable with corrosion resistance, mechanical protection, low frequency shielding, or a combination thereof. This section covers code designations, physical characteristics, and other features that require consideration in selecting the type of outer protection to be provided.

1.02 This section is reissued to cover the following:

- UM-type protection
- Description and use for the following superseded outer protections: Rubber Protection (RP), Thermoplastic Protection (TP), Thermoplastic Copper Protection (TCP), and Gopher and Thermoplastic Protection (GTP)

1.03 Wire-armored protection is covered in Section 626-759-030.

1.04 The types of outer protection described in this section are used on exchange- and toll-type cables, including those containing coaxials, video pairs, or disc-insulated spiral-four quads.

CODE DESIGNATIONS

1.05 The type of outer protection is designated by the two letters following the cable code or CA-drawing number. For example, BHAH-100-BT indicates 100-pair, 22-gauge exchange PIC cable, having PASP sheath with buried tape armor protection. The various standard and superseded

types of outer protection and their code designations are listed in Tables A and B, respectively.

TABLE A

STANDARD OUTER PROTECTION DESIGNATIONS

CODE	TYPE OF PROTECTION
AT (ATA[1])	Aerial tape armor
BT (T[1])	Buried tape armor
GT	Gopher tape armor
UM	UM-type protection (unsoldered)
MP	MP-type protection[2] (soldered)
MG	Modified gopher tape armor

Note 1: Earlier designations.

Note 2: MP-type protection used only on plastic sheath. Introduced in 1965.

TABLE B

SUPERSEDED OUTER PROTECTION DESIGNATIONS

CODE	TYPE OF PROTECTION	MFR DISC
JP (J[1])	Jute protection[2]	1965
CP	Corrosion protection[3]	1960
MT	Modified tape armor	1967
RP	Rubber protection	1941
TP	Thermoplastic protection	1947
TCP	Thermoplastic copper protection	1948
GTP	Gopher and thermo-plastic protection	1941

Note 1: Earlier designations.

Note 2: Superseded by polyethylene jacketing over lead.

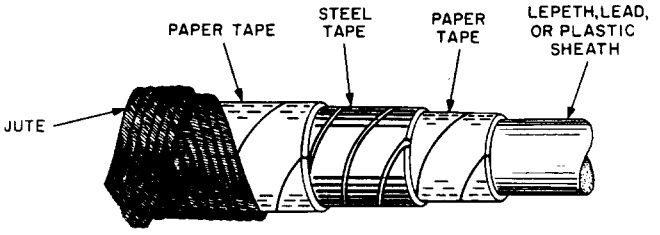
Note 3: Superseded by plastic sheaths and polyethylene jacketing over lead.

1.06 Length, manufacturer's identification, date of sheathing, and cable code markings are applied to the outer polyethylene jacket of MP-, UM-, MG-, and AT-type protected PTC cables. These markings are described in Section 626-759-015 covering plastic sheaths.

2. DESCRIPTION AND USE OF STANDARD OUTER PROTECTIONS

GT-TYPE GOPHER TAPE ARMOR

2.01 ***Description:*** GT-type gopher tape armor (Fig. 1) consists of the following:



NOTE:
LEAD AND EACH LAYER ARE FLOODED WITH ASPHALT COMPOUND. ON PLASTIC SHEATH, THE FLOODING OF ASPHALT OVER THE SHEATH IS OMITTED.

Fig. 1—GT-Type Gopher Tape Armor

(a) Spirally applied layer of impregnated paper tape.

(b) A spirally applied layer of 0.010-inch steel tape.

(c) A spirally applied layer of impregnated paper tape.

(d) One or two spirally applied layers of jute. ***Cables having less than 1 inch sheath diameter*** have one layer of jute; ***cables having 1 inch and larger,*** two layers of jute applied in reverse direction.

2.02 ***Use:*** GT-type gopher tape armor is intended for buried use in areas where gopher infestation is severe or where a small degree of mechanical protection is required. GT-type gopher tape armor could be obtained on both lead and composite sheath cable until 1965, when GT-type protection was replaced by MP-type protection for plastic sheaths having a basic sheath diameter of 2.78 inches or

less. (For larger diameter plastic-sheathed cables, the GT-type protection will be used until facilities are provided for applying MP-type protection over the larger sizes.)

