



**2006 SC B1 PROGRESS REPORT
(INSULATED CABLES)**

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1 Overview

The main highlights of 2006 are:

- The disband of one Working Group (WG) at the foreseen deadline after publishing one important technical brochure "Revision of qualification procedures for underground HV cable systems", as the topic was to recommend a simplified "Extension of Qualification" test procedure for changes in EHV cable systems.
- The launch of three WGs, and one *ad hoc* Task Force whose work is to prepare the terms of reference of a potential WG.
- The 41st CIGRE Session with a SC B1 discussion meeting with around 200 to 250 people attending the meeting. 51 prepared and app 35 spontaneous contributions were presented, referring to 12 questions as proposed by the Special Reporter, Fredrik Rüter (SE). The organisation and the quality of the contributions made it a very active and lively forum of international experts,
- The distribution of a questionnaire to the audience during the discussion meeting to get further information on the actual needs of customers and their satisfaction with the work done by the SC. The evaluation of the questionnaire will provide SC B1 with an opportunity to address outstanding issues over the next few years,
- The change in the Chairmanship as our past Chairman, Reinhard Schroth (DE) retired. He was replaced by Fredrik Rüter (SE).
- An important renewal of the SC Members giving the Committee the chance to have younger Members. Nine Regular Members (out of 12) and four Observer Members (out of 9) were renewed and three Observer Members were nominated for the first time, Argentina, Arab States of the Gulf and Greece. According to CIGRE rules, the Committee has reached the maximum number of Members.
- The launch within ICC of a new Discussion Group between ICC and CIGRE to exchange information more in depth about both organizations and to share technical information among the Working Bodies.

2 SC organisation

The activities of CIGRE Study Committee B1 concern all types of AC and DC insulated cable systems for land and submarine connections and are focused mainly on high voltage applications. Whenever appropriate, however, lower voltage applications are also considered.

Within this field, the scope of work of the Study Committee covers theory, design, applications, manufacture, installation, testing, operation, maintenance and diagnostic techniques.

The main goals of the SC B1 are the following:

- to contribute effectively to the progress in insulated cable systems technology,
- to facilitate the integration of insulated cable systems in electric power networks and in the environment, covering the complete life cycle of cables,
- to maintain its leading position in the field of power cables by providing unbiased and neutral information on all essential cable aspects,
 - to be recognised by the Electric Power Industry and others as a leading and reliable partner with competence in all engineering issues related to insulated cable systems, i.e. technical, economical, ecological and social.

The basic operating structures of the SC are its Working Groups. Their effective performances are based on a clear definition of their terms of reference and on work plans with specific time limits (typically three years).

In order to achieve this, it is the normal practice of SC B1 to set up an *ad hoc* Task Force (TF) to define the terms of reference of a new WG prior to its establishment. The duration of this type of TF must not exceed one year.

SC TFs may also be set up to study and/or update specific topics that do not justify the establishment of a full WG.

The SC is composed by 24 Regular Members, 12 Observer Members, a Secretary and a Chairman, 16 coming from Utilities, 12 from Manufacturers and 8 from Universities/Institutes.

The SC B1 has its web site at the following address: www.cigre-b1.org. The SC Secretary is also the web master.

3 Publications

Published in 2006

WG/TF number	Name of the Publication	Publication date	Electra issue and number of TB
WG B1.06	Revision of qualification procedures for underground HV cable systems	August 2006	Electra 227 TB 303
Reinhard Schroth 2002-06 Chairman	Invited paper on evolution of insulated cables	December 2006	Electra 229

To come

WG/TF number	Name of the Publication	Publication date	Publication type
WG B1.07	Statistics on underground cable in transmission networks	December 2007	Electra 234 And TB

TB : Technical brochure

4 2006 main events

As usual, CIGRE held a Session on August 28 – September 1 in Paris. The SC B1 Discussion Group Meeting was held on Tuesday, August 29th, 2006 during which 26 accepted papers were discussed.

The cable technology is still under steady development with investments in cable production machinery and factories, and development of production know-how, allowing very big conductors exceeding 2,500 mm².

