

Wire & Cable Technical Data



ANCOR is a member of:

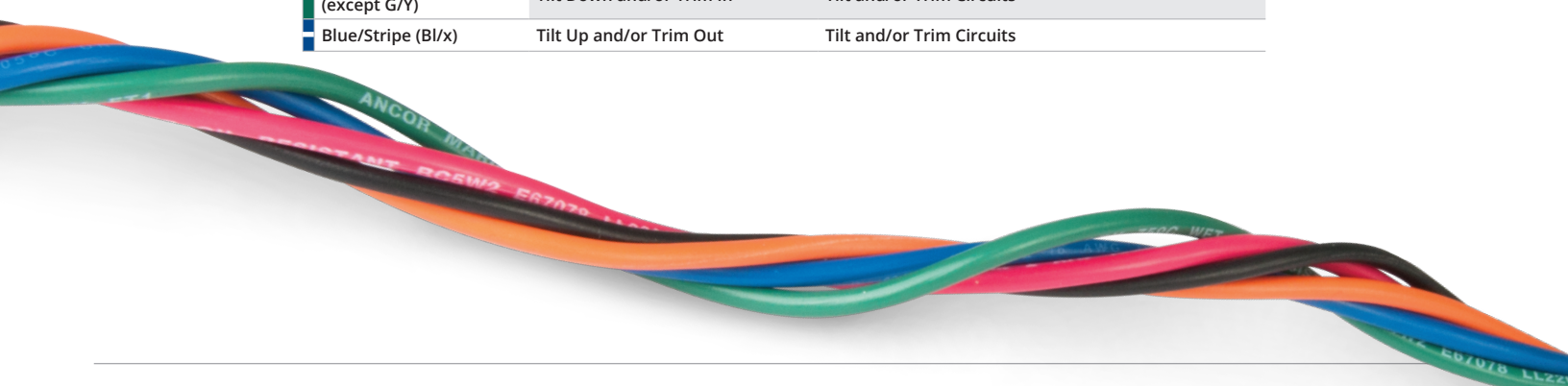


Ancor Marine Grade™ Wire & Cable

- Ancor Marine Grade™ wire and cable is manufactured from tinned copper stranding for maximum protection against corrosion and electrolysis. Ultra flexible (Type 3) stranding resists fatigue due to vibration and flexing.
- Ancor's proprietary premium vinyl insulation stays flexible even in extreme cold (-40°F / -40°C) and resists salt water, battery acid, oil, gasoline and ultra-violet radiation. Exclusive insulation is rated at 600 volts, 221°F / 105°C dry and 167°F / 75°C wet, and is resistant to heat and abrasion.
- Exceeds all UL 1426, US Coast Guard Charter boat (CFR Title 46) and ABYC standards.
- See the following for ABYC wiring guidelines and technical data.

ABYC Recommended Usages

Color	Item	Use
Red	DC Positive Conductor	Positive Mains
Black or Yellow	DC Negative Conductor	Return, Negative Mains
Green or Green w/ Yellow Stripe	DC Grounding Conductor	Bonding System Bonding Wires (if insulated)
Light Blue	Oil Pressure	Oil Pressure Sender to Gauge
Dark Blue	Cabin & Instrument Lights	Fuse or Switch to Lights
Brown	Generator Armature	Generator Armature to Regulator
	Alternator Charge Light	Generator Terminal/Alternator Auxiliary Terminal to Light to Regulator
	Pumps	Fuse or Switch to Pumps
Grey	Navigation Lights	Fuse or Switch to Lights
	Tachometer	Tachometer Sender to Gauge
Orange	Accessory Feed	Ammeter to Alternator or Generator Output and Accessory Fuses or Switches
	Common Feed	Distribution Panel to Accessory Switch
Pink	Fuel Gauge	Fuel Gauge Sender to Gauge
Purple	Ignition	Ignition Switch to Coil & Electrical Instruments
	Instrument Feed	Distribution Panel to Electric Instruments
Brown w/ Yellow Stripe	Bilge Blowers	Fuse or Switch to Blower
Yellow w/ Red Stripe	Starting Circuit	Starting Switch to Solenoid
Tan	Water Temperature	Water Temperature Sender to Gauge
Green/Stripe (G/x) (except G/Y)	Tilt Down and/or Trim In	Tilt and/or Trim Circuits
Blue/Stripe (Bl/x)	Tilt Up and/or Trim Out	Tilt and/or Trim Circuits



Wire Flexibility Explained

Wire flexibility is influenced by two major factors: wire strand size and jacket hardness.

