

Copperweld Wire Products

f o r C O M M U N I C A T I O N S

I N D E X

JAN 19 1959

January, 1958

COPPERWELD PRODUCTS

Pub. 119 Jan. '58 Copper Molten Welded to Steel Makes Copperweld

LINE WIRE

E.D. 1900 June '55 Copperweld Telephone Line Wire

E.R. 35 Mar. '54 Standard Specifications for Copperweld Wire

SAG DATA

E.D. 1901 June '54 Copperweld Sag Data for Telephone Line Wire

DROP WIRE

E.D. 1688 Oct. '57 Copperweld Telephone Drop Wire

GUY STRAND

E.D. 1878 Oct. '57 Copperweld Type M Guy Strand

E.R. 145 Jan. '58 Specifications for Copperweld Type M Guy Strand

MESSANGER STRAND

E.D. 1662 Apr. '56 Copperweld Messenger Strand for Aerial Cable Construction

E.R. 135 Sept. '54 Standard Specifications for Copperweld Strand

GROUND RODS AND CLAMPS

E.D. 1687 Jan. '58 Copperweld Ground Rods and Clamps for Telephone Grounds

E.D. 375 Oct. '55 Non-Rusting Copperweld Ground Rods

E.D. 1868 Jan. '56 Copperweld Tripod Ground Rod Driver

COPPERWELD STEEL COMPANY

WIRE AND CABLE DIVISION



Glassport, Pa., U.S.A.



QUALITY PRODUCTS

Power Conductors
Type M Guy Strand
Messenger Strand
Anchor Rods
Ground Rods and Clamps
Overhead Ground Wire
Counterpoise Wire
Telephone Line Wire
Telephone Drop Wire
Inside Telephone Wire
Parallel Distribution Wire
Signal Bonds
Signal Line Wire
Weatherproof Wire
Insulator Ties
Cable Lashing Wire
Cable Rings
Nails and Staples
Fence and Barbed Wire
Building Wall Ties
Survey Markers
Fine Wire for Radio-TV-Electronics

COPPERWELD STEEL COMPANY

WIRE AND CABLE DIVISION, Glassport, Pa., U.S.A.

For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

OTHER DIVISIONS

ARISTOLOY STEEL DIVISION, Warren, Ohio
Electric Furnace Steels

OHIO SEAMLESS TUBE DIVISION, Shelby, Ohio
Ostuco Seamless and Welded Steel Tubing

SUPERIOR STEEL DIVISION, Carnegie, Pa.
Stainless, Alloy and Carbon Strip Steels

FLEXO FINE WIRE DIVISION, Oswego, N. Y.
Flexible Cables and Fine Wire

AUGUST 1, 1960

COPPERWELD STEEL CO.
WIRE AND CABLE DIVISION
GLASSPORT, PA.

ATT: MR. S.E. ZEBROSKI
SALES DEPT.

GENTLEMEN:

PLEASE QUOTE PRICE AND AVAILABILITY ON
130,000 FEET OF 0.080" DIAMETER, 30% CON-
DUCTIVITY, EXTRA HIGH STRENGTH LINE WIRE. IT
IS TO BE PUT UPON SIX REELS OF ABOUT 400 LBS.
EACH.

PLEASE SEND A SAMPLE OF TWENTY FEET OR SO,
OF THIS WIRE AS WE WISH TO MAKE SOME BENDING
TESTS ON SAME. DO YOU HAVE ANY INFORMATION
ABOUT HOW MANY TIMES IT CAN BE FLEXED 90 DEGREES
ON A THREE INCH RADIUS WITHOUT FAILURE?

VERY TRULY YOURS,

GROTE REBER

15 June 1960

2-#16 along w main

Coeff expansion Copperweld wire $7.2 \cdot 10^{-6}$ per Deg F

L length of span = 440 ft $440 \cdot 12 \cdot 7.2 \cdot 10^{-6} \cdot 100 = 3.8$ inches expansion

Temp varies 110° to $10^{\circ} = 100^{\circ}$ range
 $(\frac{3}{2})$ original area / $(\frac{1}{2})$ $18100 = 6$

Normal operating tensions 12% to 15% of breaking strength,

Wire	3 single strands	3 wire strands		
Gauge	Dia	30% EHS Breaking	WT/1000 ft	WT/1000 ft
#12	.080"	900#	17.76	53.28
#14	.064"	575#	11.37	34.11
#16	.051"	366#	7.22	21.66

150# tension on 3/#16 is $\frac{150}{1098} = 13.7\%$ breaking strength.

On three wire conductor the current will flow over about half the total surface. Thus three #16 will be equal at R.F. to about $\frac{3}{2} \times .051 = .077$ " dia conductor, avg. .081"

From Fig 3, .081" dia at 2 megacycles gives $\sqrt{\frac{4\mu r^2}{\rho_2}} r^2 = 30$

From Fig 4, $\sqrt{\frac{4\mu r^2}{\rho_2}} r^2 = 30$, where resistance of copperweld same as copper, or perhaps slightly less.

$125 \cdot 21.7 = 2700$ lbs, avg 7.2 lbs of 400 lbs each.

12 June 1960

Terminar on pages 174-5

2 wire balanced line

$$Z_0 = 276 \log_{10} \frac{\text{spacing}}{\text{radius}}$$

$$\alpha = .00181 \sqrt{f_{mc}} / r_{\text{radius}} \log_{10} \left(\frac{s}{r} \right) = \text{DB per 1000 ft. for copper.}$$

Figure 40 page 177

#12 wire, 600 Ω ; 2 mc, gives 0.25 DB/1000 ft.

