AS/NZS 3439.1 2002 Type Testing
Temperature Rise

Presented by Peter Silsby
K.E.Brown Electrical Switchboards

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AS/NZS 3439.1 Standard Update

A revised standard was produced for public comment in Oct 2008. It was to be renamed AS/NZS 60439.1 20xx? The changes were relatively minor and included:

- Forward - Test reports and certificates issued in accordance with previous editions of this Standard may not be valid due to the requirements in this Standard or changes to the tested equipment. Acceptance of such reports and certificates are the subject of agreement between the manufacturer and user.
- Where ‘Form 2’, ‘Form 3’ or ‘Form 4’ to previous Standard is nominated by the user, in the absence of further clarification, manufacturer may assume this to refer to ‘Form 2b’, ‘Form 3b’ or ‘Form 4b’ as applicable.
- Annex D provides clarification of the main busbars and distribution busbars in the forms of separation sketches.
- Annex ZF provides switchboard layout sketches for different forms of separation.

At this point there has been no action on the review of the public comments. It will be discussed at meeting of EL6/8 in July 2009.

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International Standard Update
IEC 61439 Series (replaces 60439)

For the new re-structured IEC 61439 series, the following parts are envisaged:

- IEC 61439-0: User Guide
- IEC 61439-1: General rules (published Jan 2009)
- IEC 61439-2: Power switchgear and controlgear assemblies (psc-assemblies) (published Jan 2009)
- IEC 61439-3: Distribution boards (to supersede IEC 60439-3)
- IEC 61439-4: assemblies for construction sites (to supersede IEC 60439-4)
- IEC 61439-5: assemblies for power distribution (to supersede IEC 60439-5)
- IEC 61439-6: Busbar trunking systems (to supersede IEC 60439-2).

This list is not exhaustive; additional Parts may be developed as the need arises.

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IEC 61439 Series

Concerning the adoption of 61439 series of standards within A/NZ, the following are relevant:

- TR 61439-0 (Specifier's guide) is likely to be available late 2010.
- 61439-1 and 61439-2 are available now, but with various shortcomings relative to AU (and others) comments. Updated versions from initial maintenance will probably not be available until late 2011, assuming a CDV issued in 2010 is accepted by member countries.
- Other parts of 61439 series will probably not be available until late 2011, based on current progress. Some may be available earlier.
- Given this status, it is recommended that EL-006-08 consider deferring adoption of the new series 61439 until after the first maintenance cycle has been completed and a greater number of the respective product standards parts are available. This approach should provide smoother transition to the new series.
- This needs to be discussed and a strategy agreed at the next EL-006-08 meeting in mid 2009.

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IEC 61439 Maintenance Cycle

Current issues and outcomes of the maintenance cycle meeting held in Florence Italy attended by Rowan Peck (NDY Sydney) EL6/8 chairman:

- The definition of “Distribution Busbar” allows multiple circuits to be connected. This means that it does not need to be included in the main busbar short circuit test. There is contradiction in numerous parts of the standard including the Forms of Separation sketches. Resolution was to leave this unchanged.
- The nominated length of live conductors on the supply side of SCPD is 3m. It was proposed to change this to 1m as per the AU standard. This was rejected due to the number of existing design in IEC based on 3m.
- The reference to neutral colour as blue be deleted. This was agreed at the meeting. There is now no reference to colour.
- Temperature rise testing - AU NC do not believe that device substitution is limited to devices of the same manufacturer. The current text uses the term “from another series” but this can be ambiguous as to whether the substituted device should be from the same manufacturer or not. This is yet to be resolved by IEC.

IEC 61439.0 Specifier's Guide

LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR ASSEMBLIES –

Part 0: Specifier's guide

There are system and application details that need to be specified by the User to enable the Manufacturer to produce an ASSEMBLY. This technical report identifies, from the User's perspective, those functions and characteristics that should be defined when specifying assemblies. It provides:

- explanation of the ASSEMBLY characteristics and options within the IEC 61439 series;
- guidance on how to select the appropriate option and to define characteristics so as to meet specific application needs using a functional approach; and
- assistance in the specification of ASSEMBLIES.
- Annex A provides a specification schedule that the User should complete when defining the functions and characteristics for the ASSEMBLY.

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Standards in summary

AS/NZS 3439.1 2002 remains the current switchboard standard.

AS/NZS 60439.1 may be published as the new standard in 2010, only minor changes.

The IEC standard series 61439 may be adopted by AU and NZ sometime after 2012. It will be radically different and will include a Specifiers Guide. It will have changes to the requirements for type testing.

Temperature Rise Testing to AS/NZS3439.1 2002

Low-voltage switchgear and controlgear Assemblies

Part 1: Type-tested and partially type-tested Assemblies

(IEC 60439-1:1999 MOD)

Type Testing AS/NZS 3439.1

- Who?

Electrical Switchboard Manufacturers

- Why?

