CD AND DD SERIES OF MULTIUNIT PULP (MUP) CABLE

DESCRIPTION, USE, AND REEL LENGTHS

CONTENTS PAGE

CONTENTS PAGE

1. GENERAL

1.01 This section covers the description, use, and reel length information of the CD and DD series of MUP and the CD series of pseudo-MUP cables.

1.02 This section is reissued to add:

- Information on DDTC 2700-, 3000-, and 3600-pair cables
- New maximum diameter of bonded stalpeth sheath cables.

Revision arrows are used to emphasize the more significant changes.

1.03 CD- and ◗DD-series◖ cables are coded in accordance with the cable letter codes provided in Section 626-020-011.

1.04 ◗A high density reduced diameter-over-jacket MUP cable coded DDTC is now available. The maximum packing density (MAX-PAC) cable permits 20% more pairs than is now possible with standard MUP cables.◖

1.05 Ordering information for CDA, CDM, CDT, and ◗DDT◖ cables that are to be connectorized at the factory [ie, Connectorized Exchange Cable Splicing (CONECS) System cables] is given in Section 626-500-101.

1.06 The description and ordering information for ***MUP*** cables with ***steampeth*** sheath is given in Section 626-101-030.

2. DESCRIPTION

2.01 ***Conductors:*** The conductors are annealed copper in the following gauges:

GAUGE	CODE
22	CDA (Pseudo-MUP)
24	CDM (MUP)
26	CDT ◗and DDT (MUP).◖

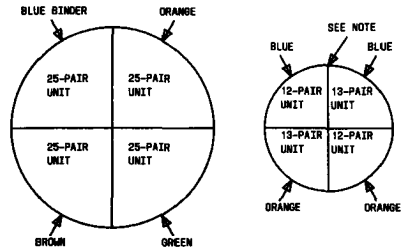
2.02 ***TUFPULP* Cable Insulation:*** A very thin and virtually invisible layer of binder adhesive is applied to the conductor just prior to applying the wood pulp insulation. The binder makes the pulp adhere to the conductor, preventing unravelling, increasing the tensile strength, and improving its crush resistance. The TUFPULP cable insulation will not easily unravel or strip from the conductor.

2.03 ***Insulation Color:*** The insulation color may be natural (designated white), green, red, or blue. Some wires have periodic bands of black or orange stain.

2.04 ***Tip and Ring:*** Most pairs are made up of one colored wire and one white wire (with or without stain). For pulp cable, an easy way to remember which is tip and which is ring is "red is ring." This implies that all white wires are tip and all wires of other colors (green or blue) are ring. For pairs with both wires colored (red-blue and red-green), again, "red is ring."

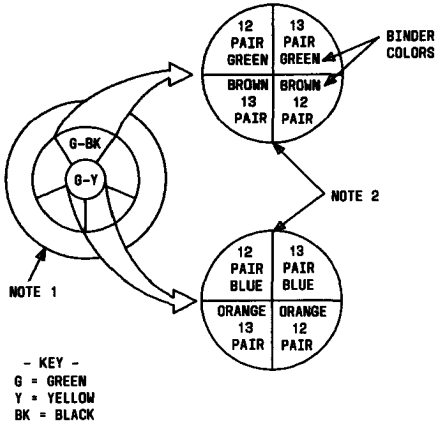
MUP MAKEUP

2.05 For MUP cable (24- and 26-gauge), the 100-pair multiunits consist of four 25-pair units, and the 50-pair multiunits consist of two 25-pair binder groups (two 12-pair and two 13-pair units). See Fig. 1 and 2 for colors of unit binders.



NOTE:
SEE ILLUSTRATION SHOWING 50-PAIR MULTIUNIT LAYUPS OF 1500-PAIR MUP CABLE FOR ONE EXCEPTION OF UNIT BINDER COLORS.

Fig. 1—◗Unit Binder Colors of 100-Pair CDM, CDT, and DDT MUP Multiunits◖



NOTES:
1. EXCEPT FOR THE TWO 50-PAIR MULTIUNITS SHOWN, ALL OTHER MULTIUNITS ARE 100 PAIRS EACH.
2. INITIAL 1500-PAIR MUP CABLES USED BLUE, ORANGE, GREEN AND BROWN UNIT BINDERS FOR BOTH 50-PAIR MULTIUNITS.

