

New Brochure / Book Cigrè 740 - August – 2018 -

## CONTEMPORARY DESIGN OF LOW COST SUBSTATIONS IN DEVELOPING COUNTRIES

### SOME MENTIONS ABOUT TESTING SIMULATIONS (more info in page 1)

<https://e-cigre.org/publication/740-contemporary-design-of-low-cost-substations-in-developing-countries>

Chapter 5. EQUIPMENT SELECTION ..... pg. 75

Chapter 12 - TRAINING AND DEVELOPMENT OF SUBSTATION PRACTITIONERS ..... pg. 211

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#### 12.4.2 -Specific reference books for training of substation designers:

This section has been specifically assembled in addition to the reference section (Appendix B) with a specific focus upon providing designers with materials that could be referenced for further learnings broadly associated to substation design:

**Book “SUBSTATIONS & LINES EQUIPMENT, SWITCHGEAR, BUSWAYS & ISOLATORS”, by Sergio Feitoza Costa** (overview of design aspects, calculations, specifications, testing and performance simulation for electrodynamic forces, temperature rise, power arcs, internal arc electromagnetic fields)

[http://www.cognitor.com.br/Book\\_SE\\_SW\\_2013\\_ENG.pdf](http://www.cognitor.com.br/Book_SE_SW_2013_ENG.pdf) (free book);

#### Appendix B – Links and References

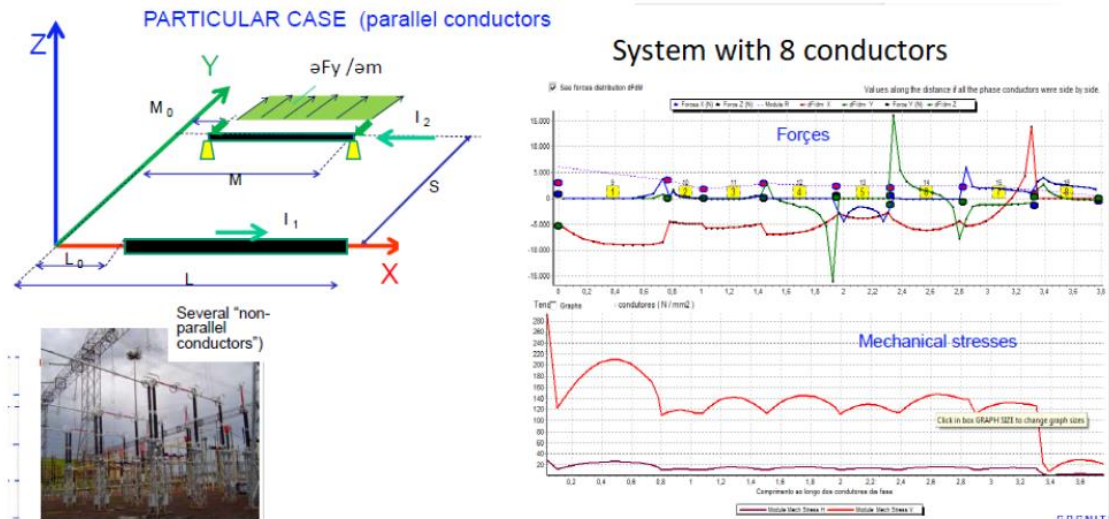
- [19] S. Feitoza Costa, “VALIDATION OF THE SOFTWARE SWITCHGEAR DESIGN\_307 FOR THE SIMULATION OF HIGH POWER TESTS,” Cognitor, Rio De Janeiro, 2014.
- [20] S. F. Costa, “VAIDATION OF MAGNETIC & ELECTRIC FIELDS MAPPING & TEMPERATURE RISE TESTS SIMULATIONS,” Cognitor, Rio De Janeiro, 2015.
- [21] CIGRE WG A3.24, “Technical Brochure 602: Tools for the Simulation of the Effects of the Internal Arc in Transmission and Distribution Switchgear,” CIGRE, Paris, 2014.

#### Text in Section 5.1 –

Using equipment previously tested and having a test report from a third-party testing laboratory is a straightforward procedure. In many developing countries testing laboratories are not as available, and this can present a barrier or increased costs. Over the past 20 years, testing and performance simulations are frequently used and may help in the specification of equipment as well as reduce the cost of substation delivery, especially in the case of developing countries. There is an increasing reliance upon simulated testing as a means to verify equipment specification. Testing of equipment is a useful approach where there is little engineering experience. This requirement needs to be factored in at the tender stage and made part of the assessment criteria.

#### Text in Section 5.2.3

Design of Equipment for Substations and Design of Testing laboratories \*\*\* Author of software SwitchgearDesign Simulation methods and easy-to-use tools can be used to perform such types of calculations which contribute to consolidating the substation project and equipment specification. Through the simulation of costly laboratory type tests, it is possible to prepare more accurate specifications avoiding the use of onerous "safety factors". Some examples are presented in the reports in reports within references [19] [20].



**Figure 5-3 – Electrodinamic forces in insulators and mechanical stresses in conductors during short-circuit**

Section 12.2.13.1 - Testing simulations for the development and assessment of substation equipment

- Short-time withstand current and peak tests (calculation of electro dynamical forces, mechanical stresses);
- Simulation of temperature rise / heating tests (calculations and how to optimize the design);
- Simulation of internal arc tests (overpressures, burn-through and supportability);
- Mapping of electromagnetic fields in substations and neighborhood;
- Optimization of the design (reduction of conductors and insulators);
- Case studies and examples of application.

With Kind Regards

**Sergio Feitoza** (co- author of Technical Brochures Cigrè 740 and 602 and IEC 62271-307 )

WhatsApp: 55-21-988874600 \*\* Tel. 55-21-33934600

E-mail [sergiofeitoza@cognitor.com.br](mailto:sergiofeitoza@cognitor.com.br) \*\* [sergiofeitozacosta@gmail.com](mailto:sergiofeitozacosta@gmail.com)

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