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Combined Qualification according to IEC & ICEA of 400kV cable system components for the GCC Countries

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ABSTRACT

Many HV projects have been installed in the Gulf Cooperation Council Countries (GCC) countries within the last years. One of the main challenge in installing the cable systems in GCC, is that these cable systems will be facing the harsh extreme temperatures and severe ampacity conditions. So, it is recommended to make sure that all quality checks are implemented based on stronger qualification parameters (instead of one common standard).

Ducab Group has qualified its 400kV 2500mm^2 XLPE cable in accordance with a number of standards. The system approach of testing according to internal Spec., IEC and ICEA standards. Additionally, a short circuit tests (of 63kA) were performed on cable system in order to check the short circuit capability of the cable and systems.

Authors will show the different tests across standards and verify the legitimacy of the system and cable components design to face the real-life operation in the GCC network. In addition, this paper highlights tests summary of 400kV XLPE cable and systems across different standards, lessons learnt, findings and recommendations.

KEYWORDS

HV XLPE cable system, 400kV 2500mm^2, IEC 62067, ANSI/ICEA S-108-720, Prequalification tests

INTRODUCTION
STANDARDS AND TEST SUMMARY

Different standards have different requirements and the aim was to combine three standards and conduct the Prequalification tests on cable system. The comparison is shown in below table 1.

Table 1: Prequalification tests comparison between Internal Specification, IEC, & ICEA

Standards	Internal Spec.	IEC 62067 [1]	ICEA S-108-720 [2]
Heating Cycle Voltage Test	190 Heating cycle voltage test, 1.7Uo 100 HC at 95 ºC	180 Heating cycle voltage test (95 ºC-100 ºC), 1.7Uo	180 Heating cycle voltage test, 1.7Vg 90 cycles at 95 ºC,
	90 cycles at 105 ºC		90 cycles at 105 ºC
Lightning Impulse Voltage Test	at 105 ºC with 1425kV	at 95◦C with 1425kV	at 105 ºC with 1425kV
Examination	√	√	√

The difference in these standards are the number of heating cycles and temperature during the heating cycles voltage test and lighting impulse voltage test. In ICEA & client specification, the tests are done at the emergency operating temperature where in IEC the tests are done at the conductor maximum temperature.

Pre-testing: Partial Discharge and AC Tests

A lot of paper publications posted in the last decade related to the cable and systems. PD test can detect the void type defects in the cable and system. These defects can be: through manufacturing processes, aging processes, delamination of components between cable and accessories, mechanical damages during installations. Figure 1 shows the equivalent circuit while testing for PD. It describes different capacitance within the same insulation capacitance which charges and interferes with the original capacitance value. As a result, PD sparks occur [3]. These cable systems can be developed through time can lead to site breakdown.