

Er. Lim Say Leong, Region Marketing Manager, South Asia, Automation Products division, 19-02-2009

Understanding how IEC standard 60439-1 could help you in specifying switchboards

Power and productivity for a better world™

Talk by S L Lim



- This lecture discusses on common problems with switchboards pertaining to overheating, fire and electric shock.
- How proactive actions could be effected in relationship to the relevant clauses in the standard to remedy or to avoid the problems. It will be illustrated with slides on construction and incidents.

Switchboards
What are the common problems?



- Overheating



- Fire



- Electric shock

ABB

How we react?

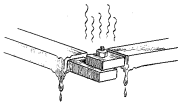
- The usual way is to blame down the chain
- Can we overcome it?
- Yes





ABB

Overheating
What causes it?

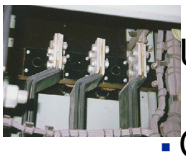


Poor connection - Mitigation

- There is proper tightening torque
  - Equipment
  - Value
- Correct selection of termination
- Regular checking

ABB

Overheating
What causes it?



Under-size - Mitigation

- Correct sizing for cable and busbar.
- At termination oversize to have heat-sink effect.
- Overdoing it results in costs increase

ABB

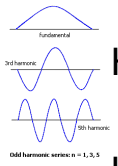
Overheating
What causes it?



Ventilations - Mitigation

- Heat concentration
- Chimney effect
- Do not block it
- Regular checking and cleaning

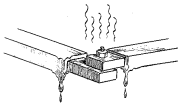
Overheating
What causes it?



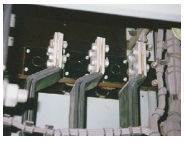
Harmonics - Mitigation

- Know the load in advance
- Filters
  - Have sufficient rating for the inductor.
  - Have capacitor that takes the over-voltage and the flame-retardant

Overheating
What causes it?



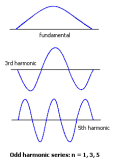
Poor connection



Under-size



Ventilations



Harmonics

ABB

Fire
What causes it?



- Prolonged overheating



- Flammability of material



- Source of ignition

ABB

Electric Shock
What causes it?



- Deterioration of insulation
- Access to live parts



- Explosion



- Flashover

ABB

Testing and acceptance



NORME INTERNATIONALE / INTERNATIONAL STANDARD

CEI IEC 60439-1

Ensembles d'appareillage à basse tension –
Partie 1:
Ensembles de série et ensembles dérivés de série

Low-voltage switchgear and

- Classification of tests in IEC 60439-1
  - type tests
  - routine tests
- Practice of acceptance – in addition to standard
  - Factory acceptance test - FAT
  - Site acceptance test – SAT
  - Operation and maintenance manual
    - O & M

ABB

Testing and acceptance


NORME INTERNATIONALE
INTERNATIONAL STANDARD
CEI IEC 60439-1
Edition 4.1 2004-10
Ensembles d'appareillage à basse tension –
Partie 1:
Ensembles de série et ensembles dérivés de série
Low-voltage switchgear and

- Type tests to verify compliance with standard & carried out on a sample to be manufactured to the same or a similar design.
- They shall be carried out on the initiative of the manufacturer.

Testing and acceptance


NORME INTERNATIONALE
INTERNATIONAL STANDARD
CEI IEC 60439-1
Edition 4.1 2004-10
Ensembles d'appareillage à basse tension –
Partie 1:
Ensembles de série et ensembles dérivés de série
Low-voltage switchgear and

- Routine tests on every production unit intended to detect faults in materials and workmanship.
  a) Inspection
  b) Dielectric test
  c) Checking of protective circuit

Testing and acceptance


NORME INTERNATIONALE
INTERNATIONAL STANDARD
CEI IEC 60439-1

- Factory acceptance test
  - Materials and construction
  - Setting and verifying
- Site acceptance test
- Transportation damage
  - Setting, sealing, signed off
- Operation and maintenance manual
  - Learning to use and maintenance

Intelligent and modular is the trend



- HMI
- Power and control networking
- Safety

Standardization
Modular and Intelligent System



Standardization
Safety and wide application



- Personnel safety



- High availability
- High reliability



- Communication to PCS

Standardization
Type of incomings and outgoings





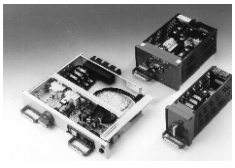
- Incoming feeders
- Starter and Feeders
- Fixed, removable and withdrawal

