

Recommendations for mechanical tests on sub-marine cables

Marc BOEDEC (1)	David DUBOIS (1)	Jon BUSBY (2)	Caroline BRADLEY (3)
Sören Krüger OLSEN (4)	SungYun KIM (5)	Allen MCPHAIL (6)	Gianni MIRAMONTI (7)
Rocco de GASPARI (7)	Andreas TYRBERG (8)	Marc JEROENSE (8)	Takekuni, NAKAJIMA (9),
Geir CLASEN (1)	Ronny STOLAN (1)	Juan Prieto MONTERRUBIO (10)	
Swetlana ANTON (11)	Tuomo KOUTI (7)	George GEORGALLIS (12)	
Jiankang CHEN (13)	Eugene BERGIN (14)	Lucie THEODULE (15)	Nathalie BOUDINET (15)
Daniel ISUS (16)	Giuseppe LAVECCHIA (17)	Luca GUIZZO (17)	

- 1 Nexans, France and Norway, marc.boedec@nexans.com, david.dubois@nexans.com, geir.clasen@nexans.com
- 2 Burns & McDonell, USA, jbusby@burnsmcd.com
- 3 National Grid, UK, Caroline.Bradley@uk.ngrid.com
- 4 Energinet, Denmark, sro@energinet.dk
- 5 LS Cables & System, South-Korea, sykim13@lscns.com
- 6 Cabletricity Connections, allen_macphail@telus.net
- 7 Prysmian, Italy and Finland, gianni.miramonti@prysmiangroup.com, rocco.degaspari@prysmiangroup.com, tuomo.kouti@prysmiangroup.com
- 8 ABB AB, Sweden, andreas.tyrberg@se.abb.com, marc.jeroense@se.abb.com
- 9 VISCAS, Japan, t-nakajima@viscas.com
- 10 REE, Spain, juprieto@ree.es
- 11 NKT, Germany, swetlana.anton@nktcables.com
- 12 Hellenic cables, Greece, ggeorgal@cablel.vionet.gr
- 13 Central Southern China electric power design institute, China, chenjkw@126.com
- 14 Mott MacDonald, Ireland, bergin_eugene@yahoo.co.uk
- 15 RTE, France, lucie.theodule@rte-france.com, nathalie.boudinet@rte-france.com
- 16 General Cable, Spain, disus@generalcable.es
- 17 TERNA, Italy, giuseppe.lavecchia@terna.it, luca.guizzo@terna.it

“Recommendations for mechanical tests on sub-marine cables” is the title of the document as published in Electra 171 in April 1997. Since then the experience in submarine cable installation has increased significantly; in number, depth and complexity. For this reason the CIGRE SC B1 decided to start a new working group, B1.43, with the purpose to update the Electra 171. This has resulted in a TB published in 2015 that covers a set of informative chapters that describe an overview of the mechanical handling of the submarine cable system throughout its life span as well as a set of normative chapters that describe the tests that are recommended. The scope of the recommendations are cable systems intended to be used in AC and DC power transmission systems with rated voltages above 30 (36) kV a.c. or 60 kV d.c. It is the opinion of the WG that the TB can be used even for voltages below as down to 6 (10) kV a.c. or 10 kV d.c.

The technical brochure is applicable for extruded cable systems, MI cable systems as well as oil-filled cable systems. The technical brochure covers both shallow and deep sea installations.

The terms of reference as decided by a previous task force is listed below:

- Cover both impregnated paper cables and extruded cables (AC and DC) including a review of cable installation methods and cable protection for submarine cables
- Examination of relevant IEC standards, CIGRE recommendations and standards from the offshore industry (e.g. umbilical testing)
- Assess the risk for mechanical damage during installation and cable protection
- Assess the risk for mechanical damage after installation (anchoring, drag-net fishing, pile driving)
- Calculation of tensile tests to be updated and a more detailed background to be described to the selected factors (security factors and torsion as well as dynamic forces)
- Propose test methods to cover:
 - Dynamic cable system installations
 - Very deep sea installations (including extruded cables)
 - Impact tests
 - Consider the heat cycling influence on the metallic sheath and evaluate possible test methods
 - Update/introduce mechanical tests for rigid joint
 - Consider tests with for free-spans, strumming
 - Consider tests for the cable interaction with e.g. J-tubes, bend restrictors etc.

The WG has not considered umbilicals in general but has followed the development of umbilical power cables.

The article will high-light some specific improvements of the Technical Brochure, as for instance the improved formula's for calculating the test tensions.