The development trend of submarine three-core AC cables is clearly towards higher voltage (implying heavier and bigger cables), and longer lengths. There are now three-core XLPE 150 kV cable systems in operation, with cross-sections of 1,000 mm².

For a long time the prevailing highest voltage for XLPE submarine AC cables was 150 kV (with a few installations at 220 kV). A recent submarine installation of single-core XLPE AC cables at 420 kV, has moved the technology forward significantly.

5 2007 main events

The 2007 SC B1 Meeting will be hosted by Japan and a symposium will be held after the Meeting in cooperation with SC C1, B4 and C5 which title is "System Development and Asset Management under restructuring". Meanwhile, SC B1 will offer a tutorial on Maintenance of HV cable systems including diagnostic methods, remaining life management and replacement planning.

The Meeting will be held in Osaka from October 30th to October 31st, 2005. and the Symposium from November 1st to November 4th.

6 2008 main events

As usual, CIGRE will hold a Session on August 24 – August 29 in Paris. The Preferential Subjects for the SC B1 Discussion Meeting are:

The Preferential Subjects are:

PS 1: Technical challenges overcome in newly installed underground and submarine transmission systems

- Current state-of-the-art in design, testing of AC and DC, submarine and underground cable systems (including High Temperature Superconducting, HTS) and Gas Insulated Lines (GIL).
- Innovations in cable systems installation.

PS 2: Current and future methods supporting efficient operation, maintenance and upgrading/replacement decisions of cable systems.

- Maintenance policies.
- Diagnostic methods applied to Cable Systems.
- Remaining Life Assessment Methods.

PS 3: Future technical solutions of underground and submarine transmission systems addressing environmental and economical considerations.

- Balancing environmental requirements against economy.
- Electromagnetic Fields (EMF) mitigation, restricted access, installation in tunnels, bridges and along motorways and railways.
- Development trends towards higher voltages and ratings.

7 Administrative report

7.1 SC Meeting

One WG and three *ad hoc* TFs finished their work. The WG kept an editorial team to finalise its documents to be published as Technical Brochure and Executive summary in Electra. Then, it will be officially disbanded.

- **WG B1.07** "*Statistics on underground cable in transmission networks*", (to be published as a technical brochure, an executive summary will be published in the December 2007 Electra issue)
- **TF B1.23** "*Impact of EMF on current ratings and cable systems*". The work of TF B1.23 launched last year was to consider whether a full working group was desirable on the impact of EMF on the de-rating of the link in ferromagnetic structures, pipes and casings.
- **TF B1.24** "*Test procedures for HV transition joints*". The work of TF B1.24 launched last year was to consider whether a full working group was desirable on writing test procedures for joints between cable systems of different insulation types,
- **TF B1.25** "*Advanced design of laminated metallic foils*". The work of TF B1.25 launched last year was to consider whether a full working group was desirable on issuing a "guide to use" explaining what could be the different cable designs

In 2006, SC B1 launched three new Working Groups and one *ad hoc* Task Force:

- **WG B1.23** "*Impact of EMF on current ratings and cable system*" which term of office is 2009,
- **WG B1.24** "*Test procedures for HV transition joints*" which term of office is 2009,
- **WG B1.25** "*Advanced design of laminated metallic coverings*" which term of office is 2009,
- **TF B1.27** "*Test recommendations on XLPE AC submarine cables from 170 kV to 500 kV*" which term of office is 2007,

SC B1 currently has three Advisory Groups, ten WGs and two TFs and participates in one JWG with another SC and in one JTF with another organization.

7.2 TC Award

Ray Awad (CA) was honoured with the CIGRE Technical Committee Award 2006 for his contribution to the work of the Study Committee.

7.3 Web site

The new SC B1 web site is on line since June 15, 2005 (www.cigre-b1.org). It offers an open space to the public and private pages to SC Members. Each Working body has private pages where documents can be exchanged among members.

The number of visits confirms that Internet is a very important tool for internal and external communication.

The Secretary is also the SC B1 web Master.