Fig. 2—Unit Binder Colors of Lay-Up of CDM and CDT 50-Pair Multiunits in CDM and CDT 1500-Pair Cable

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2.06 ***MUP Advantages:*** In comparison with the replaced AD-series cables which use 50- or 100-pair units, the MUP design offers the following advantages.

(1) The match of 25-pair units and 25-pair modular connectors speeds splicing and avoids unnecessary pair handling.

(2) At splices, 25-pair groups (units or binder groups) can be picked out on sight for assignment or rearrangement. This saves ring-out time and minimizes pair handling and consequent insulation damage.

(3) Four or five pairs in each unit are identifiable on sight for immediate restoration if a cable is cut.

PSEUDO-MUP MAKEUP

2.07 ◆The 22-gauge CDA cable has 50-pair units (green, red, and blue) and is unchanged in lay-up from the manufacture discontinued ADA cable. However, in the CDA cable, the unit binder is coded for CD-type cables. One can gain the MUP advantage of instant 25-pair group recognition with a modified splicing procedure called "pseudo-MUP splicing" (Section 632-032-111).

CORE CONSTRUCTION

A. MUP Identification

2.08 There is only one pair lay-up for 100-pair multiunits (Fig. 3) and one for 50-pair multiunits (Fig. 4). These multiunits cannot be distinguished by the color of the outer layer of pairs as in AD-type pulp-insulated cables. In MUP cable, multiunit identification is provided as follows. Each multiunit has a 2-color binder. In the center or in any layer, a green binder indicates a marker multiunit. This multiunit is flanked by multiunits with, alternately, red and blue binders. The marker multiunits are situated radially over each other. This follows the unit coloring scheme used in pulp-insulated cables and makes

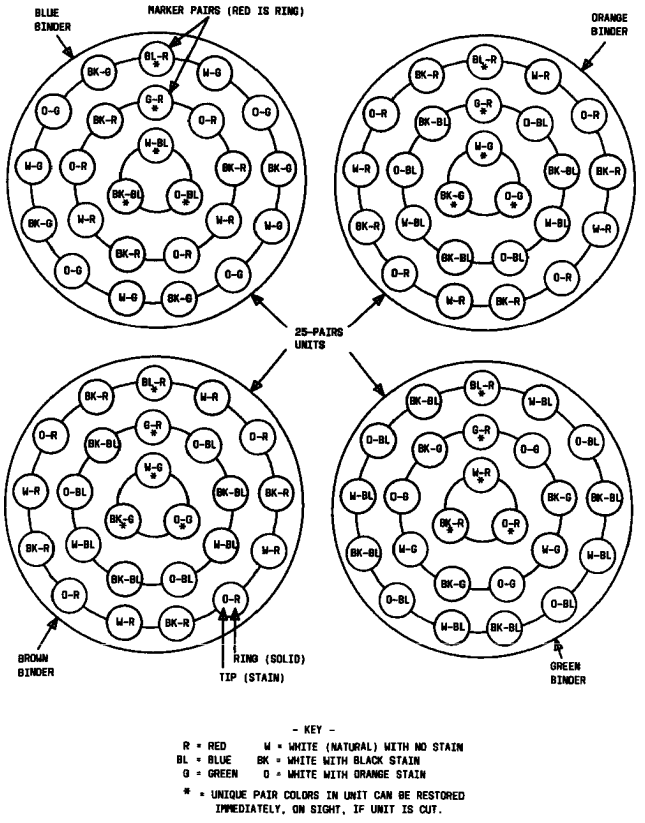


Fig. 3—Pair Lay-Up of 100-Pair Multiunit (MUP Design)

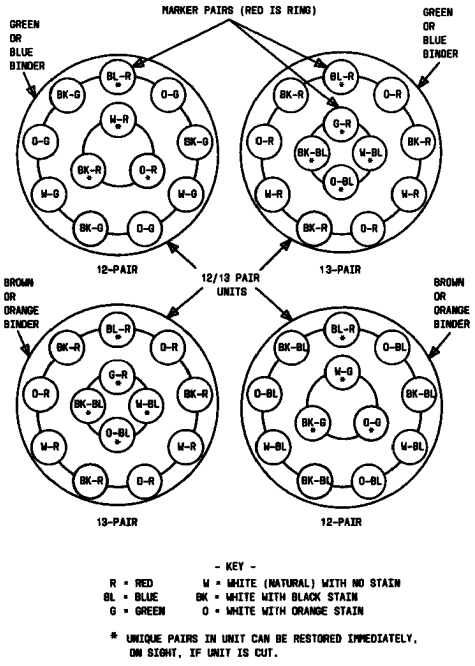


Fig. 4—Pair Lay-Up of CDM and CDT 50-Pair Multiunit (MUP Design)

it easy to remember. The second multiunit binder color indicates layer (yellow for outside layer; then, alternately, black and yellow). See Fig. 5.