Wire strand size has the largest impact on overall wire flexibility. As individual wire strand size decreases, wire flexibility increases. For boat cable, UL 1426 requires at least 19 individual strands for cables 16 AWG and larger. Ancor wire uses type 3 stranding which consists of individual 30 AWG (0.010") strands, regardless of the wire gauge. Ancor's 16 AWG wire consists of 26 individual strands, while the 4/0 AWG wire consists of 2,109 individual strands.

Jacket hardness is most commonly measured by durometer, with lower measurements reflecting a more flexible material. Ancor wire measures 7 points lower than competitive product on a scale of 1-100), resulting in a more flexible product.

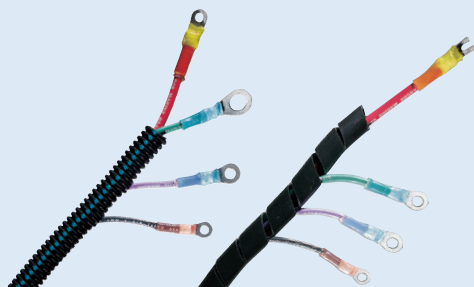


Round Versus Flat Duplex/Triplex

Duplex and Triplex cable have many different advantages to help installers. The grouped wires save time and effort by having to run only one group instead of multiple individual wires and also provides extra protection for the wire itself. But they have different advantages based on the shape too. Round cable for instance is easier to install through bulk heads, walls, panels or holes, while flat cable is easier to route long distances since it can be moved through a smaller space.

Safety Versus Regular Duplex Cables

Ancor recommends yellow wire as DC negative because black is the standard color for AC hot. There have been many cases of people working on the DC systems who have inadvertently cut the live AC wire. Because of the wide spread use of inverters, power generators and shore power connections, even today's smallest boats pose a risk of inadvertently cutting into AC wires when working on DC systems.



Wire Bundling per ABYC Guidelines

ABYC states: "Conductors that may be exposed to physical damage shall be protected by loom, conduit, tape, raceways, or other equivalent protection. When AC and DC conductors are run together, the AC conductors shall be sheathed, bundled, or otherwise kept separate from the DC conductors. Loom used to cover conductors shall be self-extinguishing. The base product (or resin) shall be classified as V-2 or better, in accordance with UL 94, Tests For Flammability Of Plastic Materials."

Conductors Sized (AWG) for 3% Voltage Drop

Use 3% voltage drop for any "critical application" affecting the safety of the vessel or its passengers: bilge pumps, navigation lights, electronics, etc....

Length (feet): Determined by measuring the length of the conductor from the positive (+) power source connection to the electrical device and back to the negative (-) power source connection. Note that the power source connection may be either the battery, panelboard or switchboard.

Current (amps): Determined by adding the total amps on a circuit.

Conductor sizes not covered in the following tables may be calculated by using the following formula:

$$CM = \frac{K \times I \times L}{E}$$

After calculating the Circular Mil Area (CM), use the temperature rating chart to determine the proper conductor size (National Fire Protection Agency and Coast Guard require that the next larger conductor be used when the calculated CM area falls between the two conductor sizes).

CM = Circular Mil Area of Conductors

K = 10.75 (Constant representing the mil-foot resistance of copper)

I = Current - amps

L = Length - feet

E = Voltage drop at load
(drop x working voltage)

ABYC Recommends...

