Two-Day Course On "Design, Protection and Sizing of Low Voltage Electrical Installations (Wiring) to IEE Wiring Regulations /BS 7671 /MS IEC (IEC) 60364"

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The above mentioned workshop took place on 1st and 2nd March 2016. Malaysian electrical engineers of today were reminded that the term "electrical installation" is the best term to describe particularly the low voltage electrical installation sector in place of the term "wiring". Electricity Supply Act 1990 (latest amendment in 2010) and Electricity Regulations 1994 (latest amendment in 2014) are the two main regulatory frameworks applicable in Peninsular Malaysia, Federal Territories and Sabah while its similar counterpart is called Ordinances and Rules in Sarawak. Nonetheless, electrical engineers also need to be aware of other acts and regulations such as the Occupational Safety and Health Act 1994, Factory and Machinery Act 1967, Construction Industry Development Board Act 2011 (CIDB) and Medical Device Act 2012. Since 2003, Malaysia has been adopting IEC standards as reference standards with examples as below:

1. MS IEC 60364: Electrical Installations of Buildings- Adoption of IEC 60364 with national deviations
2. MS 1936: Electrical Installations of Buildings: Guide to MS IEC 60364: Non-residential buildings
3. MS 1979: Electrical Installations of Buildings: Code of Practice: Residential buildings

It is highly recommended for practicing electrical engineers in Malaysia to at least have both MS 1936 and MS 1979 in possession.

Maximum compliance to the standards must be in place to ensure that the primary requirement of safety is fulfilled. However, when in doubts, it is advisable for engineers to perform a Risk Management. It is not recommended for engineers to adhere to different editions of standard. It is good to note that standards are grouped into 3:

1. Fundamental standards
2. Product, Test, Data Analysis and System standards
3. Organisational standards which includes the ISO standards

The origin of installation voltage in Malaysia is rated at 50±Hz, 230V/400V +10%,-6% effective on or after 1st January 2008.

In the electrical installations of non-residential buildings, there are two main protection zones namely earth fault protection and electric shock protection. The former covers from the generator side up to the final distribution board whereas the latter covers from the final distribution board up to the power and lighting loads. However such is not the case in a residential electrical installation whereby there is actually no protection advocated between the utility's metering device up to consumer unit or distribution board. Only electric shock protection is mandated by MS 1979 which covers from distribution board up to the power and lighting loads. Miniature Circuit Breaker (MCB) is largely used in earth fault protection which comprise of overcurrent and short circuit whereas Residual Current Device (RCD) is mostly used in electric shock protection. Again, proper sizing of MCB and RCD is paramount to ensure that safety of human and equipment is safeguarded as per recommendation of the relevant standards. It is important to adhere to that RCD must be installed at distribution board as primary protective point.

Sizing of MCB (AC) is governed by IEC 60947 (non-residential) and IEC 60898 (residential) and is classified into thermal, magnetic and thermal-magnetic type. Similar with sizing of cables, correction factors must be done accordingly. For thermal characteristic correction, ambient temperature and grouping factor needs to be considered. Derating of MCB operating in ambient temperature higher than 30°C has to be done. Another case whereby MCB needs to be derated is when few MCBs are mounted together in groups resulting in proximity heating effect when fully loaded. On the other hand, application of MCB (DC) needs to be done with arc extinction issue in mind as unlike MCB(AC), there is no natural quenching of arc. Sizing of phase conductors should be done by considering maximum load current and maximum temporary overload or inrush current. Extra attention needs to be paid to special installations such as water heaters, air-conditioner and other high current equipment.

Last but not least, any electrical installation is not considered complete without earthing. Electrical engineers in Malaysia should know inside out about the configuration of TT earthing system as well as protective earthing and protective bonding. Deployment of protective bonding must be done as per the appropriate standard and is considered as optional for residential installations as per MS 1979. It is worth mentioning that all earthing conductors in an electrical installation in Malaysia shall be copper although IEC 60364 still permits aluminium for above ground only and steel. Even so, equivalent electrical conductivity Cross Sectional Area of other materials must be at least equal to that of copper conductor. Therefore, certain conversion factor needs to be accounted for.

In conclusion, as an electrical engineer, relevant standards should be complied when designing a particular electrical installation system. By so doing, not only electricity acts are adhered to but safety of human and equipment are safeguarded as well. Appreciate the importance of Ohm's law as the basic underlying principle behind your design of electrical installation.