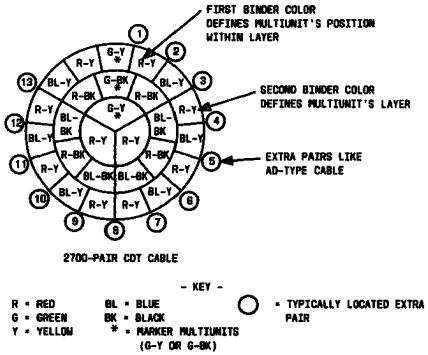


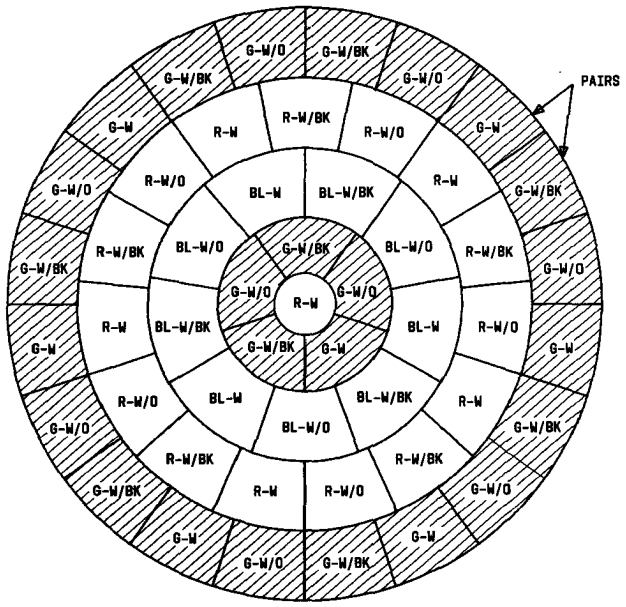
Fig. 5—Multiunit Identification for MUP Cables

B. MAX-PAC MUP Identification

2.09 The MAX-PAC cable is available only in 26 gauge in the 2700-, 3000-, and 3600-pair sizes. The MAX-PAC cable has a higher nominal average mutual capacitance than regular MUP cables (87 nf/mile vs 83 nf/mile), and the cable maximum average mutual capacitance is no more than 91 nf/mile. However, the number of spare pairs, limited defects, insulation durability, dielectric strength, and other characteristics are the same for MAX-PAC as for standard CDT-type MUP cables. The MAX-PAC cables are readily distinguished from CDT-type MUP cable by the cable code DDTC and pair count printed on the outer sheath and the blue colored core wrap.

C. Pseudo-MUP Identification

2.10 The standard unit in 22-gauge cable has 50 pairs. Of these pairs, 25 have the same color insulation and can be treated as a group like a MUP unit. For example, in a "green" unit which has a green-yellow or green-black binder, the 20 green-white pairs in the outside layer and 5 green-white pairs in the first layer around a (differently colored) single pair center can be spliced as a 25-pair group (Fig. 6). The remaining 25 pairs will have either red-white or blue-white insulation and would be spliced as the second 25-pair group. A comparable situation exists in "blue" and "red" units. The red, blue, or green binder around each unit denotes the color of the unit and that 25-pairs of the 50-pair unit are to be the same color as the binder. In pseudo-MUP cable, units are identified by plastic binders like those used for multiunit identification in MUP cable.



NOTE:
"GREEN" UNIT IS SHOWN: THERE ARE CORRESPONDING "RED" AND "BLUE" UNITS.

