



Volume 10, Issue 1
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The Circuit

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A Copper Conductor



Could it be any less glamorous? Boring with a capital B you say? As it is with many things, a closer examination reveals several facets that may be new to the casual observer...

like **stranding**. In stranding you will find:

- **Solid**, says it all
- **7 strand concentric**, single centre wire with other wires wrapped around it in layers
- **Bunch and Rope**, Bunched strand is a group of fine wires twisted in a common direction (not concentrically) and Rope are assemblies of bunch strands. These strand methods are used in flexible cables.
- **Sector**, stranded conductor with a cross section in the shape of a sector of a circle.
- **Segmental**, three or four sections slightly insulated from each other allows for better AC resistance.
- **Annular**, strands are laid around a non-conductive core material.
- **Compact** conductors are shaped to have no visible air space between the wires reducing the diameter of the conductor 9% or more. This type of stranding is used in large Tech and medium voltage power cable.
- **Compressed**, in larger gauge sizes the use of a compressed conductor reduces the OD of the conductor.
- **Class**, such as B, C, H, K, L, M and O all reference to ASTM standards, also sorts stranding. The number of strands varies from 7 strand 24 AWG Class B to 25,193 strands for 1000 MCM Class M.
- **Coatings** are of nickel, silver and tin. Tin is the most common as it improves corrosion resistance, makes the conductor easier to solder and it's inexpensive.



See the Winning Answer for the Cable Trivia from Volume 9 on Page 3

To obtain additional information on stranding, contact your local ShawFlex Sales Office

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Upcoming Events:

07-09 September
Executive Energy Forum: Time to Reinvent the Wheel
Quebec, QC

18 September
The 2004 Economic Forecast
Pearson Convention Centre
Brampton, ON

02 October
Electrical Showcase 2003 Abbotsford
Tradex Building
Abbotsford, BC

Important Information for Distributors:

In a surprise move with little public notice, the Federal Communications Commission on Friday, 25 July, announced new regulations governing how businesses and trade associations can use faxes to communicate with their members and customers. NAW and other organizations are mounting a strong effort to prevent or postpone imposition of these regulations. If these efforts are not successful, the new regulations will take effect on 25 August 2003.

If the regulations take effect, it will be unlawful under the federal Telephone Consumer Protection Act (TCPA) for a wholesaler-distributor (or any other business or person) to send an unsolicited "advertisement" to any fax machine - including a customer's fax machine - unless the customer or other recipient has granted the wholesaler-distributor prior express written permission to deliver the advertisement. This new rule can be seen completely at

www.naw.org/governmentissues38.html

Test Your Cable Knowledge Volume 9 Question and Winning Answer

Question: Please define the following terms and why they are important in electrical cables: 1) Ampacity, 2) resistance and 3) Doppler Effect

The Winning Answer was from Ron Sutherland of Anixter. His complete response follows.

Congratulations Ron!!!

Please see Page 3 for Ron's complete response.

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1) Ampacity is the RMS current which may be carried by a device, within specified temperature limitations in a specific environment and dependant upon: (a) temperature rating, (b) power loss, and (c) heat dissipation. The key to understanding Ampacity is to learn about heat transfer. The definition of Ampacity is given in the National Electrical Code (NEC) as “the current in amperes a conductor can carry continuously under the conditions of use without exceeding its temperature rating.” To better understand Ampacity we need to examine how heat is transferred and thermal circuits in respect to a current carrying conductor. When current is carried by a conductor it must pass through the electrical resistance of the conductor. When this happens heat is generated. One unit of heat, watts, can be calculated by $I^2 \times R$, where R equals the electrical resistance of the conductor in ohms and I equals the current in amperes. The heat generated in the conductor passes through several thermal barriers by convection, conduction, and radiation and dissipates into the air. Possible thermal barriers are the conductor insulation, the air inside a duct, the duct wall, the soil surrounding an underground duct, and any additional thermal insulation applied such as polyurethane. The transfer of heat follows a fundamental law in physics, and heat always flows from the warmer object to the colder object, much like heat flowing from the inside of a house through the walls to the outside on a cold day. The rate of heat transfer is dependent on several variables and can be described by a thermal equation that closely resembles ohms law ($E=I \times R$), substituting heat for current and thermal resistance for electrical resistance. In a heat transfer equation the rate of heat transfer is directly dependent on the difference in temperature between the conductor called T_C and the ambient temperature called T_A . In a heat transfer equation $T_C - T_A = (I \times R) \times R_{CA}$, where I is current in amperes, R is electrical resistance in ohms, and R_{CA} is thermal resistance in degrees Centigrade - cm/watt usually called thermal-ohm-feet. T_C is the maximum permissible operating temperature in degrees Centigrade of the conductor. T_A is the ambient temperature of the air or soil for underground installations. Letting heat, $I \times R$ in this case, be represented by W and thermal resistance, R_{CA} by R with a line over it, we can draw a thermal circuit that is similar to an electrical circuit. Heat will flow from hot to cold objects until an equilibrium temperature is reached.

