Title of TC
ELECTRIC CABLES

A Background

IEC Advisory Committee No 20 “Electric cables” first met in Prague in October 1934. Preliminary work had been done at the High Tension Conference in June 1933. The early work was aimed at HV cables (then restricted to a maximum voltage of 66 kV). Later developments saw a split into two sub-committees, SC 20A for higher voltages and SC 20B for lower voltages. In 1990 a 3rd SC was added, SC 20C, for fire performance aspects of cables. In 1998 the work was re-consolidated into a single TC 20, principally supported by permanent WGs. These are:

- WG 16 High voltage cables (1 kV and above), their accessories and cable systems
- WG 17 Low voltage cables (below 1 kV)
- WG 18 Burning characteristics of cables
- WG 19 Current ratings and short circuit limits

TC 20 holds a Group Safety function for “Fire hazard testing on cables” comprising:

- flame propagation tests;
- fire resistance tests;
- smoke optical density tests;
- corrosivity tests.

This is effected via WG 18.

B Business Environment

B.1 General

There is a high level of conservatism amongst users, who remain satisfied with well-established, safe and reliable products, now going up to 500 kV a.c. The pressures on such mature products are therefore economic rather than technical. Company mergers (both amongst manufacturers and users), leading to globalisation and rationalisation, coupled with enterprises in newly-developing countries, is consistent with this situation, and should reinforce and enhance the importance of IEC standards in the sector.

Greater globalisation, and the advent of newer producers, will ensure that test houses and approval organisations remain strong users of TC 20’s standards.

The estimated worldwide market for all energy cables covers: Americas: 25%, Europe: 25%, Asia: 30% and Africa, Oceania and Others: 20%.

At least 80 countries have some manufacture. This number is growing especially for lower voltage cables used in basic infrastructure.

Excluding China, where statistics are hard to find and small enterprises may be numbered in hundreds, there are at least 600 individual manufacturers worldwide, of whom only a few a) manufacture for voltages above 150 kV, and b) have a global presence. North American and European manufacturers...
have invested in the Middle and Far East, and in South America. Outward investment from India is increasing.

Day-to-day business is affected by the economics of oil and metal prices, and other global indicators.

B.2 Market demand

The “customers” of TC 20 are basically involved in the generation, transmission and distribution of electricity. The products range from domestic installation wiring and appliance wires through to supertension transmission cables up to 500 kV. Analysis shows that manufacturers and users are represented on Working Groups and at TC level, but for the users this is biased towards the utility sector. From both sides of the industry there had previously been some decline in representation due to commercial pressure on resources, but consistent encouragement has reversed the trend. There is also encouraging participation from the rapidly industrialising parts of the world.

The strong usage of TC 20 standards in the marketplace is manifest in different ways due to regional differences, and to differences in the type of standard (e.g. product standard or test method). Many major developed economies use the product standards as a baseline for their own national standards, but frequently impose additional requirements due to different systems, local regulations and/or customer demands. In other regions, and in the absence of such local factors, the unchanged product standard serves well as the national standard. In some industrially well-developed countries and regions, competing standards exist by virtue of historical infrastructure and regulatory influences.

For test method standards there is very wide usage, almost regardless of region. This has the potential to be enhanced further via the global relevance programme.

TC 20 is aware that the demand for standards is different in different markets. For the mature case of electric cables the strong preference is for full consensus international standards (IS), but the availability of other deliverables is recognised and used where appropriate. The preference for IS also reflects a strong desire to avoid duplication of test methods, and the wish to ensure that design options in product standards only reflect relevant global types for the applications, also avoiding unwarranted duplication. TC 20 is fully aware of the policy of IEC in respect of Global Relevance and is resolved to continue to retain a coherent and inter-related set of documents in which the essential product standards are supported by those for components, test methods, current ratings and design criteria.

The majority of the work covers the maintenance of existing standards, as these can accommodate most of the technological developments for the majority of cable types. A limited number of new standards covering major extensions of new technology, or to satisfy new applications relating to renewable energy sources, will be required.

TC 20 products, by their very nature, are generally not suitable for coverage by a horizontal system approach to standardisation. This is principally due to factors such as:

- the use of cables as long-life products (many decades) and their installation in inaccessible places (e.g. buried);
- the wide variety of end-uses to which a single cable type can be put;
- the role of cables as connecting devices (often over long distances) between items of equipment.

All these factors combine to require cables to meet the specialised tests that lead to a strong continuity and stability of requirements in our well-established standards.

B.3 Trends in technology

For established cable standards up to at least 400 kV, improvements in technology derive mainly from production processes, materials and components, and must be seen as relatively small step-by-step changes to a substantially mature situation. These developments, which improve the efficiency and durability of the cable, are incorporated into the standards via the maintenance procedure.

The newer infrastructure demands, such as from large developing countries, taken in conjunction with interconnection projects and renewable energy sources, means that the Technical Committee is looking in the medium-long term at:

- the subject of superconducting cables and, with TC 90 and CIGRE, is supporting a standardization of the testing of such cables;
- developments in UHV;
– developments for HVDC polymeric cables such as required for offshore connections;
– standardization of a MV AC submarine cable standard;
– developments for LVDC polymeric cables such as the work in SG4/ahG54;
– developments for cable connections for charging of Electric Vehicles;
– developments for cables for Photovoltaic energy systems.

B.4 Market trends

Much technical development work of the last 20 years has been in the area of fire performance cables. In certain regions and countries there is some maturity in the general industrial sector, which is often being supported by regulation. The influence is spreading to higher voltages. The demand is supported via test method standards covering all important aspects of fire behaviour. These standards are likely to be refined further and, under the global relevance programme, assessed as subjects where harmonisation across regions could be beneficial.