MP-TYPE PROTECTION

2.03 ***Description:*** MP-type protection (Fig. 2) consists of the following:

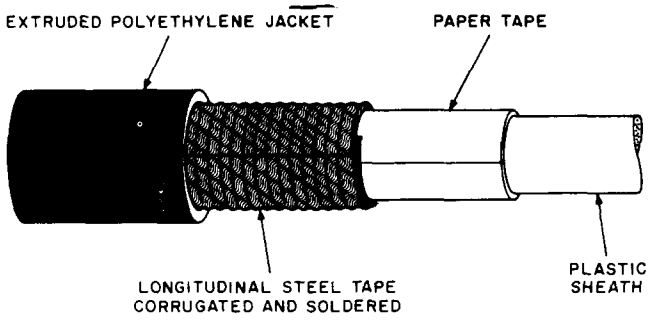


Fig. 2—MP-Type Protection

(a) A longitudinally applied layer of crepe paper over the plastic sheath.

(b) A longitudinal tin plated steel tape, 6-mils thick, corrugated and soldered.

(c) A flooding of thermoplastic cement over the longitudinal steel tape and an outer extruded jacket of polyethylene. The polyethylene jacket thickness ranges from 0.045 inch on small size cables to 0.070 inch on larger size cables.

2.04 ***Use:*** MP-type protection was introduced to the field in 1965. It supersedes the GT-type gopher tape on PAP, PASP, tolpeth K, alpeth, and stalpeth sheath cables 2.78 inches and smaller in diameter. Pulp cable with stalpeth sheath is not recommended for buried use. However, MP-type protection can be obtained on pulp-insulated cables with stalpeth sheath, primarily to serve as a light mechanical protection in built-up areas where lightning is not a problem.

2.05 ▶Cable with MP-type protection is well adapted for plowing. The outer polyethylene jacket eliminates the delays formerly caused by the accumulation of the jute impregnating compound in the plow share when cables with GT-type of protection were placed. The clean poly-jacket on MP-type protection permits attachment of the cable to a building wall or pole surface without special preparation; formerly, it was often necessary to remove the impregnated jute and steel tape to avoid dripping compound or unsightly raveling of the jute after weathering. The MP design provides added protection when required, as in pulling large size pulp or PIC cable through bored holes under roadways, and for other applications where a supplementary light mechanical protection is considered necessary.◀

▶UM-TYPE PROTECTION◀

2.06 ▶UM-type protection was introduced for field use in 1971 as a replacement for MP-type protection. MP-type protection will not be rated MD at this time since manufacturing facilities are not available to provide for a complete replacement with UM-type protection. Therefore, MP-type protection may be furnished in lieu of UM-type protection. Also UM-type protection on pulp insulated cable will not be offered at the present time.◀

2.07 ▶UM-type protection (Fig. 3) consists of the following:

(a) A longitudinal untinned steel tape, 6-mils thick, corrugated and unsoldered. To retard corrosion, a coating of polyolefin fill compound is applied to the inside surface and an adhesive coating is applied to the outside surface of the steel.

(b) An extruded polyethylene jacket.◀

2.08 ▶***Use:*** UM-type protection is intended for buried use on PIC (Plastic-Insulated Conductor) cables having a plastic sheath (except tolpeth J). The UM design is also used in areas where a light supplementary mechanical protection may be desirable.◀

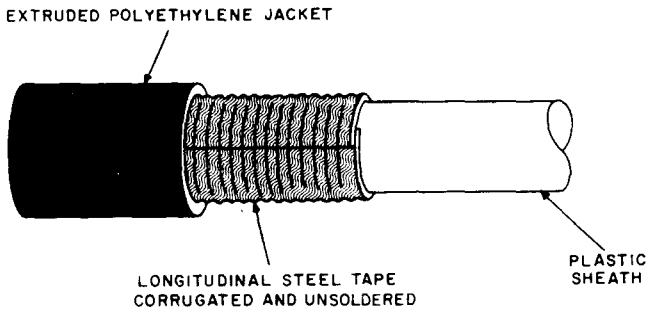


Fig. 3—UM-Type Protection

MODIFIED GOPHER TAPE ARMOR (MG)

2.09 ***Description:*** Modified gopher tape armor (Fig. 4) is used only on lead or lepeth sheath. It consists of the following:

(a) A spirally applied layer of alternate paper and lead tape.