8 Technical report

8.1 Advisory Groups

8.1.1 Strategic Advisory Group

Convener: Fredrik Rüter (Sweden)

A permanent Strategic Advisory Group (SAG) was set up in 2002, which terms of reference are to assist the Chairman in the definition of the strategic directions that should be followed by SC B1.

The SAG is composed of a limited number of members: the Chairman, who will convene, the SC Secretary, and a few other SC Members or experts, all chosen by the Chairman.

The Conveners of the other SC B1 Advisory Groups are permanent members of the SAG.

The SAG will consider, if needed, the set up of other specialized Advisory Groups and will decide about the use of their outcomes.

The SAG will initiate, whenever appropriate, the set up of new TFs or WGs.

The SAG will meet at least once a year, but will communicate as required.

All the items discussed during the 2006 SAG meeting were covered in the 2006 SC B1 meeting agenda.

8.1.2 Customer Advisory Group

Convener: Eugene Bergin (Ireland)

A permanent Customer Advisory Group was installed in SC B1 with the Scope to implement CIGRE TC's suggestion, that "Study Committees have to ensure that the needs of their Target Groups are fulfilled." The B1-CAG is the working body within SC B1 to co-ordinate all activities in this field. It works in close contact with the SC Chairman and the Strategic Advisory Group B1-SAG and involves all SC B1 members as contacts and interfaces to their national or local customers.

The Terms of Reference (ToR) of the B1-CAG are as follows:

1. Identification of Target Group

- systematically identify SC B1's Target Groups in different countries
- listing of respective organizations, persons, social groups, etc.
- analyzing of organizational levels and hierarchies
- identifying of most important and influential addressees

2. Communication means with TGs

- develop systematic and effective concepts for active contacts and communication
- consider how to implement sustainable communication links to organizations and persons
- consider how to disseminate most effectively B1's activities and outcomes to TGs
- propose appropriate presentations (Paris Session, Tutorials, Symposia, etc.) in accordance with the TAG

3. Collection and mapping of TG's needs

- identify problems and map systematically needs of TGs

- propose review/revision of current SC B1 activities with regard to needs of TGs
4. Collection and evaluation of feed-back from TGs
- collect and map the degree of TG's satisfaction
 - evaluate the findings and derive, if necessary, measures for improvements and new actions
 - identify opportunities to increase TG's satisfaction
 - coordinate activities at national level where appropriate

During the past year, the CAG prepared a questionnaire that was circulated during the Discussion Group meeting in order to collect the opinion of our Target Groups

Among the 16 SCs, our CAG is one of the three producing. So, it is our duty to take the lead and to practise the communication towards Target Groups. It was decided to take the opportunity of the WG B1.06 publication and the new possibility to download free of charge documents from the CIGRE web site to launch a communication towards Target Groups.

8.1.3 Tutorial Advisory Group

Convener: Pierre Argaut (France)

A permanent Tutorial Advisory Group was installed in 2004 in SC B1 with the Scope to implement CIGRE TC's suggestion, that "Study Committees have to deal with education, continuous training, tutorials and publications". The B1-TAG is the working body within SC B1 to co-ordinate all activities in this field. It works in close contact with the EPEE, the SC Chairman, the Strategic Advisory Group B1-SAG and the Customer Advisory Group B1-CAG. It involves all SC B1 Members and Conveners as contacts.

The Terms of Reference (ToR) of the B1-TAG are as follows:

1. Identification of the potential groups interested in education, continuous training, tutorials or technical presentations
 - identify SC B1's Tutorial Target Groups in different countries,
 - listing of respective organisations: students, young or older engineers, universities, etc...,
 - identification of the respective expected topics to be taught and training levels,
 - identification of other learned societies, IEE, IEEE,....
2. Identification of the means to disseminate the SC B1 knowledge
 - prepare the structure of appropriate presentations (Paris Session, Tutorials, Symposia, events organised by other learned societies, etc.) in accordance with the CAG
3. Collection of SC presentations
 - establish an education and training procedure
 - preparation of a standard presentation,
 - each SC working body will prepare a full presentation (up to 30 slides),
 - the TAG will prepare a synthetic presentation (up to 4 slides)
4. Coordination of activities with EPEE and with other SCs

To compensate the lack of expertise, one solution is to propose technical education and training through tutorials that could be addressed from basic to advanced experts, from students and teachers to managers and public.