"Conductors used for panelboard or switchboard main feeders, bilge blowers, electronic equipment, navigation lights, and other circuits where voltage drop must be kept to a minimum, shall be sized for a voltage drop not to exceed three percent." *ABYC 11.16.1.2.7.*

3% Voltage Drop at 12 Volts

Length	Current (Amps)												
	5	10	15	20	25	30	40	50	60	70	80	90	100
10' 3 m	18	14	12	10	10	8	6	6	6	6	4	4	4
15' 5 m	16	12	10	10	8	8	6	6	4	4	4	2	2
20' 6 m	14	10	10	8	6	6	6	4	4	2	2	2	2
25' 8 m	12	10	8	6	6	6	4	4	2	2	2	1	1
30' 9 m	12	10	8	6	4	4	4	2	2	2	2	1	1
40' 12 m	10	8	6	6	4	4	2	2	1	1/0	1/0	2/0	2/0
50' 15 m	10	6	6	4	4	2	2	1	1/0	2/0	3/0	4/0	4/0
60' 18 m	10	6	6	4	2	2	1	1/0	2/0	3/0	3/0	4/0	4/0
70' 21 m	8	6	4	2	2	1	1/0	2/0	3/0	3/0	4/0	4/0	
80' 24 m	8	6	4	2	2	1	1/0	2/0	3/0	4/0	4/0		
90' 27 m	8	4	2	2	1	1/0	2/0	3/0	4/0	4/0			
100' 30 m	6	4	2	2	1	1/0	2/0	3/0	4/0				
110' 33 m	6	4	2	2	1	1/0	2/0	3/0	4/0				
120' 36 m	6	4	2	1	1/0	2/0	3/0	4/0					
130' 40 m	6	2	2	1	1/0	2/0	3/0	4/0					
140' 43 m	6	2	2	1/0	2/0	3/0	4/0						
150' 46 m	6	2	1	1/0	2/0	3/0	4/0						
160' 49 m	6	2	1	1/0	2/0	3/0	4/0						
170' 52 m	6	2	1	2/0	3/0	3/0	4/0						

3% Voltage Drop at 24 Volts

Length	Current (Amps)												
	5	10	15	20	25	30	40	50	60	70	80	90	100
10' 3 m	18	18	16	14	12	12	10	10	10	8	8	8	6
15' 5 m	18	16	14	12	12	10	10	8	8	6	6	6	6
20' 6 m	18	14	12	10	10	10	8	6	6	6	6	4	4
25' 8 m	16	12	12	10	10	8	6	6	6	4	4	4	4
30' 9 m	16	12	10	10	8	8	6	6	4	4	4	2	2
40' 12 m	14	10	10	8	6	6	6	4	4	2	2	2	2
50' 15 m	12	10	8	6	6	6	4	4	2	2	2	1	1
60' 18 m	12	10	8	6	6	4	4	2	2	1	1	1/0	1/0
70' 21 m	12	8	6	6	4	4	2	2	1	1	1/0	1/0	2/0
80' 24 m	10	8	6	6	4	4	2	2	1	1/0	1/0	2/0	2/0
90' 27 m	10	8	6	4	4	2	2	1	1/0	1/0	2/0	2/0	3/0
100' 30 m	10	6	6	4	4	2	2	1	1/0	2/0	2/0	3/0	3/0
110' 33 m	10	6	6	4	2	2	1	1/0	1/0	2/0	3/0	3/0	4/0
120' 36 m	10	6	4	4	2	2	1	1/0	2/0	3/0	3/0	4/0	4/0
130' 40 m	8	6	4	2	2	2	1	1/0	2/0	3/0	3/0	4/0	4/0
140' 43 m	8	6	4	2	2	1	1/0	2/0	3/0	3/0	4/0	4/0	
150' 46 m	8	6	4	2	2	1	1/0	2/0	3/0	3/0	4/0	4/0	
160' 49 m	8	6	4	2	2	1	1/0	2/0	3/0	4/0	4/0	4/0	
170' 52 m	8	6	2	2	1	1	2/0	3/0	3/0	4/0	4/0		