INSULATION COLORS

G = GREEN
R = RED
BL = BLUE
W = WHITE (NATURAL) WITH NO STAIN
W/O = WHITE WITH ORANGE STAIN
W/BK = WHITE WITH BLACK STAIN

Fig. 6—Pair Lay-Up of 50-Pair Unit for Pseudo-MUP—CDA Cables

D. Extra Pairs and Allowed Defects—MUP and Pseudo-MUP Cables

2.11 ***Extra Pairs and Allowed Defects:*** In pulp-insulated cable, a standard number of extra pairs are provided which can be substituted for defects occurring during manufacture or installation. The allowable number of defective pairs in the cable as shipped (no grounds permitted) is less than the number of extra pairs provided. ◗See Table A.◖

2.12 The extra pairs are located in the interstices between units or multiunits of the outer layer.

◗ TABLE A ◖

CD-AND DD-SERIES CABLE SIZES AND EXTRA PAIRS

NOMINAL CABLE SIZES	EXTRA PAIRS TO ALLOW FOR FACTORY DEFECTS	MINIMUM NO. OF GOOD PAIRS AS SHIPPED	TOTAL PAIRS IN THE CABLE
600*	6	603	606
900*	6	903	906
1200*	7	1203	1207
1500*	9	1504	1509
1800*	10	1805	1810
2100*	10	2105	2110
2400*	12	2406	2412
2700	13	2707	2713
3000	15	3009	3015
3600	16	3609	3616

* These pair sizes are for CD-series cables only.

A standard color code (Table B) is used for ten different extra pairs. If more than ten extra pairs are included, the color code shown for pairs No. 2 through 10 is repeated in sequence for extra pairs 11 through 19. Note that pair No. 1 (red-blue) is used only once.

2.13 Extra pairs appear in sequence and in a single turn around the cable core in the direction given by moving from the outer layer green-yellow bound unit or multiunit towards the red-blue extra pair. For example, extra pairs No. 2 and No. 11 are both green-white (Fig. 7), and they can be differentiated by their ***position*** around the core (No. 2 follows the red-blue pair).

TABLE B

EXTRA PAIR COLORS

PAIR NO.	STANDARD CODE (1966 TO DATE)
1	Red-blue*
2 or 11	Green-white
3 or 12	Red-white
4 or 13	Blue-white
5 or 14	Green-white/black stain
6 or 15	Red-white/black stain
7 or 16	Blue-white/black stain
8 or 17	Green-white/orange stain
9 or 18	Red-white/orange stain
10 or 19	Blue-white/orange stain

* Red-blue extra pair is used only once in each cable.