The TAG proposed a common tutorial structure that could be easily managed according to the depth needed by the public.

Each current and new WG will have in its terms of reference the production of a tutorial. For the past WGs, some SC B1 experts are preparing the relevant tutorials.

By the end of 2006, new tutorials of recent or past WGs are ready: WG B1.18 (Special Bonding), WG B1.03 (Large cross-sections and composite screens design), WG B1.04 (Maintenance), WG B1.05 (Transient Voltages affecting long cables), WG B1.06 (Revision of qualification procedures for underground HV cable systems). Tutorials can be offered by SC B1 Members or experts on demand.

A tutorial was held during the last ICC meeting on "Technical and Environmental issues regarding the integration of new HV cable systems in the network".

8.2 Working Groups

8.2.1 WG B1.07 Statistics on underground cable in transmission networks

Convener: Steve Swingler (United Kingdom)

WG B1.07 was set up in 2003 and was due to present its final report in 2006.

The terms of reference are the following:

- To collect statistics for the lengths of underground and overhead circuits at a range of transmission voltages. Only existing lines and projects planned for implementation by 2006 should be included,
- To describe significant underground cable projects realised in the period 1996-2006 giving the reasons why undergrounding was selected,
- To describe the factors which must be considered when evaluating the cost of overhead or underground connections,
- To describe the other factors which must be taken into account in order to make a balanced choice between overhead and underground technology.

It was agreed to exclude submarine cables and DC ones as they are usually submarine, but it will be necessary to explain the main DC land projects.

The voltage range will be above 50 kV limited to transmission levels according to the countries.

The Working Group has finished its work according to the initial schedule and presented its report. The report is composed of a brief summary of technical considerations to give the readers the minimum background. Then, it is composed of significant cable projects, i.e. of international interest in engineering, commercial, environmental or social terms. Each project will be introduced with the basic details of construction of the cable, the installation methods and the reason for these choices and why was undergrounding chosen. No cost ratio will be proposed as each project is specific and could not be used as a general figure, but the components of the cost will be discussed.

As the report will be used by utilities, manufacturers, governments, regulators, politicians, environmental campaigners, it should be an international consensus. It was decided to first validate it within SC B1 and then to get agreement from SC B2 (Overhead lines) and SC C1 (System Development and Economics) before official validation by SC B1 and publication.

8.2.2 WG B1.08 Cables systems in multipurpose or shared structures

Convener: Ken Barber (Australia)

WG B1.08 was set up in 2004 and is due to present its final report in 2007.

The terms of reference are the following:

- To establish the appropriate terminology,
- To collect comprehensive information and experience on the use of multipurpose or shared structures for the installation of cable systems. It is anticipated that a comprehensive questionnaire developed by the WG will be necessary. The survey should not be limited to technical aspects such as type of cables, structure design, construction, installation, other infrastructure installed, mutual impacts, maintenance and operational constraints. It should also consider economical aspects, occupational health and safety aspects, administrative aspects, legal aspects and decision-making aspects,
- To collate, summarise and review the information,
- To identify the issues that need to be considered when installing underground cable systems in multipurpose or shared structures,
- To recommend guidelines for the practical application of for the installation of cables.

The scope of work should cover:

- MV, HV, and EHV cables,
- Solid, fluid and gas insulated cables,

- Multi-purpose tunnels and structures shared with pipe services (water including hot or cooled, oil, gas and sewage) and other utilities (other electricity services and telecommunications), Transport services (Roads, Railways and Subways).

There is a low probability of fault on cables installed in tunnels but when it occurred, the impact is high, justifying such a group.

Compared with the initial terms of reference discussed during the 2004 SC meeting, it was added, following the creation of JWG B3/B1.09, that the specific technical aspects of GIL will be investigated by JWG B3/B1.09 which will give relevant technical input to WG B1.08. The groups will share information by mutual participation of at least one of their members.

