



Distribution Connection Code

Power Quality Requirement

By :

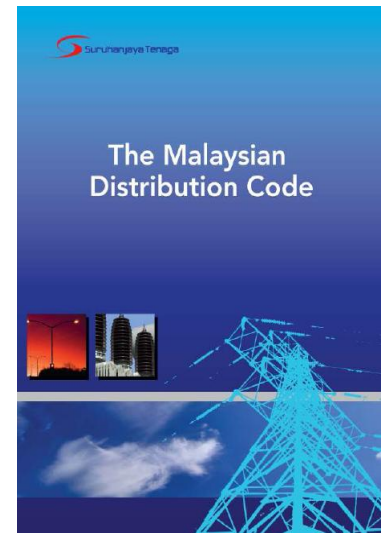
Ir.Dr.Mohamed Fuad Faisal



Distribution Code Awareness Programme Funded by
Akaun Amanah Industri Bekalan Elektrik (AAIBE)



- The Distribution Connection Code (DCC) specifies the technical, design, operational and data exchange requirements to be complied with by Users connected to or seeking connection to the Distributor's Distribution System.



Scope of Distribution Connection Code



The DCC applies to all Distributors, Consumers, Distributed Generators and Embedded Distributors. All Distributors and Users connected to the Distributor's Distribution System or seeking connection to the Distributor's Distribution System shall comply with the requirements of the DCC. For convenience the DCC is arranged in sections by User classification as follows: -

- (i) General requirements for Connection.
- (ii) Connection Requirements for Consumers connected at LV.
- (iii) Connection Requirements for Consumers connected at MV.
- (iv) Connection Requirements for Embedded Distributors.
- (v) Connection Requirements for Distributed Generators



7.4.2 Security and Quality of Supply



- 7.4.2.1 The Distributor will use reasonable diligence to supply a steady and continuous supply of electricity at the Connection Point in accordance with the security and power quality of supply requirements and planning and operation criteria set out in the DPC and DOC. On occasion irregularities or supply interruptions and short duration variations in voltage and frequency may occur as indicated in the DPC and DOC.
- 7.4.2.2 The Distributor and User may enter into special agreements for a higher or lower level of security of supply or power quality performance on terms that do not discriminate in favour of or against the User.



7.4.3 Inspection of User Installations by the Distributor



- 7.4.3.1 The Distributor reserves the right, but does not assume the duty, to inspect a User's installation at any time and refuse to supply or continue to supply an electricity service whenever the Distributor considers that the User's installation does not comply with the regulations governing that installation or the Distribution Code.



- In case of discontinuation of supply on grounds of non-compliance to regulations/ Distribution Code, the Distributor shall provide in writing to the User details of non compliance and action required to be taken by the User before supply can be restored.



7.4.9 Power Quality Disturbances



- 7.4.9.1 The User shall not employ or utilize any Equipment, appliance, or device so as to adversely affect the Distributor's electricity supply to other Users. Where a User uses or intends to use the electricity supply for the operation of hoists, welding machines, x-ray machines, electric furnaces or ovens, variable frequency drives, AC to DC converters, saturable power transformers, motor starting, switching power supplies, equipment employing semiconductor switching technology or



-or otherwise having load characteristics which produce harmonics, voltage step changes or voltage fluctuations that may be outside the limits specified in provisions of 5.4.6.6 of the DPC, or which otherwise may adversely affects voltage regulation, then the User shall may be required to install and maintain, suitable Apparatus or take action to limit the effect of such Equipment to such values as are permissible at the connection point.



7.5 Connection Requirements for Consumers Connected at LV



7.5.1.1 For supplies at **Low Voltages** of 230V and 400V, the **Consumer** shall, in the appropriate application forms for connection obtainable from the **Distributor** provide the following data:

- (a) maximum power requirements in kVA;
- (b) types and number of equipment and its corresponding connected load in kVA;
- (c) shunt connected reactors and capacitors in kVAr;
- (d) the date when connection is required; and
- (e) for single-phase 230V motors with rating of greater than 6 KVA and/or three-phase 400V motors with rating greater than 75 kVA;
 - (i) rating in HP or KVA;
 - (ii) types of control equipment;
 - (iii) methods of starting and starting current;
 - (iv) frequency of starting (number/hour);
 - (v) rated power factor; and
 - (vi) voltage sensitive loads (indicating sensitivity)



7.5.2 Technical Requirements for Connection



- 7.5.2.1 For connections at Low Voltage the Consumer's installation shall comply with the Electricity Supply Laws and Malaysian Wiring Regulations (IEC 60364) and standard requirements specified by the Distributor to ensure that the installation complies with the Distribution Code.



- 7.5.2.2 In the case of connections to Consumers at Low Voltage, the Distributor has the responsibility to specify any technical requirements for the connection.
- This includes specification of technical requirements associated with loads which may give rise to voltage fluctuations and harmonics to ensure compliance with the limits specified in the provision 5.4.6.6 of the DPC.