10.0	1.0	1.0	1.0	1.0
11.0	1.1	1.1	1.1	1.1
12.0	1.2	1.2	1.2	1.2
13.0	1.3	1.3	1.3	1.3
14.0	1.4	1.4	1.4	1.4
15.0	1.5	1.5	1.5	1.5
16.0	1.6	1.6	1.6	1.6
17.0	1.7	1.7	1.7	1.7
18.0	1.8	1.8	1.8	1.8
19.0	1.9	1.9	1.9	1.9
20.0	2.0	2.0	2.0	2.0

12.0 1.2 1.2 1.2 1.2

14 June 1960

66 dipole rods 440' long =	29000
66 down leads each 2x130' long =	17200
1 NS feed line 2x7260	14300
2 EW feed line each 2x8360	33400
16 NS top stangs each 4x250 + 2x125 = 1250	<u>20000</u>
	113900
10% extra for fittings etc.	<u>11400</u>
	125300

say 125,000 feet
3 strand 30% conductivity, Extra high strength,
Breaking strength 1500 lbs.

put up in drums for export shipping

Copper, Weld 30% Conductivity Wire. 24 Jan 59

Dia Inches	Solid Copper Ohms /1000ft	Frequency in Kilocycles	30	50	70	145	520	Mils Copper
.032	10.15	Factor Figure 3	1.5	2.0	2.5	3.3	6.1	2.1
		" " 2	3.9	4.0	4.1	4.2	4.4	
		Ohms /1000 ft	39.5	40.6	41.6	42.6	44.7	
.057	3.18	Factor Figure 3	2.8	3.5	4.0	5.9	11.0	3.7
		" " 2	4.1	4.3	4.4	4.5	4.8	
		Ohms /1000 ft	13.0	13.7	14.0	14.3	15.3	
.080	1.65	Factor Figure 3	3.8	4.8	5.7	8.0	15.5	5.2
		" " 2	4.2	4.3	4.4	4.6	5.2	
		Ohms /1000 ft	6.9	7.1	7.3	7.6	8.6	
.102	1.00	Factor Figure 3	5.0	6.0	7.1	10.0	19.0	6.6
		" " 2	4.3	4.4	4.5	4.8	6.6	
		Ohms /1000 ft	4.3	4.4	4.5	4.8	6.6	
.144	.500	Factor Figure 3	6.2	8.2	10.0	14.5	26	9.4
		" " 2	4.4	4.6	4.8	5.0	8.4	
		Ohms /1000 ft	2.2	2.3	2.4	2.5	4.2	
.182	.313	Factor Figure 3	8.5	11	13	18	34	11.8
		" " 2	4.5	4.7	4.9	6.0	11	
		Ohms /1000 ft	1.41	1.47	1.53	1.88	3.45	

Dia Inches	Solid Copper Ohms /1000ft	Frequency in Kilocycles	30	50	70	145	520	Mils Copper
.040	6.39	Factor Figure 3	1.9	2.5	3.0	4.0	7.6	2.6
		" " 2	4.0	4.1	4.2	4.4	4.6	
		Ohms /1000 ft	25.6	26.2	26.8	28.1	29.4	
.072	2.003	Factor Figure 3	3.5	4.3	5.1	7.1	14	4.7
		" " 2	4.3	4.4	4.5	4.6	5.1	
		Ohms /1000 ft	8.6	8.8	9.0	9.2	10.2	
.165	.381	Factor Figure 3	7.5	9.8	12	17	32	1.7
		" " 2	4.4	4.6	4.8	5.5	12	
		Ohms /1000 ft.	1.68	1.75	1.83	2.10	4.57	

Copperweld 30% Conductivity EHS wire 25 Jan 59

Strands		Wt/1000 ft		Breaking Lbs		Frequency in Kilocycles				
Number	Dia	Single	Total	Single	Total	30	50	70	145	520
						0 hum per 1000 feet				
19	.040	4.51	85.6	234?	4440?	5.12	5.24	5.36	5.62	5.88
		2080 cir mils effective copper				Taken as 1/5 single strand				
7	.072	14.4	100.8	729?	5120?	2.87	2.93	3.00	3.07	3.40
		4060 cir mils effective copper				Taken as 1/3 single strand				
3	.102	28.8	86.4	1460	4380	2.15	2.20	2.25	2.40	3.30
		5400 cir mils effective copper				Taken as 1/2 single strand				
1	.182	91.86	91.86	3913	3913	1.41	1.47	1.53	1.88	3.45
		8600 cir mils effective copper				Taken same as single strand				

The values marked by ? are increased by 37 1/2 % above published values to take care of difference between EHS and HD wire. This factor was secured by comparing .080 EHS and .072 HD wire. Since the values marked by ? are all small diameter wires, these values are probably still too low because no account has been taken of the increased strength derived from drawing wire very fine.

Copper Weld 30% Conductivity EHS Wire 24 Jan 59

Strands		Wt / 1000 ft		Breaking Strength		Frequency in Kilocycles				
Number	Dia	Single	Total	Single	Total	30	50	70	145	520
Ohms per 1000 feet										
19	.032	2.84	54.0	151?	2880?	7.9	8.1	8.3	8.5	8.9
Taken as 1/5 single strand										
7	.057	9.04	56.3	454?	3180?	4.3	4.5	4.7	4.8	5.1
Taken as 1/3 single strand										
3	.080	17.76	53.3	900	2700	3.4	3.5	3.6	3.8	4.3
Taken as 1/2 single strand										
1	.144	57.8	57.8	2681	2681	2.2	2.3	2.4	2.5	4.2
Taken as same as single strand										
1	.182	91.9	91.9	3913	3913	1.41	1.47	1.53	1.88	3.45
Taken as same as single strand										