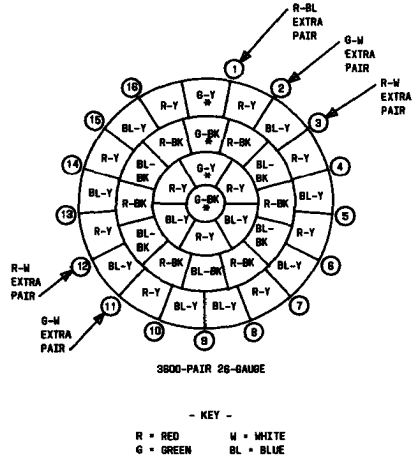


Fig. 7—◗Repeat of Extra Pair Colors◖

E. Core Lay-Ups—MUP and Pseudo-MUP Cables

2.14 Figures 8 and 9 illustrate the available pair sizes and core lay-ups of MUP and pseudo-MUP cables.

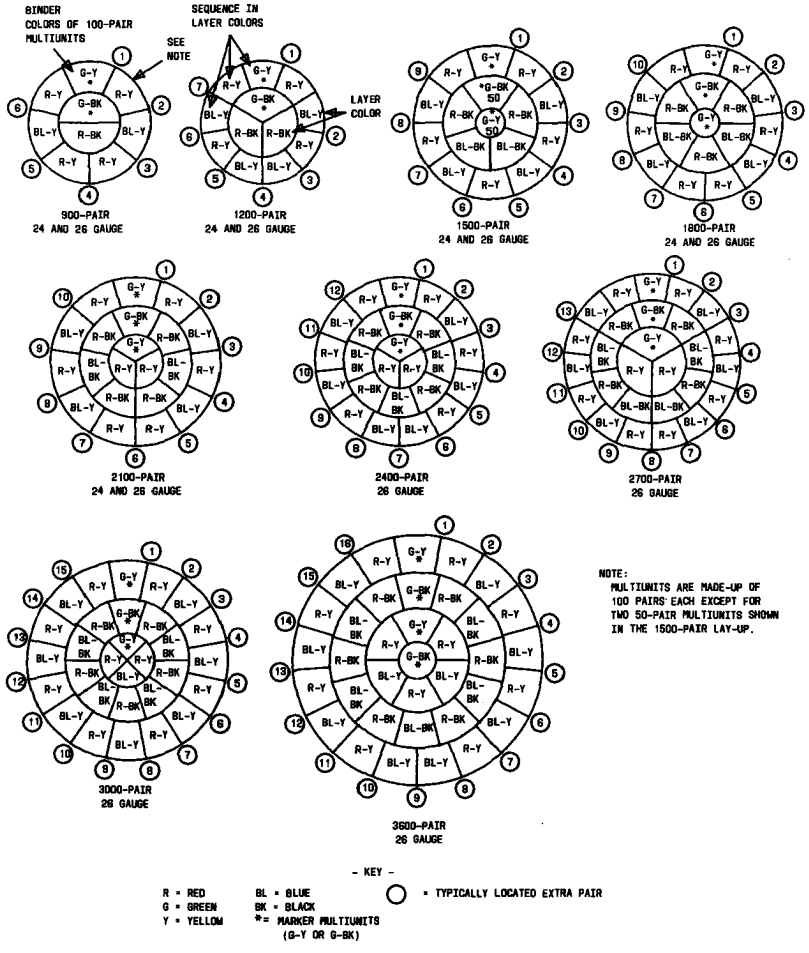


Fig. 8—CDM and CDT MUP Cable Lay-Ups

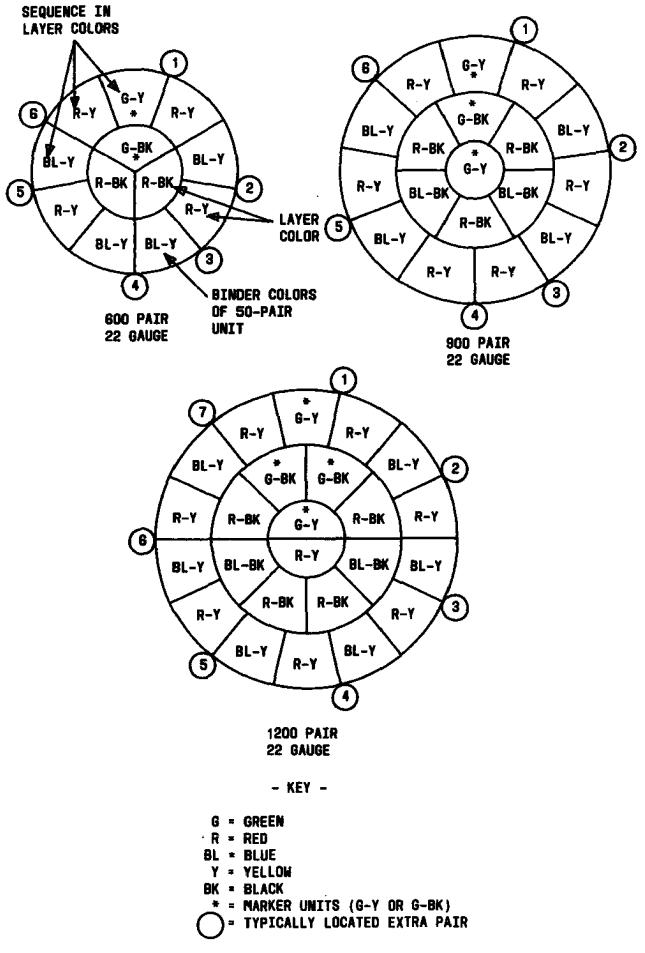


Fig. 9—CDA Pseudo-MUP Cable Lay-Ups

F. Bonded Stalpeth Sheath for Large Size CD-Series Cables

2.15 A modified and improved version of stalpeth sheath for CDA-1200, CDM-1800, CDM-2100, CDT-2700, CDT-3000, and CDT-3600 pair cables has been introduced. Its use will be extended to smaller cables at a later date. The new sheath is called bonded stalpeth sheath and is allocated a fourth letter code "Z."

2.16 The bonded version of stalpeth sheath differs from the regular version in having a thin plastic coating on the steel which causes the steel to bond (adhere) to the polyethylene jacket as the jacket is applied. In the sheath there is no need for a thermoplastic flooding between the steel and the jacket. In the bonded stalpeth sheath, the soldering of the overlapped steel seam is also omitted, being no longer necessary or feasible; however, the seam is sealed with an adhesive.

2.17 Bonded stalpeth sheath resists buckling during installation better than regular stalpeth. The bonded stalpeth is more efficient in preventing moisture diffusion into the cable core.