(b) A spirally applied layer of 0.010 inch thick nongalvanized steel tape.

(c) A flooding of thermoplastic cement over the steel tape and an outer extruded jacket of polyethylene.

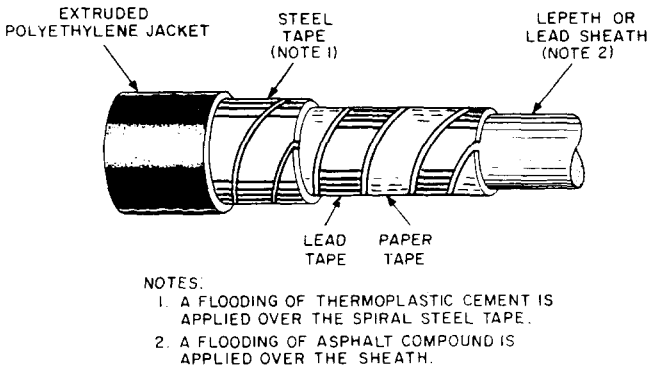


Fig. 4—Modified Gopher Tape Armor (MG)

2.10 ***Use:*** Modified gopher tape armor is used on buried lead or lepeth sheath toll cables to protect against gophers. It is not used on plastic-sheathed cables. This structure is a modification of gopher tape armor to provide a continuous electrical contact between the steel tapes and the lead sheath. This is done to prevent sheath damage by arcing between the steel tape and lead sheath due to lightning. This class of protection is intended for use in lightning areas, where gopher protection is required.

POLYETHYLENE JACKET PROTECTION

2.11 ***Prior to 1965:*** Two types of corrosion protection were provided for lead covered cables: poly-jacket type for use in conduit, and jute protection (JP-type) for buried use. ***In 1965*** the poly-jacket type was standardized to supersede the JP-type for buried use.

2.12 The standard code designations are ***E*** for poly-jacketed lead, and ***F*** for poly-jacketed lepeth. These code designations should be used in placing orders for cable with poly-jacket protection.

2.13 ***Description:*** Poly-jacketed lead and lepeth sheaths are described in Section 626-759-015 and 626-759-020.

2.14 ***Use:*** The primary use of lead and lepeth sheath with poly-jacket is in intercity coaxial cable routes where the use of tolpeth J or K sheaths is not recommended. Poly-jacketed lead sheaths may also be used for replacement of corroded lead sheath in conduit or jute protected lead sheath in buried plant where conditions do not permit installation of one of the standard plastic sheath designs.

2.15 Poly-jacket lead is superior to the superseded jute protected type (JP-type) for buried use. Poly-jacketed cable is easier to install by plowing. The clean sheath eliminates delays involved in cleaning the plow share of asphalt compound which accumulates when plowing jute-protected cables. The relatively high resistance from sheath to earth of the poly-jacketed type also simplifies the application of cathodic protection on lead sheath where this is necessary, such as in the vicinity of pipe lines or other underground metallic structures.

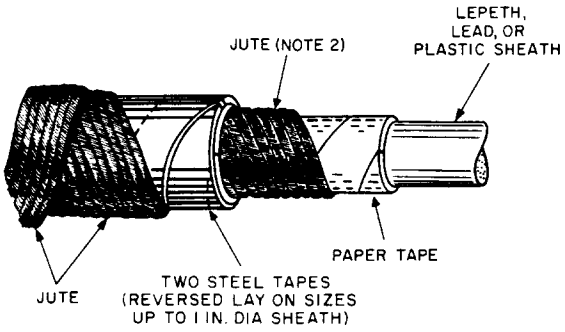
BURIED TAPE ARMOR (BT)

2.16 ***Description:*** Buried tape armor (Fig. 5) consists of the following:

(a) For lead sheath, a spirally applied layer of impregnated paper tape and a spirally applied layer of jute. For plastic sheath, two spirally applied layers of impregnated paper tape.