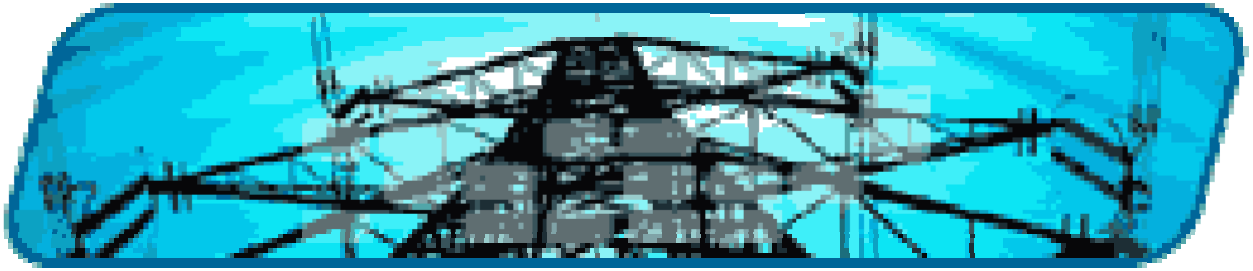
Type tests are intended to verify compliance with the requirements laid down in the standard

- Where?

Testing and Certification Australia (TCA) – Mars Rd, Lane Cove

Peter Ryan – Manager Testing TCA

Peter is responsible for the operation of the Lane Cove laboratory. He is an accredited ASTA Observer since 1985 and NATA Signatory. Peter has been involved in high power testing and associated testing activities since 1983.



Type Testing AS/NZS3439.1

Type tests include the following:

a) verification of temperature-rise limits (8.2.1);

b) verification of the dielectric properties (8.2.2);

c) verification of the short-circuit withstand strength (8.2.3);

d) verification of the effectiveness of the protective circuit (8.2.4);

e) verification of clearances and creepage distances (8.2.5);

f) verification of mechanical operation (8.2.6);

g) verification of the degree of protection and internal separation (8.2.7).