2.18 Installation, hardware, and procedures for bonded stalpeth sheaths are the same as for nonbonded stalpeth sheaths with one exception—to remove the sheath, the steel and jacket have to be taken off as a unit.

3. USE

3.01 ◗The CD-series of◖ MUP cables are intended for general use in exchange, subscriber, and trunk plant for voice or carrier frequency. However, for full-fill 2-way T-carrier transmission, screened cable is needed. (See Section 626-800-090.)

3.02 ◗The DD-series of MUP (MAX-PAC) cable is ***not*** for general use. Rather, MAX-PAC cable is recommended ***only for congested duct*** situations where higher-than-normal mutual capacitance can be tolerated. (A 3600-pair MAX-PAC cable can be used with 3.5-inch duct.) The MAX-PAC cables should be limited to use on loops or trunks in lengths of 10,000 feet or less.◖

3.03 The advantages of MUP cable are realized by engineering with 25-pair groups corresponding to units (or binder groups). See paragraph 2.06(2).

3.04 Random splicing of ***all*** pairs in units (or binder groups) is necessary. In 25-pair modular splices, the ***ring*** colors are red, blue, or green and the ***tip*** color is white except that in red-green and red-blue pairs, the green and blue conductors are the tip colors. Particularly, ring colors include no white color and tip colors include no red color.

4. ELECTRICAL CHARACTERISTICS

4.01 ◗The electrical characteristics of CD- and DD-series cables are listed in Tables C and D. The attenuation values shown in Table D represent averages at 50°F. Refer to the appropriate Bell System Practices for engineering losses applicable to specific systems.◖

◗ TABLE C ◖

ELECTRICAL CHARACTERISTICS

GAUGE AND CABLE CODE	DC RESISTANCE (OHMS/ LOOP MI AT 69°F)	CAP: (nF/MI) AT 60°F 900 OR 1000 Hz)	CONDUCTANCE (μS/MI AT AT 900 Hz	INSULATION RESISTANCE GREATER THAN (MEGOHM MI)	DIELECTRIC STRENGTH (GREATER THAN)	
					BETWEEN CONDUCTORS (VOLTS RMS)	BETWEEN CONDUCTORS AND SHEATH
22-Ga CDA	173	83	2	500	350	CDAL = 1000V rms CDAC = 1000V rms CDAZ = 1000V rms CDAE = 1000 Vdc CDAH = 20,000 Vdc
24-Ga CDM	274	83	2	500	350	CDML = 1000V rms CDMC = 1000V rms CDMZ = 1000V rms CDME = 1000V rms CDMM = 1000V rms CDMH = 20,000 Vdc
26-Ga CDT	440	83	2	500	350	CDTL = 1000V rms CDTC = 1000V rms CDTZ = 1000V rms CDTE = 1000V rms CDTM = 1000V rms CDTH = 20,000 Vdc
26-Ga DDT	440	87	2	500	350	DDTC = 1000V rms

◗ TABLE D ◖

ATTENUATION AT 50°F

FREQUENCY (kHz)	dB/1000 FT (APPROX)			
	22-GA CDA	24-GA CDM	26-GA CDT	26-GA DDT
1	0.34	0.43	0.58	0.60
48	1.44	2.04	2.60	2.90
96	1.76	2.50	3.10	3.50
136	1.99	2.80	3.50	3.80
168	2.15	3.00	3.70	4.00
208	2.40	3.30	4.00	4.30
256	2.60	3.60	4.30	4.60
772	5.10	6.80	8.20	8.40
1600	7.20	–	–	–

5. REEL LENGTH DATA

Western Electric cable length procedure applies to direct shipments from the factory to the operating company. For service center procedure, consult the local service center.

5.01 Factory methods for shipping lengths of cables are covered in Section 626-020-009.

5.02 The sizes, appropriate weights and diameters, type of sheath, outer protection, and reel lengths of MUP cables are listed in Tables E through L.