The WG agreed on the definition of a shared structure: "Any continuous structure containing one or more utility services which permits the replacement, renewal, maintenance, repair or revision of the service without the necessity of making excavation. This implies the structure is traversable by people and in some cases by some sort of technology".

The questionnaire circulated end of 2005-beginning of 2006 received very good response, and the progress is considered good. The final report is awaited for 2007.

8.2.3 WG B1.09 Remaining life of existing HV AC underground lines

Convener: Willem Boone (The Netherlands)

WG B1.09 was set up in 2004 and is due to present its final report in 2007.

The terms of reference are the following:

- To prepare proper definitions for "End of life/Remaining life"
- To list relevant cable and accessory types,
- To list information to be collected,
- To review relevant ageing mechanisms for paper cable- and extruded cable systems,
- To list defects that contribute to dramatic ageing,
- To review appropriate diagnostic methods,
- To review experience in remaining life estimation (RLE), the techniques used and the success of these techniques,
- To develop a strategy for RLE of paper- and extruded cable systems, based on condition assessment, ageing mechanisms, condition extrapolation to failure for the related cable/accessory types,
- To collect a few case histories,
- To give guidelines for practical application of a strategy for RLE, indicating the accuracy, the effectiveness and the efficiency of applied techniques and methodology.

The scope of work is for voltage over 50 kV:

- Paper cable systems (SCFF and HPFF) for AC application on land,
- Extruded cable systems for AC applications on land,

The remaining life of a cable system will not be extended at any cost as it could be replaced, contrary to human beings. So, realistic criteria that could be measured and checked should be found to make the replacement decision appropriate.

The group will propose a model based on technical, economical and strategical criteria that could help the utilities in taking the decision to replace the asset. The model under preparation is established on utilities' experience and the results of the questionnaire.

The final report is awaited for 2007.

8.2.4 WG B1.10 Update of Service Experience of HV cable systems

Convener: Robert Rosevear (United Kingdom)

WG B1.10 was set up in 2004 and is due to present its final report in 2007.

The SAG identified service experience as a topic which was not addressed since long, as the last figures published by CIGRE regarding underground cables dealt with the experience gained between 1982 and 1986, those regarding accessories for HV cables with extruded insulation dealing with the experience gained up to 1992 and the last figures regarding submarine cables being published in 1986.

The terms of reference are:

To update up to 2003 existing service experience and previously published information studying at least:

- Technology,
- Laying zone (urban, rural, submarine,...),
- Type of current (AC, DC),
- Internal or external faults,
- Type of cable burial, (protection or not)
- Number of faults per year per mileage,
- Fault duration,
- Repair duration.

Scope of work :

- The voltage range will be above 50 kV limited to transmission levels according to the countries.
- AC and DC cables,
- Land and submarine cables.

The WG prepared two questionnaires, one on land cable systems covering the years 2000 to 2005 and one on submarine cable systems covering the period from 1991 to 2005, in order to collect the new data. Responses are slow and important cable countries have still to respond.

The final report is awaited for 2007.

8.2.5 WG B1.11 Upgrading and Uprating of Underground Cable Systems

Convener: Frederic Lesur (France)

WG B1.11 was set up in 2004 and is due to present its final report in 2007.

The difficulties to obtain planning permission for new sites favour the life extension of existing facilities, with the goal of transmitting more power with higher reliability.

The terms of reference are:

- To review the literature on similar subjects (IEC, CIGRE, IEEE publication),
- To establish the appropriate terminology,
- To inventory the possible technical solutions for increasing the transmitted power in an existing cable system, or extending the life duration of the cable system
- To gather available utility experience in such cases,
- To list the technical and environmental issues to be addressed in such cases,
- To propose a step by step approach.

Scope of work :

- AC and DC cables
- Extruded and lapped cables
- Land and submarine cables
- Cooling systems.

The study will be limited to whole cable systems, not considering the components themselves. The final report will include some case studies: increasing transmitted power, increasing the voltage level or/and the current rating, the hot spot mitigations, the increase of safety and the better insertion in the environment.

The final report is awaited for 2007.