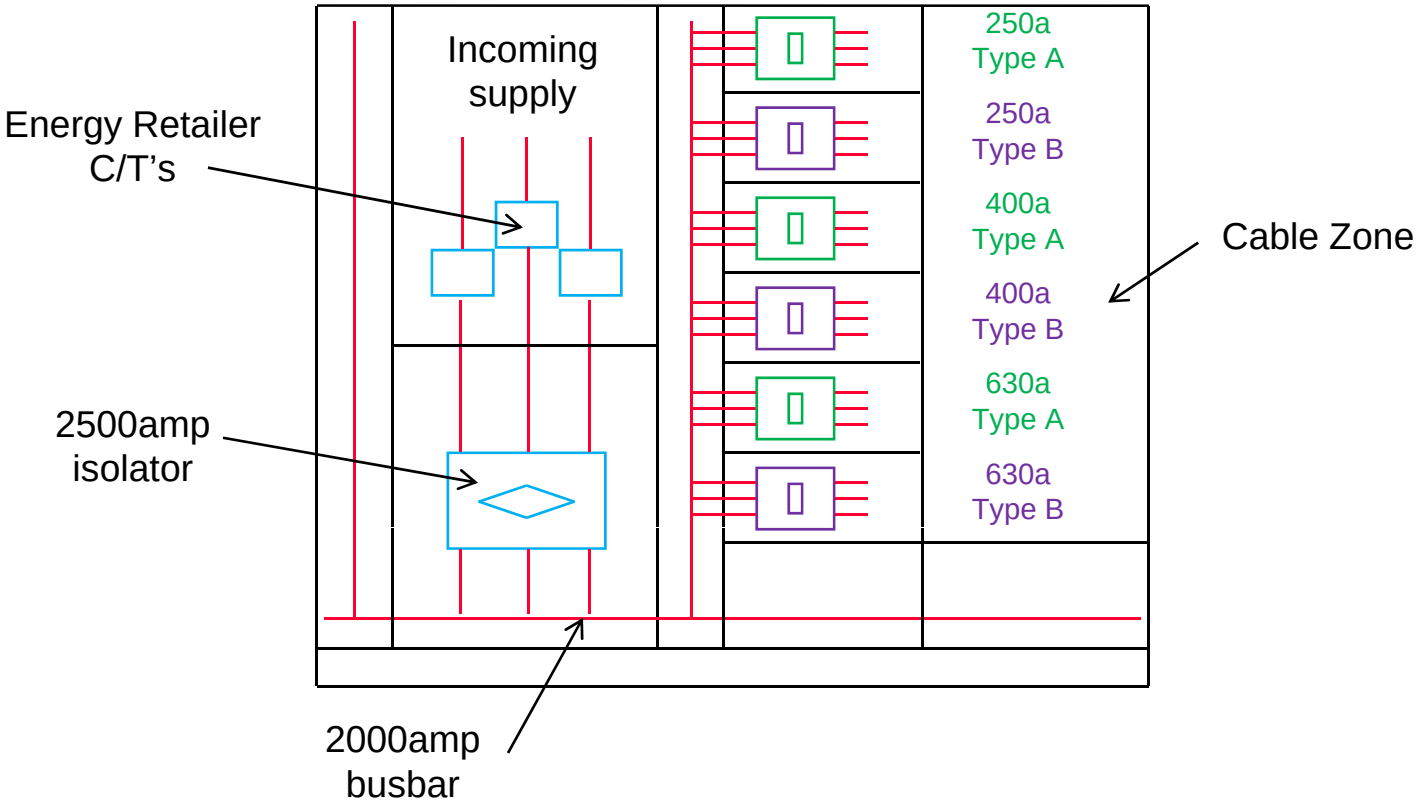
Type Testing AS/NZS3439.1

Type Testing conducted by KEB in late 2007 –

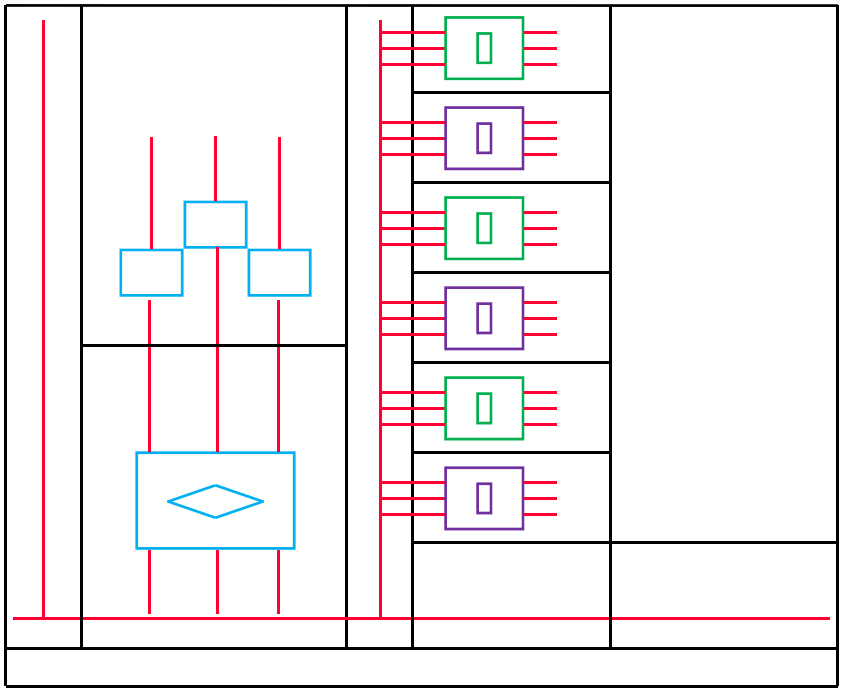
Verification of temperature-rise limits (8.2.1);

Verification of the short-circuit withstand strength (8.2.3);

Typical Design????



Front Elevation



400a

630a

2500amp
Isolator

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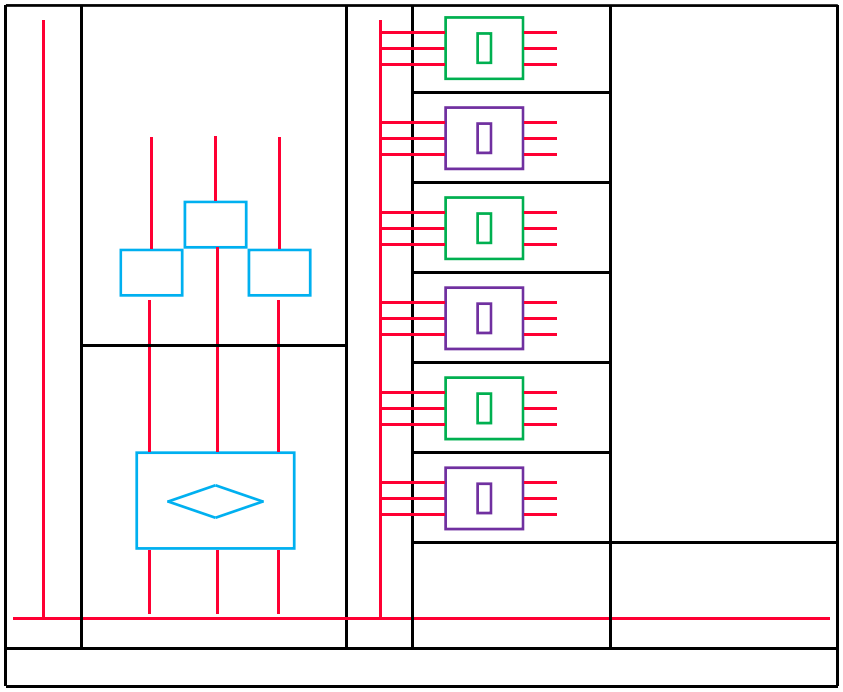
Form of Separation ????