1. Temperature remains constant is heat loss = heat gain
2. Effectiveness depends on substances and situation

2) Resistance in DC circuits is the opposition material offers to current measured in ohms. In AC circuits it is the real component of impedance and may be higher than the value measured at DC. In other words, resistance is like trying to make water flow uphill... the hill and gravity (oppositions) both create resistance to the flow of the water (current) as does evaporation (temperature).

3) Doppler Effect is what happens when you drink too much... you begin to hear in “wavy lines” ...something like earlier TV shows when the sound would fade and return. Actually the Doppler Effect is the change in observed frequency of an acoustic or electromagnetic wave due to relative motion of the source and/or observer. An is the sound made as an ambulance or police car goes by? The siren’s pitch changed as the vehicle raced towards, then away from you. First the pitch became higher, then lower; this change in pitch results from a shift in the frequency of the sound waves. As the ambulance/police car approaches, the sound waves from its siren are compressed towards the observer. The intervals between waves diminish, which translates into an increase in frequency or pitch. As the ambulance/police car recedes, the sound waves are stretched relative to the observer, causing the siren’s pitch to decrease. By the change in pitch of the siren, you can determine if the ambulance is coming nearer or speeding away. If you could measure the rate of change of pitch, you could also estimate the ambulance’s speed. (Gee wasn’t High School physics fun..... NO!) The electromagnetic radiation emitted by a moving object also exhibits the Doppler Effect. The radiation emitted by an object moving toward an observer is squeezed; its frequency appears to increase and is therefore said to be blue shifted. In contrast, the radiation emitted by an object moving away is stretched or red shifted. Because of the inverse relationship between frequency and wavelength, we can describe the Doppler shift in terms of wavelength. Radiation is red shifted when its wavelength increases, and is blue shifted when its wavelength decreases. Originally discovered by the Austrian mathematician and physicist, Christian Doppler (1803-53).

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from Across the Country

Western Droppings:

The Nexen/OPTI Oil Sands project could begin as early as next year if the partners decide to proceed with the project. EUB approval was just recently given for this project. The final approval should be in place by both boards by December 2003, allowing the project to begin in 2004.

The drilling market in Western Canada has again begun to a flurry of activity. This is good news to all who have waited through the first half of 2003 for this to kick in.

Suncor Energy (U.S.A.) Inc., a US subsidiary of Suncor Energy has received Federal Trade Commission approval to acquire ConocoPhillips Denver refinery and 43 Phillips-branded retail stations along with the associated storage, pipeline and distribution facilities.

Central Crumbs:

Ontario will add 3000 MW of renewable energy capacity by 2014. This is almost the equivalent of the Darlington nuclear generating station. Renewable sources include wind, solar, water, biomass, geothermal and gas captured from landfill sites.

Ontario and Manitoba launched a feasibility study into what could become one of Canada's biggest hydro-electric projects. The provinces will study the Conawapa dam project in Manitoba. A 1250 MW generating station would be built on the Nelson River about 800 km north of Winnipeg and a transmission line would take the electricity to Ontario's industrial heartland. This project would translate into billions of dollars in jobs and business in both provinces. The station would not be built unless Hydro One agrees to buy power from Manitoba Hydro.



Eastern Tidbits:

Despite the customary construction holidays in Quebec, activity remains brisk. The slow down in the USA has not crossed the border into the province and the large projects announced previously all appear to be on track. Hydro Quebec is planning to build a generating station that will be run on natural gas. The 550 MW plant should be up and running by 2006.

Activity in the Maritimes is also brisk, with the Coleson Cove project for NB Power occupying a lot of space.

Remember ShawFlex can manufacture up to 4/O cable sizes!! Call for your quote today.

800 668 4842
quotes@shawflex.shawcor.com

Mensa Brain Teaser

How many times can you subtract 6 from 30???

First Correct Answer from each territory will receive a small prize!