8.2.6 WG B1.21 Third party damages on underground and submarine cables

Convener: Christian Jensen (Denmark)

WG B1.21 was set up in 2005 and is due to present its final report in 2008.

Utilities are already suffering for a long time from third party damages, the damages caused to cables from so-called external origins: usually digging activities but also indirect aggression such as overheating, corrosion or change of backfill due to other utilities. Compared with the efforts to solve "internal" damage, issues are usually treated in an off-hand or unmanaged way, although in terms of money it is a very serious problem.

The terms of reference are:

To give guidance to all relevant parties involved (cable owners, utilities dealing with electricity, contractors, authorities, other utilities) as follows:

- To define the right terminology.
- To collect information worldwide about third party damage failure statistics. To collect information about main "damagers", the most sensitive areas and the most "dangerous" civil works techniques.
- To collect information about existing practices to control/solve the problem in different countries around the world.
- To propose improvements to present methods, after examination and comparison of present methods/practices.
- To propose guidelines on how to effectively control/reduce third party damages of cables.

Scope of work :

- AC and DC cables.
- Land and submarine cables.
- MV (whenever appropriate), HV and EHV.
- Mechanical, thermal damages and, more generally, all damages caused by human activities.

The WG will try to get information about the main damagers, the most sensitive areas and the most dangerous civil works techniques by analysing the already received questionnaires or by asking specific questions to utilities on the fault caused by third party damages.

Then, the WG will address the Burial Protection Index (BPI) that is used for submarine telecom cables and pipelines and accepted by insurance companies, and examine whether it could be extended to underground cable systems after having defined specific criteria relevant for this technique.

8.2.7 WG B1.22 Cable accessories workmanship

Convener: Kieron Leeburn (South Africa)

WG B1.22 was set up in 2005 and is due to present its final report in 2008.

One of the trends in the cable technology is the reduction of the cable insulation thickness and therefore the growing of electrical stress based on a better knowledge of the insulating material and the extrusion process. As the cables are made under well-defined factory conditions, their quality and reliability are usually assured. Accessories, however, are mounted on site, and even if this job is done by skilled and trained jointers, it is realized in more delicate and undefined conditions than in the factory.

In view of safeguarding the cable system's reliability which utilities rely on, it is important to study the electrical stress limits in the different types of joints, to learn about the safety margins between theoretical and practical strength levels, to examine the necessary skills of jointers and relative Quality Assurance and to study the recent service experience of high stressed cables.

The terms of reference are:

- To review the literature on the subject
- To complete the terminology not covered by TB 177 "Accessories for HV cables with extruded insulation"
- To prepare an easy to understand guide that could be useful for non-technical customers aligned to IEC voltage ranges
- To prepare guidelines for jointers training. The objective is to have this document referenced in call for tenders

Scope :

- HV Extruded AC >30kV cable systems only (MV and HTS cables are excluded)
- Land and Submarine cable systems
- Special considerations may be needed for large conductors
- Types of joints and terminations
- Interface preparation (Different methods)

It was agreed during the SC to reword the terms of reference of the WG by changing "type of joints" by "accessory designs".

Moreover, it was considered that the experts' skills were not sufficient to cover the submarine cables. It was agreed to delete these types of cable systems from the ToR and validated by the TC Chairman.

One important point is presently considered whether the necessary skills to prepare an accessory were voltage dependant or section dependant.

8.2.8 WG B1.23 Impact of EMF on current ratings and cable systems

Convener: Harry Orton (Canada)

WG B1.23 was set up in 2006 and is due to present its final report in 2009.

Numerous methods have been devised by electric utilities and various research organizations to manage power frequency magnetic field levels in the vicinity of underground cable systems. Although information will be available (ongoing work TF C4.2.04) concerning considerations for implementing the various methods, their impact on construction, their cost effectiveness, and their impact on cable ratings needs to be evaluated. In particular, there are differing opinions about the derating effects of transmission cables placed in ferromagnetic shielding structures such as pipes and casings. Past work at CIGRE and elsewhere addressed magnetic field calculation procedures (with and without ferromagnetic components), however, they do not address the derating impact of the magnetic field management methods or their practical application to electric utility systems.