400a

630a

2500amp
Isolator

Form 4a

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Temperature Rise Testing

The temperature-rise test is designed to verify that the temperature-rise limits specified in 7.3 for the different parts of the ASSEMBLY are not exceeded.

The requirements for built-in components, busbars and conductors, plug-in contacts of removable or withdrawable parts which connect to busbars would generally be considered to be complied with if temperature rises do not exceed **70 K** for H.C. copper.

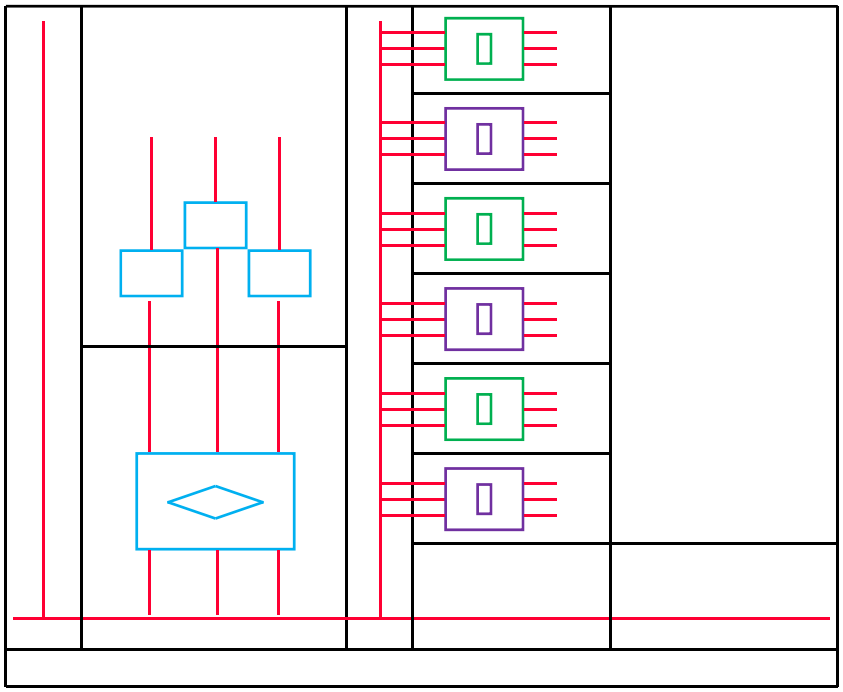
In addition from Table 2, external enclosure and cover not to exceed 30 K for metal surfaces.

Temperature Rise Testing
how hot can it get?

70 deg Celsius above ambient temperature on the terminals of the functional units.

Test station set up

Temperature Rise Testing – 70 K our objective



Busbar selection –

KEB Engineering manual document EM-311-1

Main busbars

2 x 60 x 10mm busbar at 150mm centres = 2064amps

Busbar take-off from main bars to cb's

Braided copper flex

250a cb – 1 x FB50

400a cb – 1 x FB100

630a cb – 2 x FB100

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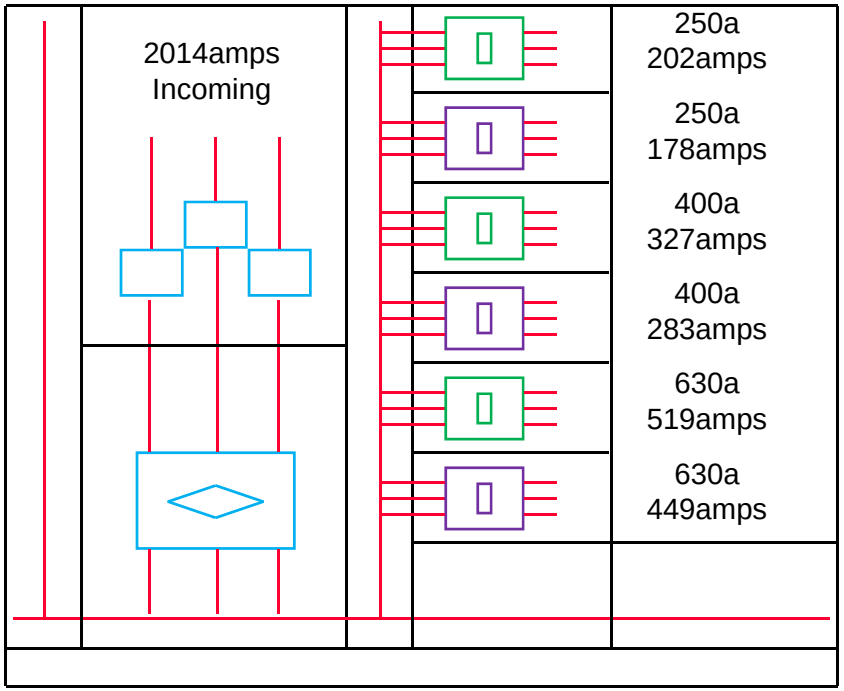
Temperature Rise Testing Results – Test 1

