

Gigre Working Group B1.22

CABLE ACCESSORY WORKMANSHIP ON EXTRUDED HIGH VOLTAGE CABLES 2005-2009

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Scope of work

- Workmanship of jointing and terminating of AC land cables, with extruded dielectrics for 36 to 500kV.
- Overview of skills needed for the installation of accessories and the risks associated with this
- Training and certification of jointers



Background

Conclusion of WG B1.10

(Up-dating of service experience of HV Underground and Submarine Cable Systems)

- Failure rates of accessories, particularly on XLPE cable are higher than other components and are of great concern. Focus on quality control during jointing operations must be maintained.

Trends

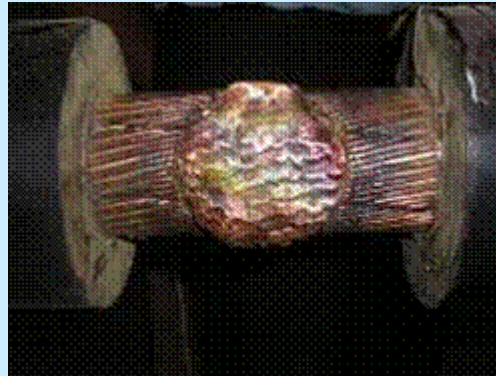
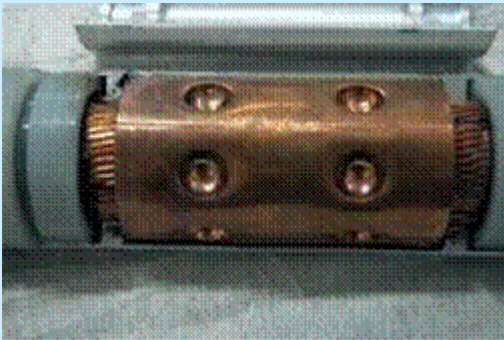
- Reduction of the cable insulation thickness and the corresponding increase of electrical stresses.
- Retirement of experienced jointers:
loss of experience
- Installation by third parties (not by manufacturers)



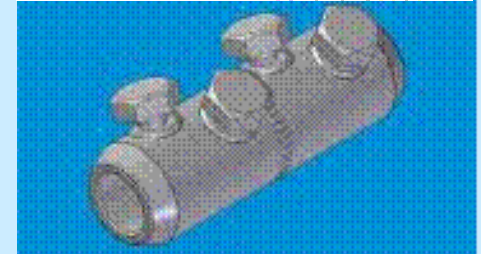
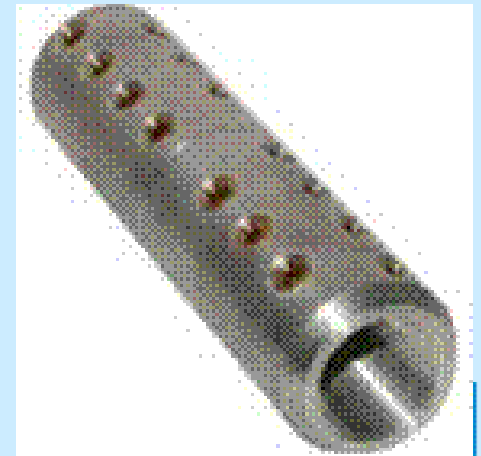
Example skills assessment

Work Phase	Risks	General skills
Preparing the jointing area	<ul style="list-style-type: none">•Accidents leading to cable or accessories damage•Electric shocks•Traffic accidents•Collapse of joint bay or trench	<ul style="list-style-type: none">•Sense of organisation and selection of proper tools and equipment•Knowledge of electricity (voltage induction, absence of voltage, phasing etc.)•Proper grounding connections•Familiarity with safety and security measures•Proper bracing
Cable preparation	<ul style="list-style-type: none">•Underside cable is blind	<ul style="list-style-type: none">•Due care
Cable straightening	<ul style="list-style-type: none">•Over heating of insulation•Mechanically damaging the cable	<ul style="list-style-type: none">•Use of electric heaters•Use of hydraulic equipment
Preparing cable insulation	<ul style="list-style-type: none">•Rough insulation surface leading to bad interface between cable and accessory	<ul style="list-style-type: none">•Proper use of sanders•Meticulous sanding

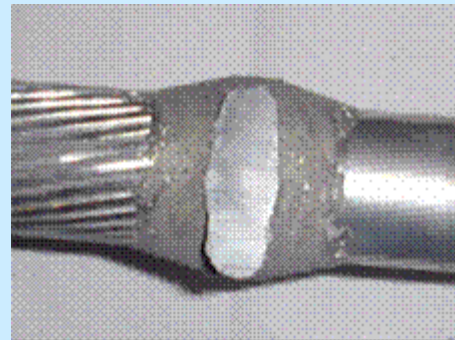
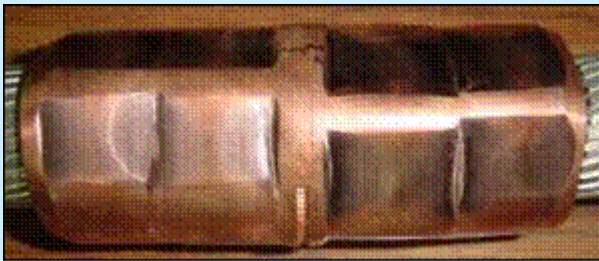
Conductors