(b) Two spirally applied layers of steep tapes 0.020 through 0.041 inch thick. ***On cables having less than 1 inch sheath diameter*** the two layers of steel tape are spiraled in opposite directions to avoid cable damage during application. ***On cables having 1 inch and larger*** the outer layer is applied in the same direction and centered over the gap between turns of the first layer.

(c) One or two spirally applied layers of jute. ***Cables having less than 1 inch sheath diameter*** have one layer of jute; ***cables having 1 inch and larger*** have two layers of jute.



NOTES:
1. THE SHEATH AND EACH LAYER ARE FLOODED WITH ASPHALT COMPOUND. ON PLASTIC SHEATH, THE FLOODING OF ASPHALT OVER THE SHEATH IS OMITTED.
2. JUTE USED ON LEAD SHEATH ONLY.

Fig. 5—Buried Tape Armor (BT)

2.17 ***Use:*** Buried tape armor is available on plain lead, lepeth, and all plastic-sheathed cables except stalpeth and tolpeth J, both of which are used predominantly in conduit and aerially. Buried tape armor is intended for use as mechanical protection in rocky soil, and provides gopher protection where necessary. The measure of protection provided by the steel tapes against mechanical injury by power tools or heavy construction equipment such as bulldozers and trenchers is small. However, it is useful as protection against damage by hand tools.

2.18 Buried tape armor is also used to provide shielding against low frequency induction in routes closely parallel to high voltage power lines.

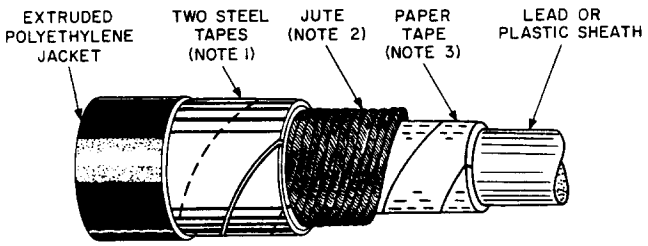
AERIAL TAPE ARMOR (AT)

2.19 ***Description:*** Aerial tape armor (Fig. 6) consists of the following:

(a) Two spirally applied layers of impregnated paper tape on plastic sheath cable or one spirally applied layer of jute on lead sheath cable.

(b) Two spirally applied layers of 0.020-, 0.030-, or 0.041-inch thick ***nongalvanized*** steel tapes depending on cable diameter. ***On cables having less than 1.5 inches sheath diameter*** the steel tapes are spiraled in opposite direction. ***On cables having 1.5 inches and larger diameter,*** both layers of steel tape are applied in the same direction; the outer tape is centered over the gap between the turns of the inner tape. ***Prior to 1968*** galvanized steel tapes were used rather than nongalvanized steel tapes.

(c) A flooding of thermoplastic cement and an extruded outer jacket of polyethylene. These components were not used prior to 1968.



NOTES:
1. A FLOODING OF THERMOPLASTIC CEMENT IS APPLIED OVER THE SPIRALED STEEL TAPES.
2. JUTE USED ON LEAD SHEATH ONLY.
3. PAPER TAPE USED ON PLASTIC SHEATH ONLY.

Fig. 6—Aerial Tape Armor (AT)

2.20 ***Use:*** Aerial tape armor is intended for aerial use on lead or plastic-sheathed cables. The new design with nongalvanized steel tapes, flooding compound, and outer polyethylene jacket was adapted in 1968 to simplify manufacture, inhibit corrosion of the tape armor and to facilitate handling the cable in the field. The use of aerial tape armored cable is relatively small; however, cable of this

type has limited application in plant under the following conditions.

(a) Where the added shielding from low frequency induction provided by the tape armor is required on aerial routes.

(b) Where protection is needed to minimize mechanical damage to cable supported by strand attached to a bridge. The jute bedding between the steel tapes and the sheath also provides cushion that minimizes the possibility of fatigue failure of lead sheath through vibration of the cable.

(c) Where protection against stone bruises is required, such as in the vicinity of stone yards, quarries, or other locations where blast damage might occur.

