

SELECTING WIRES AND CABLES

This text is designed to provide basic information for selecting wires and cables most commonly used from the Aetna Insulated Wire Company Catalog.

The first step in selecting a wire or cable for primary and secondary power circuits is to consider the requirements in terms of:

1. *Type of installation*
2. *Voltage rating*
3. *Ampacity requirements*
4. *Heating conditions*
5. *Special conditions*

1. The method used to install a cable is a determining factor in choice. In outdoor areas, the cable can be either directly buried in the ground, installed in underground duct bank, hung from a messenger wire, or installed in overhead cable racks.

In underground installations in particular, it is almost impossible to keep ducts free from moisture. Thus, the cable selected should be suitable for wet installation conditions.

Indoors, cable is installed either in conduit or in overhead racks. A popular choice today is the use of interlocked armor cable. The armor eliminates the need for a conduit and the cable is a completely self-contained unit. When interlocked armor cable is installed indoors in open overhead racks, advantage can be taken of the higher "in air" ampacities because there is no "dead air" space around the conductors. Often, an interlocked armor cable installation will save from 20 to 50% over a conventional cable-in-conduit system on an installed cost basis.

2. The voltage at which the cable is to operate determines the type and thickness of the insulation and the minimum size of conductor that can be used for very small loads. In addition to determining the voltage rating, it is also necessary to know whether the system is to be operated with a grounded or ungrounded neutral (100% or 133% insulation level).

3. The ampacity of KVA loading is the primary consideration in determining the final conductor size, either from the conductor or the voltage drop standpoint. The current load, KVA load, or the kilowatt load and power factor must be known before this

conductor size can be determined.

Cable size is sometimes governed by voltage drop rather than by heating. In general, the conductor size on long, low-voltage lines is governed by voltage drop, and on short run high-voltage lines by heating. In any doubtful case, the size should be determined in two ways: by voltage drop and by heating, and the larger size should be used.

4. External thermal conditions (heat) play an important part in determining the temperature rise of a cable. Some of the more important conditions are earth or ambient temperature, presence of artificial cooling, number of cables in a duct bank, proximity of other cables, thermal conductivity of the soil or other surrounding medium, depth of buried cable, character of surrounding atmosphere, and presence of sheath losses on single-conductor cables.

5. There are too many possible "special" conditions to list them all. Some of the more common are: presence of boilers, steam pipes, or other large sources of heat; the effect of magnetic material such as pipes or structural members in close proximity to large cables carrying heavy current; the presence of corrosive reagents in the soil or other locations in which the cable is installed; and the interference occurring in telephone circuits because of adjacent power cables.

When preparing to place an order for wire or cable, be sure to have the following information, so that the proper material is supplied:

1. *Voltage Rating* - If the voltage rating is 5000V, is the cable non-shielded or shielded cable. If the voltage rating is one of the following: 8000V, 15000V, 25000V, 28000V or 35000V, is the cable for a grounded neutral or ungrounded neutral system (100% or 133%).
2. *Conductor Construction* - Size; and Number
3. *Type of insulation.*
4. *Type of protective covering.*
5. *Total length* of each item and individual cutting length desired.
6. *What are the delivery requirements.*
7. *Destination to which cable is to be shipped.*