3% Voltage Drop at 32 Volts

Length	Current (Amps)												
	5	10	15	20	25	30	40	50	60	70	80	90	100
10' 3 m	18	18	16	16	14	14	12	12	10	10	10	8	8
15' 5 m	18	16	14	14	12	12	10	10	8	8	8	6	6
20' 6 m	18	16	12	12	12	10	10	8	8	6	6	6	6
25' 8 m	18	14	12	12	10	10	8	8	6	6	6	6	4
30' 9 m	16	14	10	10	10	8	8	6	6	6	4	4	4
40' 12 m	16	12	10	10	8	8	6	6	4	4	4	2	2
50' 15 m	14	12	8	8	8	6	6	4	4	2	2	2	2
60' 18 m	14	10	8	8	6	6	4	4	2	2	2	2	1
70' 21 m	12	10	6	6	6	6	4	2	2	2	1	1	0
80' 24 m	12	10	6	6	6	4	4	2	2	1	1	0	0
90' 27 m	12	8	6	6	6	4	2	2	2	1	1/0	1/0	2/0
100' 30 m	12	8	6	6	4	4	2	2	1	1/0	1/0	2/0	2/0
110' 33 m	10	8	6	6	4	4	2	2	1	1/0	1/0	2/0	2/0
120' 36 m	10	8	6	4	4	2	2	1	1/0	1/0	2/0	2/0	3/0
130' 40 m	10	8	6	4	4	2	2	1	1/0	2/0	2/0	3/0	3/0
140' 43 m	10	6	6	4	2	2	1	1/0	1/0	2/0	3/0	3/0	3/0
150' 46 m	10	6	6	4	2	1	1	1/0	2/0	2/0	3/0	3/0	4/0
160' 49 m	10	6	4	4	2	1	1	1/0	2/0	3/0	3/0	4/0	4/0
170' 52 m	8	6	4	2	2	1	1	1/0	2/0	3/0	3/0	4/0	4/0

Conductors Sized (AWG) for 10% Voltage Drop

Use 10% voltage drop for any "non-critical" applications: windlass, cabin lights, etc....

For Example...

Q: A bilge pump draws 10 amps. The positive run is 11 feet from the power panel, including the float switch. The negative run is only 10 feet. What size is the wire?

A: Use the formula to reach the correct answer:

$$CM = \frac{10.75 \times 10 \text{ (amps)} \times 21 \text{ (total length of run)}}{0.36 \text{ (3\% of 12v)}} = 6.271$$

Ancor cable specifications show that 12 AWG wire has a CM area of 6,500 and is the correct choice. However, SAE wire has a CM area of only 5,833. Under NFPA and USCG regulations, 10 SAE wire must be used.

ABYC Recommends...

"Conductors used for lighting, other than navigation lights, and other circuits where voltage drop is not critical, shall be sized for a voltage drop not to exceed 10 percent." ABYC 11.16.1.2.7.

10% Voltage Drop at 12 Volts

Length	Current (Amps)												
	5	10	15	20	25	30	40	50	60	70	80	90	100
10' 3 m	18	18	18	16	16	14	14	12	12	10	10	10	10
15' 5 m	18	18	16	14	14	12	12	10	10	8	8	8	8
20' 6 m	18	16	14	14	12	12	10	10	8	8	8	6	6
25' 8 m	18	16	14	12	12	10	10	8	8	6	6	6	6
30' 9 m	18	14	12	12	10	10	8	8	6	6	6	6	4
40' 12 m	16	14	12	10	10	8	8	6	6	6	4	4	4
50' 15 m	16	12	10	10	8	8	6	6	4	4	4	2	2
60' 18 m	14	12	10	8	8	6	6	4	4	2	2	2	2
70' 21 m	14	10	8	8	6	6	6	4	2	2	2	2	1
80' 24 m	14	10	8	8	6	6	4	4	2	2	2	1	1
90' 27 m	12	10	8	6	6	6	4	2	2	2	1	1	1/0
100' 30 m	12	10	8	6	6	4	4	2	2	1	1	1/0	1/0
110' 33 m	12	8	8	6	6	4	2	2	1	1	1/0	1/0	1/0
120' 36 m	12	8	6	6	4	4	2	2	1	1	1/0	1/0	2/0
130' 40 m	12	8	6	6	4	4	2	2	1	1/0	1/0	2/0	2/0
140' 43 m	10	8	6	6	4	2	2	1	1	1/0	2/0	2/0	2/0
150' 46 m	10	8	6	4	4	2	2	1	1/0	1/0	2/0	2/0	3/0
160' 49 m	10	8	6	4	4	2	2	1	1/0	2/0	2/0	3/0	3/0
170' 52 m	10	6	6	4	2	2	2	1	1/0	2/0	2/0	3/0	3/0