(d) Where heavy protection against abrasion is needed, such as where the cable passes between tree branches.

2.21 ***Precautions:*** The increase in weight of the cable and the effect of the added diameter on storm loading must be taken into account in planning the job and selecting the strand where aerial tape armor is to be used.

3. DESCRIPTION AND USE OF SUPERSEDED OUTER PROTECTIONS

3.01 The description and use of superseded protections are retained in this section because there are considerable quantities of cable having these protections still in plant.

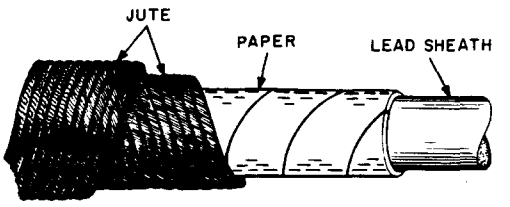
JUTE PROTECTION (JP)

3.02 Jute protection on lead-sheathed cables was rated Manufacture Discontinued in 1965. Poly-jacketed lead (E) and lepeth (F) sheaths are the present standards.

3.03 ***Description:*** Jute protection (Fig. 7) consists of the following:

(a) Two spirally applied layers of impregnated paper tapes.

(b) One or two spirally applied layers of jute, depending on the diameter over the sheath.



NOTE:
LEAD AND EACH LAYER ARE FLOODED WITH ASPHALT COMPOUND.

Fig. 7—Superseded Jute Protection (JP)

3.04 ***Use:*** Jute protection was used on buried lead-sheathed cables in nongopher areas where soil conditions were favorable. It provides corrosion protection and minimal mechanical protection.

CORROSION PROTECTION (CP)

3.05 With the advent of plastic sheaths, the CP-type corrosion protection on lead-sheathed cables was rated Manufacture Discontinued because of the superior corrosion resistance offered by a polyethylene jacket.

3.06 ***Description:*** CP-type protection consists of two reversed layers of sisal-kraft paper and outer layer of fabric tape. The sheath and each layer have a coating of flooding compound. Fabric tape was used to minimize diameter buildup and prevent pile-up material in the ducts during placement or removal.

3.07 ***Use:*** CP-type corrosion protection was used in conduit under conditions where the lead was subject to corrosion.

3.08 The recommended replacement for corrosion protection, is a standard plastic sheath design such as stalpeth or tolpeth J. However, under conditions where the standard plastic sheath designs are unsuitable, poly-jacketed lead may be used. Sections 626-759-015 and 626-759-020 describe poly-jacketed lead sheath.

◗RUBBER PROTECTION (RP)◖

3.09 ◗Rubber protection on lead-sheathed, paper-insulated cables was rated Manufacture Discontinued in 1941.◖

3.10 ◗***Description:*** Rubber protection consists of vulcanized rubber applied over a lead sheath.◖

3.11 ▶*Use:* Rubber protection was used on lead sheath cables in buried plant without the use of conduit.◀

▶THERMOPLASTIC PROTECTION (TP)◀

3.12 ▶Thermoplastic protection on lead-sheathed, paper insulated cables was rated Manufacture Discontinued in 1947.◀

3.13 ▶*Description:* Thermoplastic protection consists of the following:

(a) Two layers of thermoplastic compound.

(b) Serving of fabric tape saturated with peservative compound.◀

3.14 ▶*Use:* Thermoplastic protection was used on lead sheath cables in buried plant without the use of conduit. Also used in the field on stub cable for 37-C and 37-D type terminals.◀

▶THERMOPLASTIC COPPER PROTECTION (TCP)◀

3.15 ▶Thermoplastic copper protection on lead sheathed cables was manufactured from 1944 thru 1948, and was then replaced by modified tape armor applied over lepeth sheath.◀

3.16 ▶*Description:* Thermoplastic copper protection on cables used for various coaxial projects consisted of the following:

(a) Two layers of thermoplastic compound.

(b) Corrugated copper tape applied longitudinally.