78 thermocouples fitted

Stabilization confirmed when change no greater than +/-1deg C

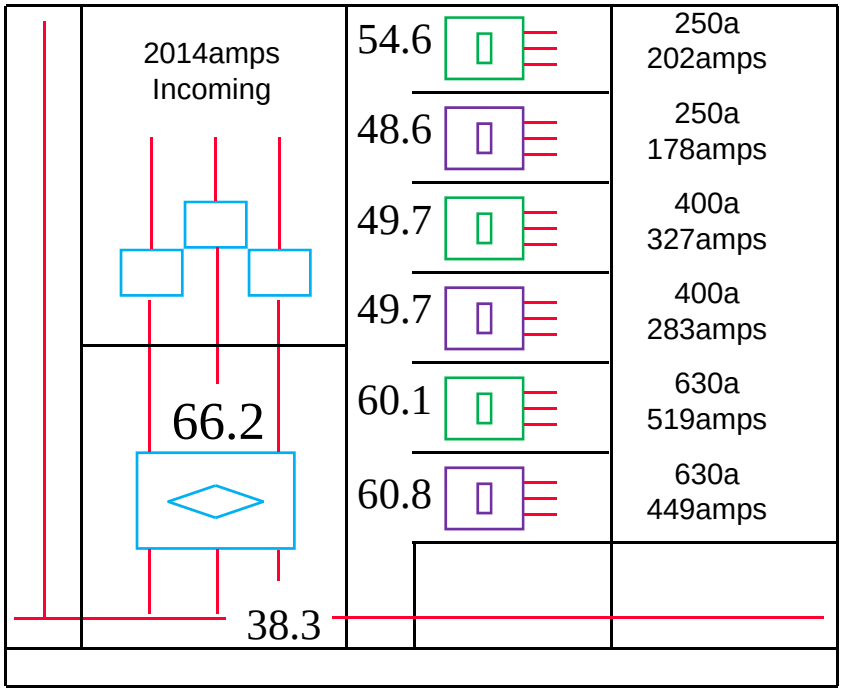


Temperature Rise Testing Results – Test 1

78 thermocouples fitted

Stabilization confirmed when change no greater than +/-1deg C

6.20am



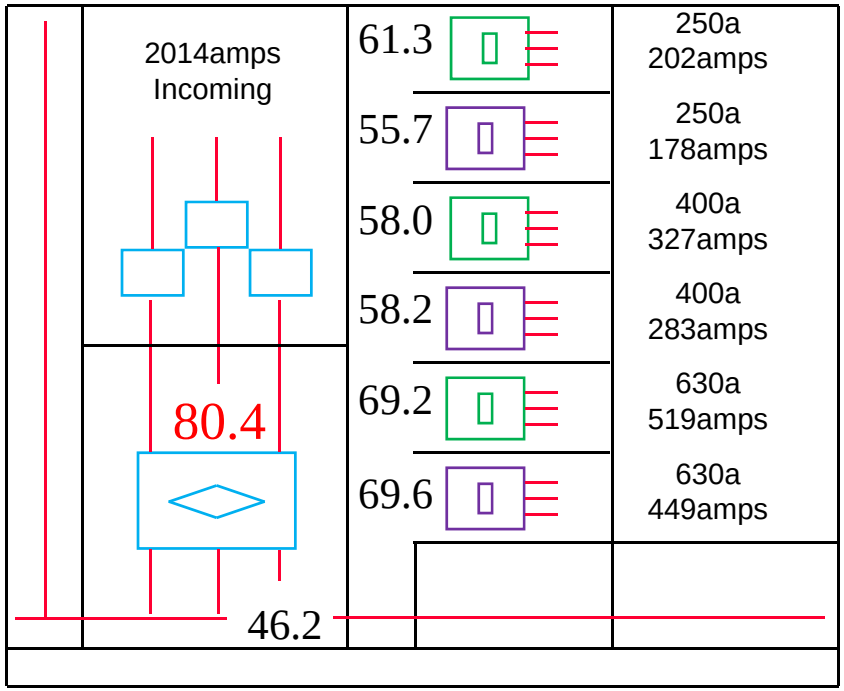
Stability – 1%

Temperature Rise Testing Results – Test 1

78 thermocouples fitted

Stabilization confirmed when change no greater than +/-1deg C