10% Voltage Drop at 24 Volts

Length	Current (Amps)												
	5	10	15	20	25	30	40	50	60	70	80	90	100
10' 3 m	18	18	18	18	18	18	16	16	14	14	14	12	12
15' 5 m	18	18	18	18	16	16	14	14	12	12	12	10	10
20' 6 m	18	18	18	16	16	14	14	12	12	10	10	10	10
25' 8 m	18	18	16	16	14	14	12	12	10	10	10	8	8
30' 9 m	18	18	16	14	14	12	12	10	10	8	8	8	8
40' 12 m	18	16	14	14	12	12	10	10	8	8	8	6	6
50' 15 m	18	16	14	12	12	10	10	8	8	6	6	6	6
60' 18 m	18	14	12	12	10	10	8	8	6	6	6	6	4
70' 21 m	16	14	12	10	10	8	8	6	6	6	6	4	4
80' 24 m	16	14	12	10	10	8	8	6	6	6	4	4	4
90' 27 m	16	12	10	10	8	8	6	6	6	4	4	4	2
100' 30 m	16	12	10	10	8	8	6	6	4	4	4	2	2
110' 33 m	14	12	10	8	8	8	6	6	4	4	2	2	2
120' 36 m	14	12	10	8	8	6	6	4	4	2	2	2	2
130' 40 m	14	12	10	8	8	6	6	4	4	2	2	2	2
140' 43 m	14	10	8	8	6	6	6	4	2	2	2	2	1
150' 46 m	14	10	8	8	6	6	4	4	2	2	2	2	1
160' 49 m	14	10	8	8	6	6	4	4	2	2	2	1	1
170' 52 m	12	10	8	6	6	6	4	2	2	2	2	1	1

10% Voltage Drop at 32 Volts

Length	Current (Amps)												
	5	10	15	20	25	30	40	50	60	70	80	90	100
10' 3 m	18	18	18	18	18	18	18	16	16	14	14	14	14
15' 5 m	18	18	18	18	18	18	16	14	14	14	14	12	12
20' 6 m	18	18	18	18	16	16	14	14	12	12	12	10	10
25' 8 m	18	18	18	16	16	14	14	12	12	10	10	10	10
30' 9 m	18	18	18	16	14	14	12	14	10	10	10	10	8
40' 12 m	18	18	16	14	14	12	12	10	10	8	8	8	8
50' 15 m	18	16	14	14	12	12	10	10	8	8	8	6	6
60' 18 m	18	16	14	12	12	10	10	8	8	8	6	6	6
70' 21 m	18	14	14	12	10	10	8	8	8	6	6	6	6
80' 24 m	18	14	12	12	10	10	8	8	6	6	6	6	4
90' 27 m	18	14	12	10	10	10	8	6	6	6	6	4	4
100' 30 m	16	14	12	10	10	8	8	6	6	6	4	4	4
110' 33 m	16	14	12	10	10	8	8	6	6	6	4	4	4
120' 36 m	16	12	10	10	8	8	6	6	6	4	4	4	2
130' 40 m	16	12	10	10	8	8	6	6	6	4	4	2	2
140' 43 m	14	12	10	8	8	8	6	6	4	4	2	2	2
150' 46 m	14	12	10	8	8	6	6	6	4	4	2	2	2
160' 49 m	14	12	10	8	8	6	6	4	4	2	2	2	2
170' 52 m	14	12	10	8	8	6	6	4	4	2	2	2	2