(c) Fabric tape saturated with preservative compound.◀

3.17 ▶Thermoplastic copper protection on cables used as stubs for loading coil cases consisted of the following:

(a) Two layers of thermoplastic compound

(b) Fabric tape saturated with presevative compound

(c) Two copper tapes

(d) Fabric tape or jute yarn saturated with preservative compound.◀

▶GOPHER AND THERMOPLASTIC PROTECTION (GTP)◀

3.18 ▶Gopher and thermoplastic protection on lead-sheathed cables was Manufacture Discontinued in 1941.◀

3.19 ▶*Description:* Gopher and thermoplastic protection consists of the following:

(a) A layer of paper tape

(b) Serving of steel tape

(c) A layer of thermoplastic compound

(d) A layer of fabric tape saturated with perservative compound.◀

3.20 ▶*Use:* Gopher and thermoplastic protection was used on lead sheath cables in buried plant without the use of conduit. Also used on cable for making connections at valve points and between cables for gas pressure testing purposes.◀

MODIFIED TAPE ARMOR (MT)

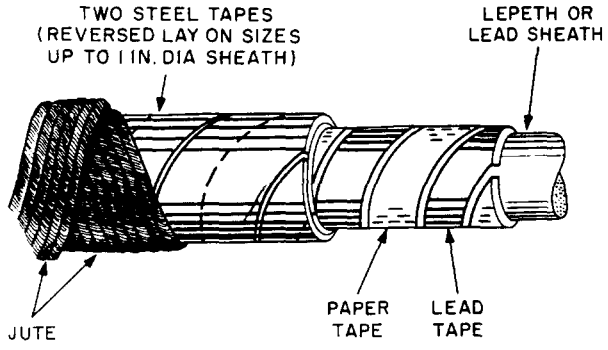
3.21 Modified tape armor on lead- or lepeth-sheathed cables was rated Manufacture Discontinued in 1967. The replacement for MT protection can be buried tape armor (BT) or modified gopher tape armor (MG), depending on the amount of mechanical protection that is required and amount of lightning exposure in the area.

3.22 ***Description:*** Modified tape armor (Fig. 8) consists of the following:

(a) A layer of alternate open spirals of lead and paper tapes directly over the lead.

(b) Two spirally applied layers of 0.020 or 0.030 inch steel tapes. ***On cables having less than 1 inch sheath diameter,*** the steel tapes are spiraled in opposite directions. ***On larger cables*** both steel tapes are applied in the same direction and the outer tape is centered over the gap between turns of the inner tape.

(c) One or two spirally applied layers of jute; one layer ***on cables having less than 1 inch sheath diameter;*** two layers ***on larger cables.***



NOTE:
THE SHEATH AND EACH LAYER ARE FLOODED WITH ASPHALT COMPOUND.

Fig. 8—Superseded Modified Tape Armor (MT)

3.23 *Use:* Modified tape armor was used primarily on buried lead- or lepeth-sheathed toll cables. This structure is similar to buried tape armor. However, MT protection also has a continuous electrical contact (lead tape) between the steel tapes and the sheath in order to prevent sheath damage by arcing in lightning areas. MT protection also provides rodent protection as well as protection against abrasion in rocky soil.

3.24 Lepeth sheath with modified tape armor was used in areas known to have severe lightning exposure. Cables with lepeth sheath and MT protection were provided to minimize arcing trouble. In the event sheath damage occurs on any of these cables still in plant, the inner polyethylene jacket should prevent the entrance of water into the core.

3.25 Lead sheath with modified tape armor was used only in areas known to have minimal lightning exposure.

4. EFFECT OF PROTECTION ON ELECTRICAL CHARACTERISTICS

4.01 The application of protection may compress the cable somewhat, resulting in a slight increase in the capacitance of the pairs and the quads of protected cable. In exchange cable, the increased capacitance is not significant in view of the small amounts of protected cable used in exchange plant; and somewhat higher capacitance values are allowed in protected cable than in nonprotected cable. For toll cable, the upper capacitance limit for protected cable is the same as that for nonprotected cables.

5. DIAMETERS AND WEIGHTS

5.01 The approximate diameters, weights, and reel lengths of coded exchange cables with outer protection are covered in the 626 Division of the Bell System Practices. Section 626-759-040 contains curves and tables for determining the weights and diameters of quadded cables having lead or plastic sheath with buried, underground, and aerial protective coverings.