

# Selection Of Number Of Cable Cores With Emphasis On Sizing Parameters



*Selection Of Number Of Cable Cores With Emphasis On Sizing Parameters (photo by dnvkema.com)*

## Dependance On Installation Site

The selection of number of [cable cores](#) basically depends on the type of system where it is going to be installed.

### **Generally we have two types of systems:**

1. A perfectly balanced system and
2. A system with some degree of unbalance (*or Unbalanced System*).

### **Generally cable sizing includes below parameters:**

1. Cable installation conditions and the load it will carry
2. Continuous current rating of the cable
3. [Voltage drop](#) and short circuit considerations
4. Earth fault loop impedance

Here, I am going to describe that how the number of cores can be selected.

## 3-Core Cables

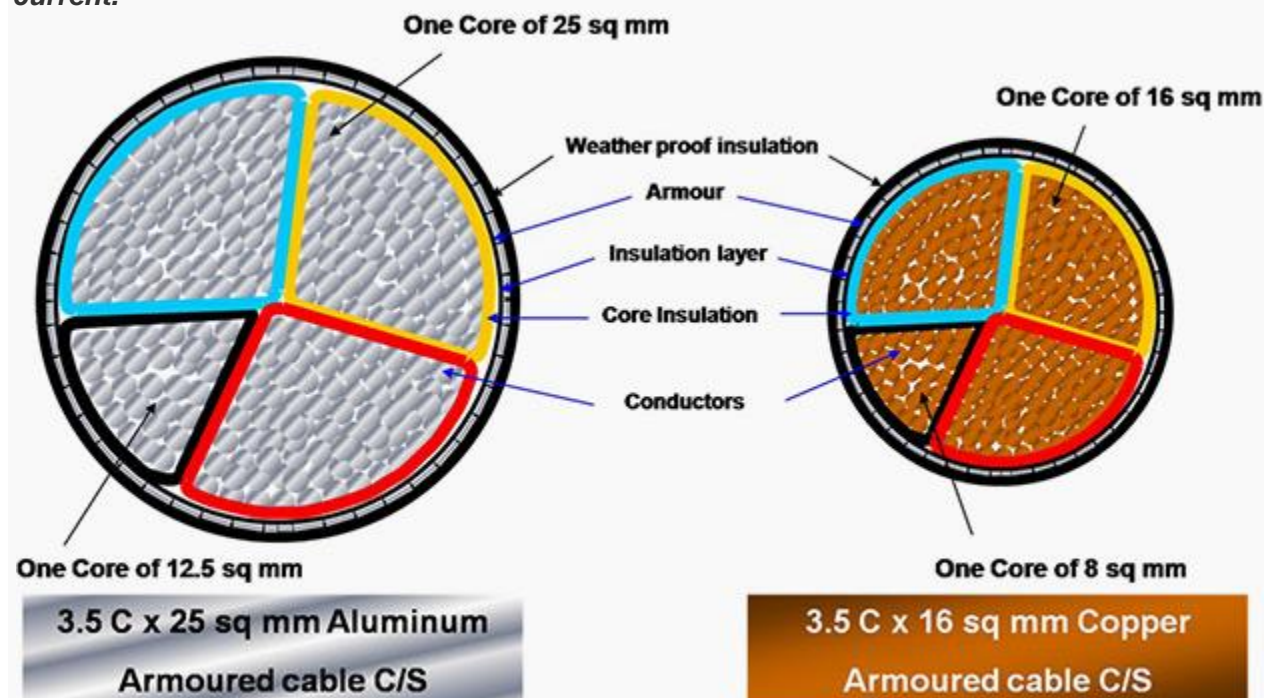
These cables are used generally for a **perfect balanced 3-phase system**. When the currents on the 3-live wires of a 3-phase system are equal and at an exact  $120^\circ$  phase angle, then the system is said to be balanced. The 3-phase loads are identical in all respects with no need of a **neutral conductor**.

An important example of 3-phase load is **electric motor** and that is why, they are fed through 3-Core cables in most cases.

## 3.5-Core Cables

A 3-phase system may have a neutral wire. This wire allows the 3-phase system to be used at **higher voltages** while it will still support lower voltage single phase loads.

It is not likely in such cases that the loads will be identical, so the neutral will carry the **out-of-balance current** of the system. **The greater the degree of imbalance, the larger the neutral current.**



3-5-core cable construction (figure by mitesh-raval.blogspot.com)

When there is **some degree of unbalance** and the amount of fault current is very small, then 3.5 core cables are used. In these types of cables, a neutral of reduced cross section as compared to the 3-main conductors is used, which is used to carry the small amount of unbalanced currents.

## 4-Core Cables

When there is **severe out-of-balance conditions**, the amount of fault current will raise to a very high level. Generally in the case of **linear loads**, the neutral only carries the current due to imbalance between the phases.



4-core PVC insulated and sheathed copper conductor power cable

The **non-linear loads** such as switch-mode power supplies, computers, office equipment, lamp ballasts and transformers on low loads produce third order harmonic currents ([Definition of Harmonics and Their Origin](#)) which are in the phase of all the supply phases.

These currents do not cancel at the star point of a three-phase system as do normal frequency currents, but add up, so that the neutral carries **very heavy third harmonic currents**.

That is why the neutral of the cable feeding the equipment are not reduced and made with **cross sectional area same as that of the main conductor** to carry this high amount of current.

## 5 and 6-Core Cables

Some conditions may arrive when the amount of **fault (neutral) current** becomes very large than the phase currents. When the load concerned to this type of situation is fed through a multi-core cable, it is necessary to use a 5-Core or 6-Core Cable.



*5-core PVC insulated and sheathed copper conductor power cable*

In this condition, **two (or three) conductors can be used in parallel formation** to carry the high amount of generated unbalanced currents.

Source:

<http://electrical-engineering-portal.com/selection-of-number-of-cable-cores-with-emphasis-on-sizing-parameters>