18-4/0 AWG Wire and Cable Specifications

Wire Size	Nominal O.D.	Wire Diameter	Stranding No. of 30 AWG	Cir. Mil Area	Ohms per 1000'	mm ²	Wt. per 1000'
18 AWG	.08 mm ²	7/64" 2.7 mm	1.0 mm	16	1600	6.48	.08 12 lbs 5.4 kg
16 AWG	1 mm ²	1/8" 3.2 mm	1.5 mm	26	2600	4.00	1.31 16 lbs 7.3 kg
14 AWG	2 mm ²	9/64" 3.6 mm	2.0 mm	41	4100	2.53	2.08 23 lbs 10.4 kg
12 AWG	3 mm ²	5/32" 4.0 mm	2.6 mm	65	6500	1.75	3.31 31 lbs 14 kg
10 AWG	5 mm ²	7/32" 5.6 mm	3.3 mm	105	10,500	1.00	5.26 44 lbs 20 kg
8 AWG	8 mm ²	5/16" 7.9 mm	4.3 mm	168	16,800	0.62	8.37 86 lbs 39 kg
6 AWG	13 mm ²	11/32" 8.7 mm	5.5 mm	266	26,600	0.40	13.30 118 lbs 53.5 kg
4 AWG	21 mm ²	13/32" 10.3 mm	7.0 mm	420	42,000	0.24	21.15 178 lbs 81 kg
2 AWG	34 mm ²	15/32" 11.9 mm	8.0 mm	665	66,500	0.16	33.62 277 lbs 126 kg
1 AWG	42 mm ²	17/32" 13.5 mm	9.0 mm	836	83,690	0.13	42.38 350 lbs 159 kg
1/0 AWG	53 mm ²	9/16" 14.3 mm	10.5 mm	1064	105,600	0.10	53.49 437 lbs 198 kg
2/0 AWG	68 mm ²	5/8" 15.9 mm	12.0 mm	1330	133,000	0.08	67.43 549 lbs 249 kg
3/0 AWG	85 mm ²	11/16" 17.5 mm	13.0 mm	1665	167,800	0.06	85.01 675 lbs 306 kg
4/0 AWG	107 mm ²	13/16" 20.6 mm	14.0 mm	2109	211,600	0.05	107.20 837 lbs 380 kg

Temperature Rating of Conductor Insulation

The Law

The Code of Federal Regulations (CFR) 183.425 Conductors

- (b) Except for intermittent surges each conductor must not carry a current greater than that specified for the conductor's gauge and temperature rating.
- (c) For conductors in engine spaces, amperages must be corrected by the appropriate correction factor in Note 1.

Due to engine heat, the ambient temperature in engine spaces is usually higher than in other spaces of the boat. Wiring in and passing through engine spaces must be able to operate at these higher ambient temperatures. The ampacity values are based on an ambient temperature of 86°F / 30°C which is considered reasonable for use on boats except in engine spaces. The correction factors in Note 1 converts the ampacities to acceptable values in an ambient temperature of 122°F / 50°C. This higher temperature has been selected as satisfactory for engine spaces. Note 1 is supplied to eliminate the need for calculating the corrections. The values are already corrected.

Conductor Size AWG	Ampacity Outside of Engine Space	Ampacity Inside of Engine Space (Note 1)
18	20	17
16	25	21
14	35	30
12	45	38
10	60	51
8	80	68
6	120	102
4	160	136
3	180	153
2	210	178
1	245	208
1/0	285	242
2/0	330	280
3/0	385	327
4/0	445	378

*De-rating for engine space is 0.85 for 221°F / 105°C rated wire.

Allowable Amperage of Conductors of 50 Volts or More

The current values shown in this chart and also on the wire and cable specifications chart do not consider voltage drop for conductors under 50 volts. The values shown on the ampacity table are the maximum safe amperages which the conductor can carry on a continuous basis. They do not apply to intermittent starting loads such as motor start currents. Since all Ancor Boat Cable is 105°C insulated, only that temperature rating is shown.

Due to the higher ambient temperatures in engine spaces and the heat retention of large wire bundles, a "correction factor" must be used to de rate the wire by increasing conductor size. This chart takes into consideration these factors and should be used to select conductor sizes for circuits over 50 volts. Note that for electrical systems under 50 volts, voltage drop is the controlling factor and the tables on 4 and 5 should be used.