7.05am



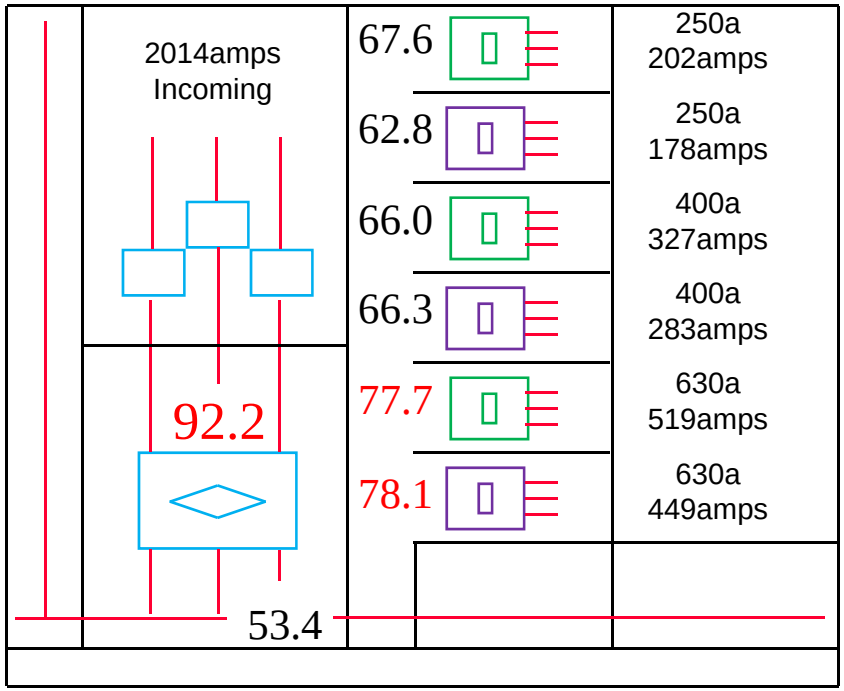
Stability – 1%

Temperature Rise Testing Results – Test 1

78 thermocouples fitted

Stabilization confirmed when change no greater than +/-1deg C

8.00am



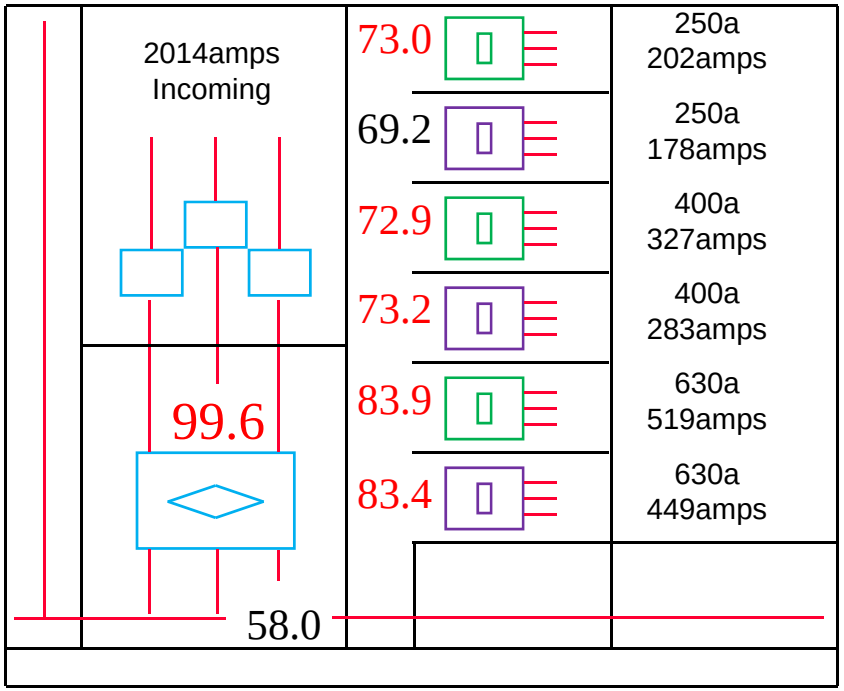
Stability – 1%

Temperature Rise Testing Results – Test 1

78 thermocouples fitted

Stabilization confirmed when change no greater than +/-1deg C

9.00am



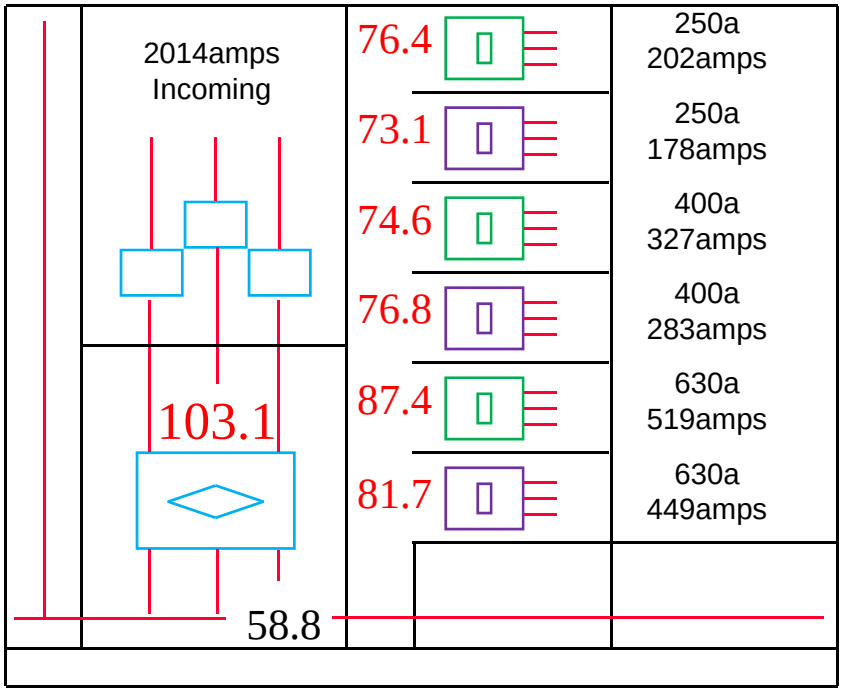