The strong growth in demand for energy in developing economies, and the parallel demand for energy efficiency as an environmental benefit, will promote infrastructure changes. As indicated in B.3, this could result in an eventual need for standardisation associated with cables for UHV, LVDC and HVDC, and for superconducting cables.

B.5 Ecological environment

The TC is constantly monitoring the environmental aspects of its products and components both in relation to their end of life disposal or recycling or their in-service performance. A specific guidance document (IEC/TR 62125) has been published, and a revision is in progress. TC 111 is seen as a future source of information and encouragement, and its work will be monitored as part of the review.

There is a strong awareness of the demands and potential impact of requirements and regulations relating to “X-free”, where “X” includes lead, halogen, cadmium etc. This is being carefully monitored to assess relevance to power cables.

There is a demand for more energy efficient operation of cables and the TC published information some years ago on suitable cable design parameters to achieve lower transmission losses and reduced heating effects, and hence reduced carbon footprint. A future standard is to be developed to raise the profile, and possible adoption, of work which up-to-now has been resisted due to short-term commercial practices, such as consideration of environmental conductor size optimization.

C System approach aspects

TC 20 has liaison and interface with other TCs and SCs, but (see also B.2) finds that its standards are not generally suitable for coverage by a system approach. There is however inter-dependence in areas as illustrated below.

| TC 20 as a customer for standards of other TCs | TC 15 | Solid electrical insulation materials |
| TC 42 | High-voltage testing techniques |
| TC 89 | Fire hazard testing |

| SC 18A | Electric cables for ships and mobile and fixed offshore units |
| TC 34 | Lamps and related equipment |
| TC 46 | Cables, wires, waveguides, R.F. connectors, R.F. and microwave passive components and accessories |
| TC 61 | Safety of household and similar electrical appliances |
| TC 69 | Electric road vehicles and electric industrial trucks |
| TC 82 | Solar photovoltaic energy systems |
| TC 86 | Fibre optics |
TC 108  Safety of electronic equipment within the field of audio/video, information technology and communication technology

TC 1  Terminology

TC 64  Electric installations and protection against electric shock

TC 111  Environmental standardization for electrical and electronic products and systems

TC 112  Evaluation and qualification of electrical insulating materials and systems

Cooperation established:
- Liaison officers, experts participating in product/horizontal committees: TC 64, TC 89, IEEE-PES-ICC
- Experts working in other TC/SCs and reporting to TC 20: SC 17C, SC 18A, SC 23A

D Objectives and strategies (3 to 5 years)

D.1 Objectives
1. Maintain the time for development of TC 20 work within requested timescales.
2. Ensure that those standards that have had no review since the introduction of the formal maintenance process are addressed.
3. Regularly review TC 20 product standards to reflect changing technologies and user requirements, including especially in the area of fire performance, but ensure maximum stability for associated test methods.
4. Ensure that work is prioritised in relation to the available resources.
5. Continue to respect targets for global relevance of standards without creating non-homogeneous deliverables.
6. Promote the existing high awareness of TC 20’s work and standards, especially towards newer members and associate members of IEC.
7. Build upon the environmental considerations already developed in TC 20.

D.2 Strategies
1. Encourage Convenors and Project Leaders to plan work, meetings and schedules up to three years ahead;
2. Ensure that Convenors and project leaders are aware of Best Working Practices, and have access to all tools to assist;
3. Monitor, with assistance of TC 20’s Strategic Planning Group, emerging market and technological trends;
4. Engage with IEC Central Office at the earliest stage of any procedural or structural problems likely to cause delay;
5. Maximise consensus for both new work and amendments/revisions before formal entry into the procedures;
6. Regularly review target dates for all work.

E Action plan
The latest version of TC 20’s work programme can be found on the relevant web page for the committee. The items listed below are the most significant ones, and should all be completed or have made significant progress by the time of the next plenary meeting.

1. Assess of the work of CIGRE SC B1 for relevance towards future standardization, WG 16 and WG 19, to report at the next plenary meeting.
2. Review the work in a future CIGRE SC B.1 WG on UHV
3 Install a liaison WG17 to SG4/ahG54 (LVDC application)
4 Evaluate in WG 18 the relevant work from TC 89 in relation to improvements to fire testing of cables and use of common terminology. - In line with TC 89 progress.

5 Start the work on MV AC submarine cable standard
6 Start the work on Mode 4 charging for Electric Vehicles (future 62893-4)
7 Start the work on HTS cable testing by a Joint Project Team TC20-TC90, based on the CIGRE SC B1 recommendation TB 538
8 Develop TR 62602 (AWG and kcmil conductors) to an International Standard.

9 Conclude the standardization work on 62895 (HVDC land cables).
10 Start review on 60840 and 62067 (HV and EHC cable systems)
11 Start review on 60502-1
12 Conclude standardization on 62930 (cables for Photovoltaic energy systems)
13 Conclude standardization on 62893 (Part 1, 2, 3) on charging cables for Electric Vehicles (Mode 1, 2, 3)
14 Conclude the 63010 series on halogen-free cable standard series (without smoke requirements, for 300/300V) to comply with the requests for halogen-free thermoplastic flexible cables for use with small devices and for short connection to desktop appliances.
15 Start review on 60331 series
16 Continue 60754-3 on Ion Chromatography.
17 Update of the parts of 60287-1 and 60287-2 series according to work plan of WG19
18 Monitor the activities in TC 64.
19 Prepare a NP to develop an International Standard on environmental aspects including conductor size optimization and relevant matters from TC 111.

F Useful links to IEC web site
IEC/TC20 dashboard giving access to Membership, TC/SC Officers, Scope, Liaisons, WG/MT/PT structure, Publications issued along with their Stability Dates, Work Programme and similar information for SCs, if any.

Name or signature of the secretary
H Myland