Terms of Reference:

- To define the correct terminology for field management techniques.
- To review practical magnetic field management methods that are currently used for underground transmission cable systems.
- To quantify the shielding effectiveness of practical methods.
- To review practical design and construction considerations relating to engineering, standardization of components, scalability, constructability, environmental suitability of component materials, impact by third party damage, reduction of rating due to air inclusions, corrosion, theft of materials, logistics, and worker skill level.
- To review the cost effectiveness of different field management methods.
- To quantify the cable ampacity de-rating aspects of the various field management methods

This working group will neither cover any environmental or biological effects of EMF, nor discuss any specific levels of EMF.

Scope of work :

The work shall focus on single conductor, high voltage, AC land cable systems, excluding pipe type cables with :

- Extruded dielectric insulation
- Laminar dielectric insulation

8.2.9 WG B1.24 Test procedures for HV transition joints

Convener: Marco Marelli (Italy)

WG B1.24 was set up in 2006 and is due to present its final report in 2009.

Extruded cable is increasingly being used for transmission and distribution circuits in preference to cables with lapped insulation. It is becoming more common for a length of extruded cable to be introduced into a lapped cable circuit, when the latter is repaired or diverted. International cable specifications are generally written to cover a specific insulation technology e.g. IEC 60840 applies to cables with extruded insulation and their accessories. Applications that involve cables with more than one insulation system are not usually considered. The test regimes differ between lapped paper and extruded polymeric insulation ; for example an AC after laying test might be used with extruded cable and a DC test with paper cable.

Terms of Reference:

- To review the range of transition joints currently available
- To review the existing international standards and the extent to which they cover the testing of transition joints
- Align voltage levels to those specified in IEC Standards for extruded cable systems
- To propose test regimes for transition joints and their associated cables. Type, routine, sample and after-laying tests should be considered.

Scope of work :

The WG should take into account AC cables and accessories for rated voltages above 30 kV up to 500 kV. Transition joints in submarine or DC cable systems are not considered. Priority should be given to jointing paper cables with extruded cables, in particular SCFF cables with XLPE cables. All forms of testing should be considered. Priority shall be given to after-laying and type tests.

8.2.10 WG B1.25 Advanced design of laminated metallic coverings

Convener: Pierre Mirebeau (France)

WG B1.25 was set up in 2006 and is due to present its final report in 2009.

WG 21.14 published in 1992 "Guidelines for tests on high voltage cables with extruded insulation and laminated protective coverings". Numerous improvements appeared on laminated coverings since then in parallel with field experience. We now have a feed back relative to their use as a function of the length to be laid, the installation method (ducts, directly buried...), the environment, the design of the metallic screen (aluminium, copper wire screen + aluminium, copper...), the connection and grounding of the screen (single point, cross bonding, double point)...

In parallel, new processes and new installation methods have appeared.

Terms of Reference:

- To review and update the tests on cables with extruded insulation and laminated protective coverings taking into account the system view, i.e. the installation of accessories. Tests on cable, on accessories and on the system itself should be addressed, including the short circuit one
- To issue a Guide to Use for non experts explaining what could be the different cable designs

Scope of work :

- Extruded cable systems only
- AC cable systems only with a focus above 36 kV
- Land cables

8.2.11 JWG B3/B1-09 Application of long high capacity Gas Insulated Lines in structures

Convener: Hermann Koch (Germany)

JWG B3/B1-09 was set up in 2004 by SC B3 and is due to present its final report in 2007.

As GIL is in SC B1 scope and as the relative expertise derives mainly from GIS depending on SC B3, it was decided by the CIGRE Technical Committee that this topic will be studied by a JWG led by SC B3.

The terms of reference are:

- To collect information on existing GIL installations in structures
- To identify the issues that need to be considered when installing GIL in specific or shared structures
- To give information how to handle large scale projects and to define what "long GIL" means

The study shall be limited to:

- Mechanical and thermal design,
- Ambient conditions,
- Laying, installation, and gas handling
- Testing, commissioning, and Quality control,
- Repair process,
- Safety risks,
- Life cycle analysis.