7.6 Connection Requirements for Consumers Connected at MV



7.6.1.1 For supplies at **Medium Voltages** of 6.6 kV, 11 kV, 22 kV and 33 kV, the **Consumer** shall provide information on the loads and their characteristics including but not limited to the following:

(b) For all types of loads:

- (i) Maximum **Active Power** consumption in kW; and
- (ii) Maximum **Reactive Power** consumption in kVAr.

(c) For motor loads:

- (i) rating of motor (in HP/kVA)
- (ii) types of control equipment;
- (iii) methods of starting;
- (iv) magnitude and duration of the starting current;
- (v) frequency of starting (number/hour);
- (vi) under voltage setting and time;
- (vii) negative phase sequence protection; and
- (viii) sub-transient and/or locked rotor reactance of the motor.



- (d) For nonlinear loads with harmonic current injections:
 - (i) harmonic current spectrum including harmonic number and the corresponding maximum current.
- (e) For fluctuating loads:
 - (i) The rates of change of **Active Power** and **Reactive Power** consumption in kW/minute and kVAr/minute respectively, both increasing and decreasing;
 - (ii) The shortest repetitive time interval between fluctuations for **Active Power** and **Reactive Power** in minutes; and
 - (iii) The magnitude of the largest step changes in **Active Power** and **Reactive Power** in kW and kVAr respectively, both increasing and decreasing.



- (f) For voltage sensitive loads:
 - (i) steady-state voltage tolerance limits of the equipment in percentage of the nominal voltage;
 - (ii) intrinsic immunity limits to short duration voltage duration;
 - (iii) transient voltage tolerance limits of the equipment in percentage of the nominal voltage and the corresponding duration;
 - (iv) harmonic voltage distortion tolerance limits for the equipment in % total harmonic distortion and individual harmonic distortion.



7.6.2 Technical Requirements for Connection



- 7.6.2.1 The Distributor upon receipt of the information specified in provision 7.6.1.1 of the DCC shall perform an assessment of the impact of the loads on the Distributor's Distribution System and if necessary advise the Consumer to contain the impact of the Consumer's load in compliance with the limits and standards specified in DPC and DOC of the Distribution Code.



- 7.6.2.2 Certain types of User Equipment connected to the Distributor's Distribution System may give rise to voltage fluctuations and/or voltage distortion which result in disturbance to other Users or damage to the Distribution System or connected User Equipment.
- Voltage fluctuations include voltage step changes due to switching of User or Distributor Demand or Equipment, voltage flicker due to the operation of User Equipment such.....



-such as welding machines and arc furnaces, Voltage Unbalance due to unbalanced loads.
- Harmonic voltage distortion may arise due to the connection of converters.
- In order to limit these effects both the Distributors and Users shall take into account their responsibilities as follows:



- (a) The Distributor shall through the planning and connection process maintain voltage fluctuations due to step changes, flicker, Voltage Unbalance and harmonic distortion within the limits specified in as set out in provision 5.4.6.6.
- (b) The User shall maintain voltage distortion at points of common coupling (PCC) such that it does not result in voltage distortion in the Distributor's Distribution System beyond the limits specified in provision 5.4.6.6.
- (c) The User shall make an appropriate assessment of the impact of the connection of such Equipment to the System and take measures to limit the distortion of the supply voltage of the Distributor's Distribution System within the limits specified in provision 5.4.6.6.



- (d) The User shall inform the Distributor in reasonable time of the intention to connect Equipment likely to have a distorting affect on the System voltage and provide the Distributor with the information specified in the Distribution Connection Code.
- (e) The Distributor upon receipt of the above information shall make an appropriate assessment of the impacts of the connection of such Equipment to the System and recommend any further measures to be undertaken by Users if necessary to limit the distortion of the supply voltage of the Distributor's Distribution System within the limits specified in provision 5.4.6.6.
- (f) The Distributor shall apply the best available engineering techniques and prudent utility practices in making such assessments following the procedures set out in the Licence Standard or where a Licence Standard has not been specified then the Distributor will comply with the relevant Malaysian Standards and IEC Standards (IEC 61000 series).



7.8.3.3 Generating Unit Specifications



7.8.3.3.1 A Generating Unit with a capacity greater than 10 kVA or as specified by the Distributor shall be a three-phase Generating Unit.

7.8.3.3.2 Any generation, utilizing a direct current (dc) generating device and an inverter, shall be capable of supplying energy with a sine wave with a Total Harmonic Distortion i.e. the RMS sum of all harmonics superimposed on the 50 Hertz sine wave, not exceeding 5%, as calculated and/or measured at the Connection Point with no other Users connected. The RMS harmonic distortion from any individual harmonic shall be limited to 1% - 1.5% as specified by the Distributor.

7.8.3.3.3 In addition the Generating Unit shall not produce harmonics of a magnitude and frequency so as to interfere with communication and electronic equipment.



7.8.3.8 Power Factor



- 7.8.3.8.1 The Distributed Generator shall be responsible for maintaining a minimum power factor of 90% lagging for all machines larger than 10 kVA unless otherwise required by the Distributor.



THANK YOU



**Distribution Code Awareness Programme Funded by
Akaun Amanah Industri Bekalan Elektrik (AAIBE)**