Stability – 3%

Temperature Rise Testing Results – Test 1

78 thermocouples fitted

Stabilization confirmed when change no greater than +/-1deg C

10.00am



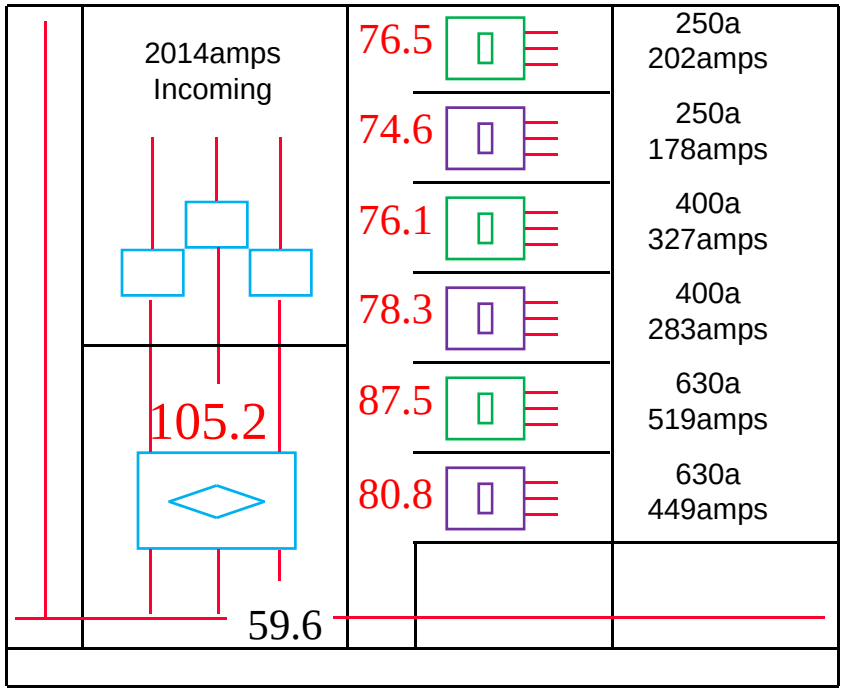
Stability – 19%

Temperature Rise Testing Results – Test 1

78 thermocouples fitted

Stabilization confirmed when change no greater than +/-1deg C

11.00am



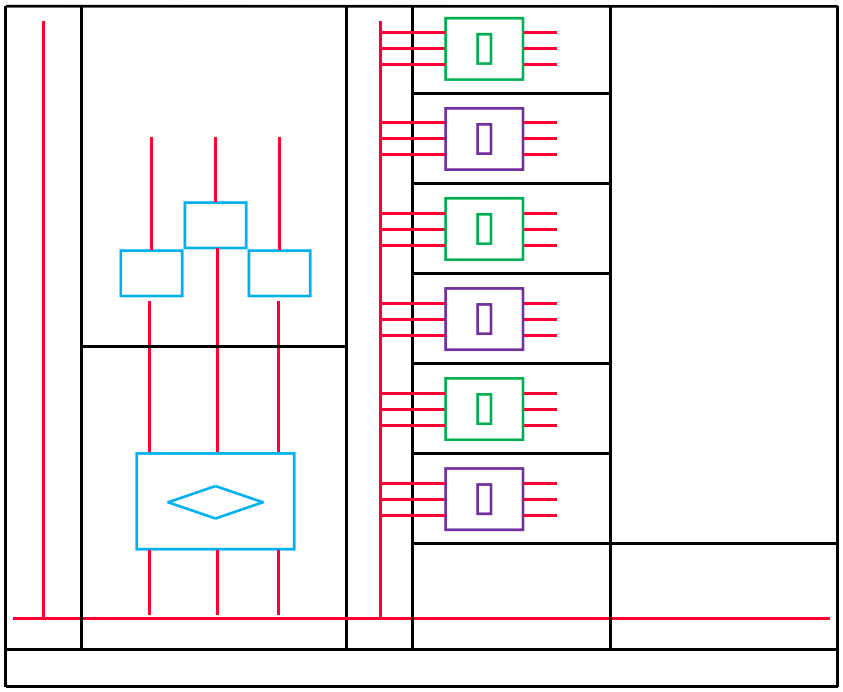
Test aborted

Stability – 54%

Where to from here?