It was noticed that the number of experts involved in this working body was shrinking due to the change of position for some experts. Nevertheless, a first draft of the final report was presented during the SC meeting.

The final report is awaited for 2007.

8.3 Task Forces

8.3.1 TF B1.26 Earth potential rises in specially bonded screen systems

Convener: Eric Dorison (France)

TF B1.26 was set up in 2005 and is due to present its final report in 2007.

Earth potential rises on cross bonded cable systems connected at each end to a substation are generally considered negligible but recent breakdowns seem to deny this opinion.

It is proposed to make a general study focused on earth potential rises on cross bonded cable systems connected to overhead lines called hybrid systems and on cross bonded cable systems directly linking two low resistance substations.

The Terms of Reference are:

To improve the design of special bonded screen systems, dealing with EPR, providing :

- more information on EPR which may occur during single phase to earth faults
- details of a calculation method based on the Complex Impedance Model.
- calculation examples for typical situations.

Scope of work :

- The voltage range will be limited to transmission levels according to the countries.
- Specially screen bonded links, using AC single-core cables,
- Land and submarine cables

Some investigations were already made on the Madrid case (fault that destroyed substations) and almost completed the work for the earth potential rises on links between two substations. The next step will be the study of underground cable systems at substation entrance before studying the siphon case.

The TF will try to provide simple formulas for simple case studies, but the Convener said that providing simple formulas for complex problems is still a challenge !

8.3.2 TF B1.27 Test recommendations on XLPE AC submarine cables from 170 kV to 500 kV

Convener: Gunnar Evenset (Norway)

For a long time the prevailing highest voltage for XLPE submarine AC cables was 150 kV (with a few installations at 220 kV). A recent submarine installation of single-core XLPE AC cables at 420 kV, has moved the technology forward significantly. The existing tests on AC submarine cables are presently limited to 150 kV.

It was considered interesting to study the extension of test recommendations on XLPE AC submarine cables from 170 kV to 500 kV.

The TF is due to present in 2007 the Terms of Reference for a potential full WG on the above subject.

8.3.3 JTF SCB1/ICC Interactions between CIGRE SCB1 and IEEE/PES Insulated Conductors Committee

Convener: Willem Boone (The Netherlands)

The activities to date are: exchange of relevant technical information, cooperation and coordination between working groups with similar activities. Moreover, ICC information has been added on the SC B1 web site after ICC having posted information on CIGRE SC B1 on its web site last year.

Presently, ICC is considering the option of a WG activity on CIGRE activities, whether or not in combination with IEC issues later.

During these five past years, significant progress was made for a better cooperation between several groups of both organizations dealing with the same or close subjects, generating an added value to the work produced by SC B1 and ICC.

It was decided:

- to continue the JTF with the same Convener,
- to launch a discussion group during the next Spring ICC meeting,
- to continue the process of exchange of information and of cooperation/coordination between working groups of CIGRE and ICC,
- to exchange information on how to motivate effective participation,
- to consider a joint seminar.

During the last ICC meeting in Reno (NV), a new Discussion Group between ICC and CIGRE was launched to exchange information more in depth about both organizations and to share technical information among the Working Bodies.

8.4 Relations with other CIGRE Groups or organizations

8.4.1 AORC

SC B1 had already good relations with the other SCs in relation with cables, B2 at the end of some mixed lines, B3 in the substations, C1 for asset management, D1 as they work on materials and emerging technologies, but tries to develop new relations with D2 Information Systems and Telecommunications.

In addition, SC B1 is a very good contributor to the AORC (Asia Oceania Regional Committee) as the B1 panel, led by the Australian SC Member meets regularly with the experts from the AORC countries. In return, the experts provide subjects of interest for themselves that could be taken into consideration at the SC level.

8.4.2 IEC

The close liaison between CIGRE SC B1 and IEC TC 20 is very well established and the IEC TC 20 Chairman is permanently invited to the SC meetings. The IEC representative presented their future work, thanked CIGRE B1 for its technical support and looked forward to further strengthening this collaboration in the future.