ABB

Standardization
Type of outgoing







- Fixed
- Removable
- Withdrawal



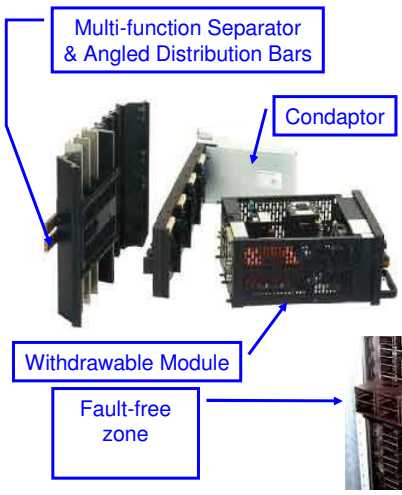
ABB

Standardization
Main busbars



- Short-time withstand 1s instead of 3s
- Co-ordination of circuit breaker
- Rated Ultimate short-circuit current
- Impulse voltage tests

Standardization
Outgoing and separator for safety







- Safety by Design
  - Multi-function Separator is Finger Proof
  - Fault-free zone
- High Availability
  - Quick Replacement of Modules
  - Replacement Under Voltage

Standardization
Logout and safety



Position of handle:		Contact functions of the unit:
ON		- All electrical circuits connected, unit mechanically locked in.
OFF		- All electrical circuits disconnected, unit mechanically locked in.
TEST		- Main circuit disconnected, control circuits connected, unit mechanically locked in.
MOVE		- All electrical circuits disconnected. Unit can be moved to the disconnected position. Unit is automatically locked into the disconnected position and operation handle turns to the OFF position. Unit can be removed by turning the handle to MOVE position.

Standardization
Service and maintenance







Arc fault testing
80kA, 440V to IEC 61641

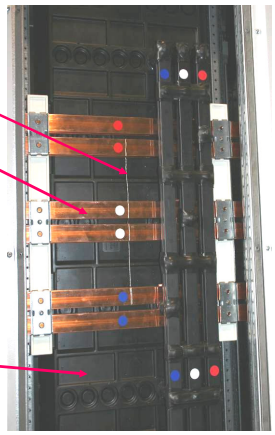
Ignition wire

Main Bus 4 x 40 x 10 cu / phase

Test data

- Rated Volts 440
- Permissible Prospective current 80kA
- Permissible Duration 300 ms

Multi-functional wall (MFW)



ABB

Arc fault testing
80kA, 440V to IEC 61641



ABB

Arc fault testing
80kA, 440V to IEC 61641

Test Results

Passed IEC61641

Arc Duration the full 300ms

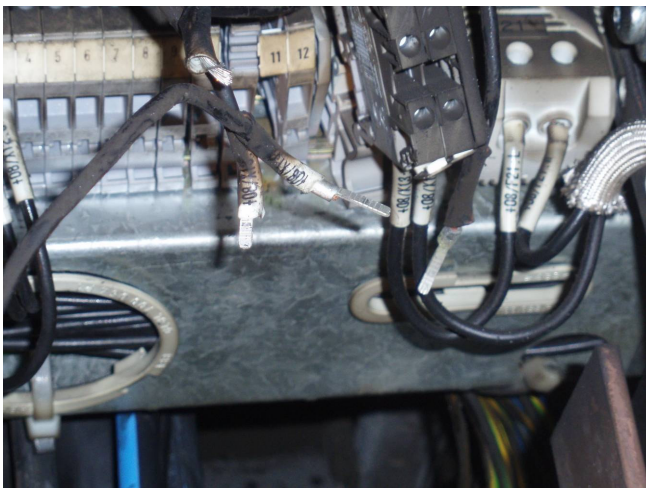


- No sign of arcing
- Thick layer of copper dust
- Travelling Arc

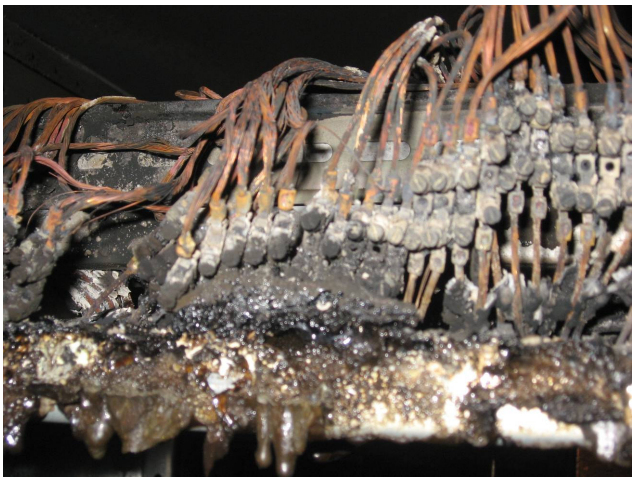
Case of a fire



Case of a fire



Case of a fire



Power and productivity
for a better world™