Increase copper braid sizes
Increase ventilation
Add heat sinks to isolator
Reduce currents

Temperature Rise Testing – 70 K our objective



Busbar selection –

KEB Engineering manual document EM-311-1

Main busbars

2 x 60 x 10mm busbar at 150mm centres = 2064amps

Busbar take-off from main bars to cb's

Braided copper flex

250a cb – 1 x FB100

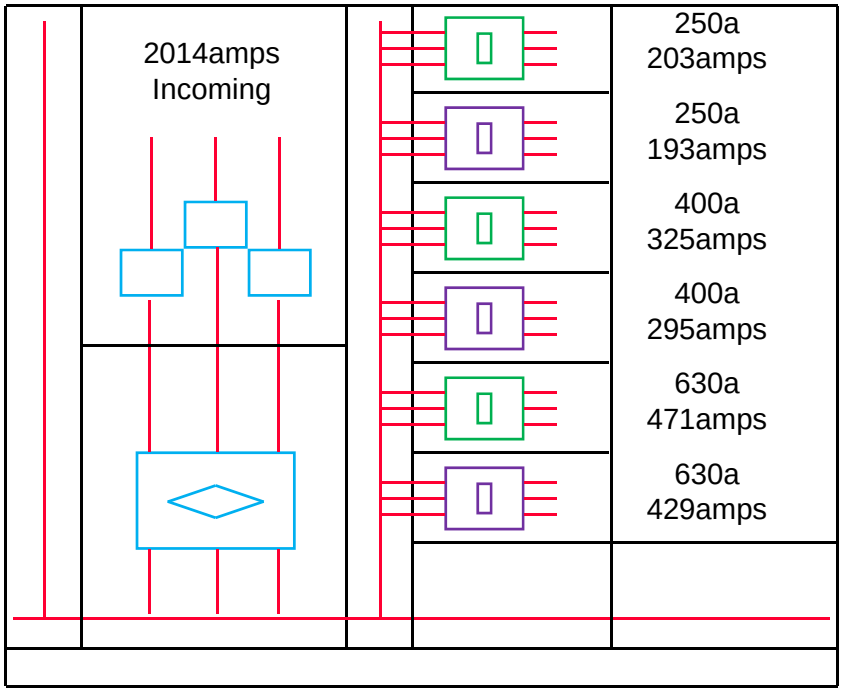
400a cb – 2 x FB100

630a cb – solid bar 30 x 10mm

Temperature Rise Testing Results – Test 2

78 thermocouples fitted

Stabilization confirmed when change no greater than +/-1deg C

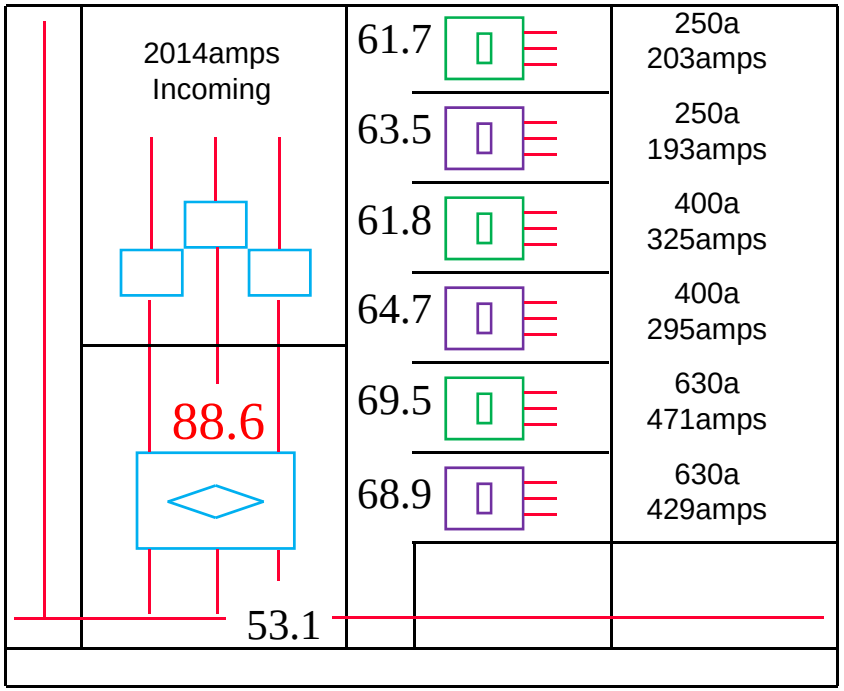


Temperature Rise Testing Results – Test 2

78 thermocouples fitted

Stabilization confirmed when change no greater than +/-1deg C

12.37pm
the next day
after approx
8 hours



Circuit breakers and main busbars passed

Stability – 100%

Further testing verified the isolator suitable for 1600amps at 70K

Summary

Temperature rating is expressed as rise above ambient

Terminal temperatures can not exceed 70 deg rise

Functional units such as circuit breakers and isolators need to be derated when enclosed

Temperature rise can be reduced by:

Increasing ventilation

Reducing current

Increasing the size of conductors