TABLE E

CD- AND DD- TYPE CABLE WITH STALPETH OR BONDED STALPETH SHEATH (NOTES 1 & 2)

CABLE CODE	NO. OF PAIRS	GAUGE	MAXIMUM LENGTH ON 420 REEL (FEET)	MAXIMUM LENGTH ON 487 REEL (FEET)	OUTSIDE DIAMETER (INCHES)	WEIGHT PER FOOT (POUNDS)
CDAC	600	22	1736	3025	2.32	3.22
	900	22	1320	1985	2.78	4.70
CDAZ*	1200	22	936	1425	3.20	6.19
CDMC	900	24	2145	–	2.24	3.06
	1200	24	1395	2405	2.55	4.00
	1500	24	1326	1985	2.82	4.93
CDMZ*	1800	24	935	1624	3.14	5.88
	2100	24	680	1275	3.40	7.17
CDTC	900	26	2796	–	1.87	2.02
	1200	26	2109	–	2.12	2.63
	1500	26	1738	3029	2.33	3.23
	1800	26	1654	2570	2.53	3.82
	2100	26	1310	2460	2.71	4.41
	2400	26	1223	1985	2.88	5.01
CDTZ*	2700	26	1018	1622	3.04	5.59
	3000	26	936	1425	3.20	6.21
	3600	26	684	1183	3.40	7.37
DDTC	2700	26	1200	1900	2.84	5.41
	3000	26	1012	1600	2.98	5.98
	3600	26	937	1420	3.18	7.09

Note 1: Bond wires and pulling eyes are furnished on factory shipments when specified on agreement with the service center. Cables are shipped under air pressure.

Note 2: All cable codes are nonstock with eight-week interval.

* Z = Bonded Stalpeth.

TABLE F

CD-TYPE CABLE – STALPETH SHEATH WITH AERIAL TAPE ARMOR (AT) (NOTES 1 & 2)

CABLE CODE	NO. OF PAIRS	GAUGE	MAXIMUM LENGTH ON 420 REEL (FEET)	OUTSIDE DIAMETER (INCHES)	WEIGHT PER FOOT (POUNDS)
CDAC-AT	600	22	1296	2.61	6.36
	900	22	1021	3.08	8.45
CDMC-AT	900	24	1654	2.53	6.10
	1200	24	1218	2.84	7.45
	1500	24	931	3.11	8.72
CDTC-AT	900	26	2118	2.15	4.56
	1200	26	1755	2.41	5.50
	1500	26	1299	2.63	6.38
	1800	26	1216	2.83	7.25
	2100	26	1015	3.01	8.07
	2400	26	936	3.17	8.88

Note 1: Bond wires and pulling eyes are furnished on factory shipments when specified on agreement with the service center. Cables are shipped under air pressure.

Note 2: All cable codes are nonstock with eight-week interval.

TABLE G

CD-TYPE CABLE WITH PASP SHEATH
(NOTES 1 & 2)

CABLE CODE	NO. OF PAIRS	GAUGE	MAXIMUM LENGTH ON 420 REEL (FEET)	MAXIMUM LENGTH ON 487 REEL (FEET)	OUTSIDE DIAMETER (INCHES)	WEIGHT PER FOOT (POUNDS)
CDAH	600	22	1648	2559	2.50	3.45
	900	22	1011	1885	2.97	4.98
	1200	22	754	1425	3.38	6.51
CDMH	900	24	1757	2880	2.42	3.27
	1200	24	1313	1984	2.73	4.25
	1500	24	1014	1885	3.00	5.21
	1800	24	945	1526	3.27	6.19
CDTH	900	26	2222	–	2.03	2.19
	1200	26	1729	3011	2.29	2.82
	1500	26	1650	2563	2.51	3.45
	1800	26	1310	2460	2.71	4.07
	2100	26	1004	2027	2.90	4.69
	2400	26	1020	1627	3.07	5.30
	2700	26	941	1517	3.22	5.90
	3000	26	755	1425	3.39	6.52

Note 1: Bond wires and pulling eyes are furnished on factory shipments when specified on agreement with the service center. Cables are shipped under air pressure.

Note 2: All cable codes are nonstock with eight-week interval.

TABLE H

CD-TYPE CABLE – PASP SHEATH WITH MECHANICAL PROTECTION (MP)
(NOTES 1 & 2)

CABLE CODE	NO. OF PAIRS	GAUGE	MAXIMUM LENGTH ON 420 REEL (FEET)	OUTSIDE DIAMETER (INCHES)	WEIGHT PER FOOT (POUNDS)
CDAH-MP	600	22	1309	2.70	3.83
	900	22	933	3.13	5.45
CDMH-MP	900	24	1297	2.62	3.64
	1200	24	1222	2.87	4.67
	1500	24	940	3.21	5.69
	1800	24	684	3.47	6.72
CDTH-MP	900	26	2130	2.19	2.49
	1200	26	1636	2.44	3.17
	1500	26	1309	2.70	3.84
	1800	26	1222	2.87	4.49
	2100	26	1018	3.05	5.14
	2400	26	940	3.21	5.78

Note 1: Bond wires and pulling eyes are furnished on factory shipments when specified on agreement with the service center. Cables are shipped under air pressure.