Conductor Size AWG	2 Conductors 221°F (105°C) Engine Space		3 Conductors 221°F (105°C) Engine Space		4-6 Conductors 221°F (105°C) Engine Space		7-24 Conductors 221°F (105°C) Engine Space	
	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside
18	20	17.0	14.0	11.9	12.0	10.2	10.0	8.5
16	25	21.3	17.5	14.9	15.0	12.8	12.5	10.6
14	35	29.8	24.5	20.8	21.0	17.9	17.5	14.9
12	45	38.3	31.5	26.8	27.0	23.0	22.5	19.1
10	60	51.0	42.0	35.7	36.0	30.6	30.0	25.5
8	80	68.0	56.0	47.6	48.0	40.8	40.0	34.0
6	120	102.0	84.0	71.4	72.0	61.2	60.0	51.0
4	160	136.0	112.0	95.2	96.0	81.6	80.0	68.0
3	180	153.0	126.0	107.1	108.0	91.8	90.0	76.5
2	210	178.5	147.0	125.0	126.0	107.1	105.0	89.3
1	245	208.3	171.5	145.8	147.0	125.0	122.5	104.1
1/0	285	242.3	199.5	169.6	171.0	145.4	142.5	121.1
2/0	330	280.5	231.0	196.4	198.0	168.3	165.0	140.3
3/0	385	327.3	269.5	229.1	231.0	196.4	192.5	163.6
4/0	445	378.3	311.5	264.8	267.0	227.0	222.5	189.1

Number of current carrying conductors:	Correction Factor
3	0.70
4 to 6	0.60
7 to 24	0.50
25 and above	0.40

This table is supplied to eliminate the need for calculating the corrections for multi-conductor cable bundles in the temperature rating chart. The values are already corrected.

Note: These tables only apply for 221°F (105°C) wire and other premium wire and should not be used for lesser grades of wire and cable.

Reprinted at the courtesy of the United States Coast Guard Electrical System Compliance Guideline.

* There is NO LIMIT on conductors in a bundle under 50 volts.

TECH tip™

Wire Bundling per ABYC Guidelines

ABYC states: Conductors shall be supported throughout their length or shall be secured at least every 18 inches (455mm) by one of the following methods:

- By means of non-metallic clamps sized to hold the conductors firmly in place. The material shall be resistant to oil, gasoline, and water and shall not break or crack within a temperature range of 30°F / -34°C to 250°F / 121°C
- By means of metal clamps lined with an insulating material resistant to the effects of oil, gasoline, and water

All of **Ancor's clamps** are resistant to oil, gasoline, and water and are rated for use within the ABYC specified range. Stainless steel cushion clamps are designed to perform within a wider temperature range and provide additional shock, vibration and noise protection compared to nylon cable clamps.



All of **Ancor's cable ties** are resistant to oil, gasoline, and water and are rated for use within the ABYC specified range.



Full Line of Products

For over 40 years Ancor has been the industry leader for quality tinned copper Marine Grade™ wire and cable. Ancor's comprehensive product line includes everything required to complete a wiring project. This includes Marine Grade wire and cable, terminals and connectors, wire management products, and hand tools. Ancor designs products to the highest standards that meet UL, ABYC, NMMA and USCG standards. Product selection, quality, and service are the pillars of the brand, and only Ancor can be your single source for wire and accessories.

WIRE & CABLE



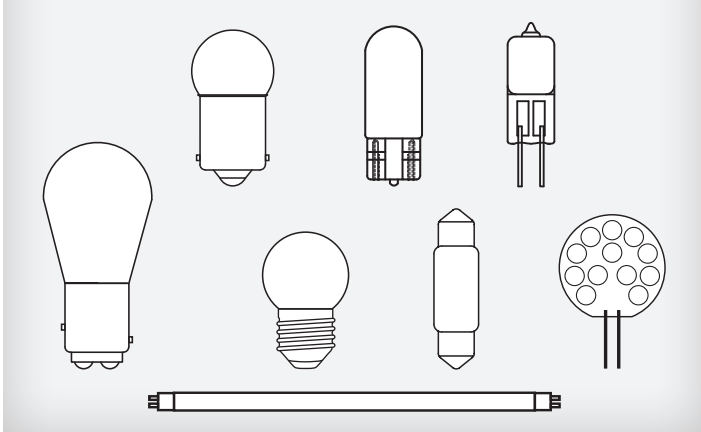
TOOLS & TESTERS



TERMINALS & LUGS



LIGHTING



WIRE MANAGEMENT