Note 2: All cable codes are nonstock with eight-week interval.

TABLE I

CD-TYPE CABLE – PASP SHEATH WITH BURIED TAPE (BT) ARMOR
(NOTES 1 & 2)

CABLE CODE	NO. OF PAIRS	GAUGE	MAXIMUM LENGTH ON 420 REEL (FEET)	OUTSIDE DIAMETER (INCHES)	WEIGHT PER FOOT (POUNDS)
CDAH-BT	600	22	1101	2.97	6.21
	900	22	682	3.44	8.18
CDMH-BT	900	24	1224	2.89	5.96
	1200	24	939	3.20	7.23
	1500	24	684	3.47	8.45
CDTH-BT	900	26	1648	2.50	4.51
	1200	26	1317	2.76	5.38
	1500	26	1012	2.98	6.23
	1800	26	937	3.18	7.03
	2100	26	954	3.37	7.83
	2400	26	688	3.54	8.59

Note 1: Bond wires and pulling eyes are furnished on factory shipments when specified on agreement with the service center. Cables are shipped under air pressure.

Note 2: All cable codes are nonstock with eight-week interval.

TABLE J

CD-TYPE CABLE WITH LEAD SHEATH
(NOTES 1 & 2)

CABLE CODE	NO. OF PAIRS	GAUGE	MAXIMUM LENGTH ON 420 REEL (FEET)	OUTSIDE DIAMETER (INCHES)	WEIGHT PER FOOT (POUNDS)
CDAL	600	22	2133	2.20	6.02
	900	22	1304	2.67	8.51
	1200	22	1021	3.08	10.98
CDML	900	24	2109	2.12	5.70
	1200	24	1634	2.43	7.30
	1500	24	1309	2.70	8.83
	1800	24	1011	2.97	10.46
CDTL	900	26	3274	1.75	3.96
	1200	26	2536	2.00	5.02
	1500	26	2139	2.22	6.07
	1800	26	1755	2.41	7.06
	2100	26	1402	2.60	8.09
	2400	26	1319	2.77	9.08
	2700	26	1006	2.92	10.03
	3000	26	929	3.09	11.02

Note 1: Bond wires and pulling eyes are furnished on factory shipments when specified on agreement with the service center. Cables are shipped under air pressure.

Note 2: All cable codes are nonstock with eight-week interval.

TABLE K

CD-TYPE CABLE WITH POLY-JACKETED LEAD SHEATH

CABLE CODE	NO. OF PAIRS	GAUGE	MAXIMUM LENGTH ON 420 REEL (FEET)	OUTSIDE DIAMETER (INCHES)	WEIGHT PER FOOT (POUNDS)
CDAE	600	22	1744	2.36	6.25
	900	22	1216	2.83	8.80
	1200	22	942	3.24	11.32
CDME	900	24	1727	2.28	5.91
	1200	24	1401	2.59	7.56
	1500	24	1222	2.87	9.12
	1800	24	933	3.13	10.78
CDTE	900	26	2649	1.89	4.13
	1200	26	2118	2.15	5.22
	1500	26	1747	2.37	6.30
	1800	26	1398	2.57	7.32
	2100	26	1317	2.76	8.36
	2400	26	1007	2.93	9.38
	2700	26	929	3.09	10.35

TABLE L

CD-TYPE CABLE WITH ALVYN SHEATH

CABLE CODE	NO. OF PAIRS	GAUGE	MAXIMUM LENGTH ON 420 REEL (FEET)	OUTSIDE DIAMETER (INCHES)	WEIGHT PER FOOT (POUNDS)
CDMM	900	24	2148	2.25	3.09
	1200	24	1396	2.56	4.06
	1500	24	1223	2.88	5.15
	1800	24	932	3.12	6.09
CDTM	900	26	2796	1.87	2.03
	1200	26	2109	2.12	2.65
	1500	26	1740	2.34	3.27
	1800	26	1395	2.55	3.89
	2100	26	1313	2.73	4.49
	2400	26	1008	2.94	5.23
	2700	26	930	3.10	5.82