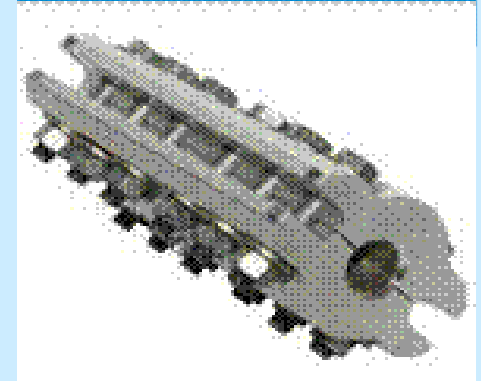
MIG/TIG Welding



Compression

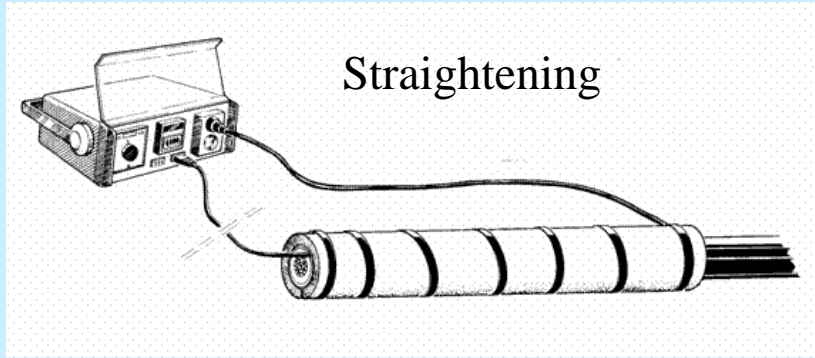


Thermit Weld

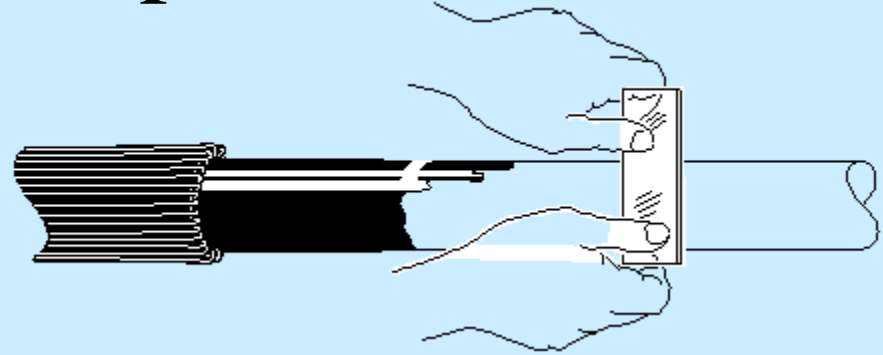


Mechanical Connection

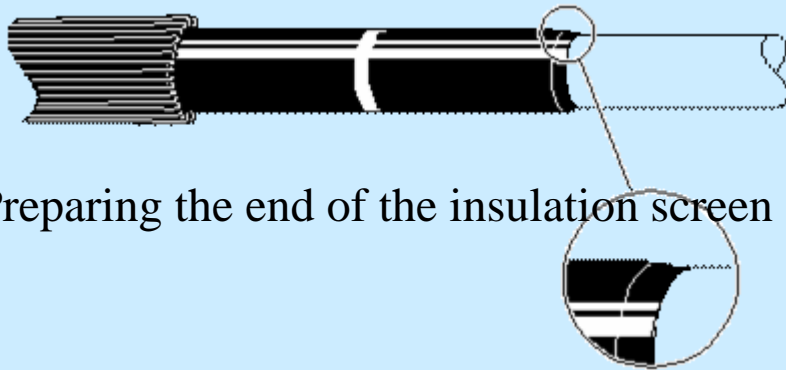
Insulation Preparation



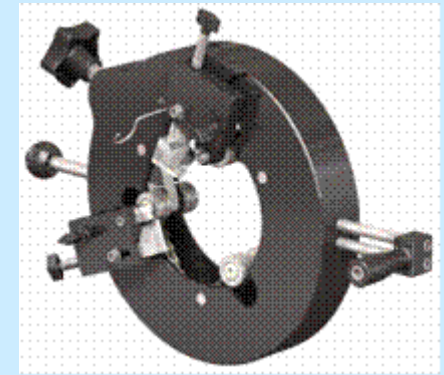
Straightening



Stripping of insulation screen



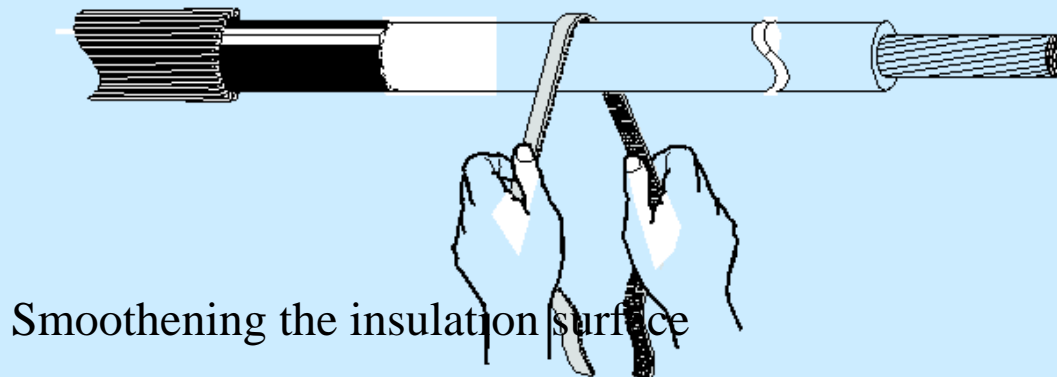
Preparing the end of the insulation screen



Cleaning of insulation

Shrinkage

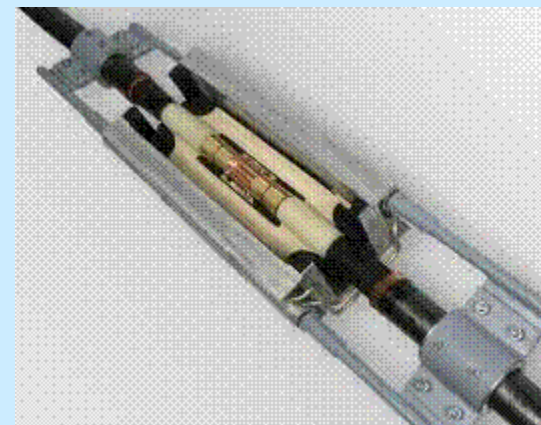
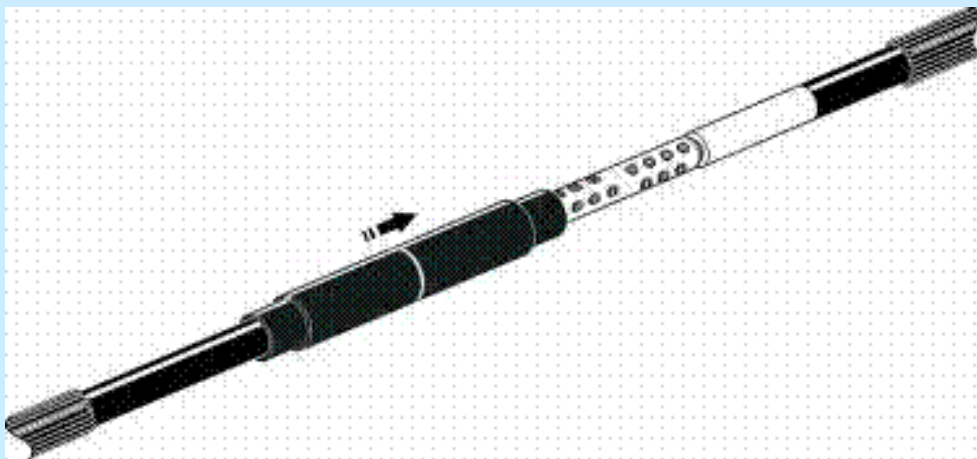
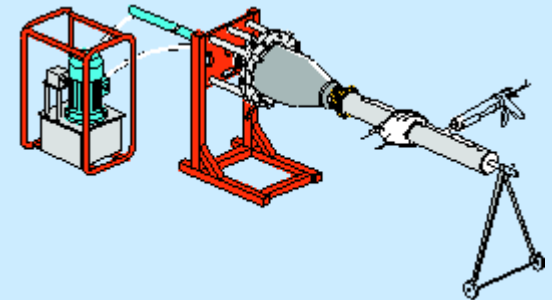
Lubrication



Smoothing the insulation surface

Installation of stress control bodies

- Installation of joint electric field control components
- Installation of termination electric field control components
- Filling of Terminations



Training is required for all High Voltage jointers.

Other important skills needed:

- Sense of observation and organisation;
- Environmental and safety awareness;
- Problem solving, sometimes called "common sense";
- Ability to read and interpret drawings and instructions in the relevant language;
- Good familiarity and handling of different electric and hydraulic tools;
- Understanding of electricity;
- Precision in taking physical measurements.

Other essential basic attributes include:

- Patience;
- Dexterity;
- Discipline;
- Sense of engagement;
- Responsibility;
- Physical fitness;
- Mental fitness.



three levels of competence

- Apprentice/helper (not allowed to do jointing on their own);
- Jointer (allowed to do jointing on their own);
- Supervisor (highly experienced and could train others).

Methods of qualification

- Theoretical understanding of WHY a particular aspect is important;
- Observation that a jointer has understood and executed the instructions correctly;
- Electrical and mechanical testing of the final accessory assembly (e.g. AC test, PD test, Impulse test)



Duration of certification

- Active jointer: no need for re-certification
- Temporarily inactive: need to be re-certified.
- Experienced jointer installing a different accessory: certified for the additional skills required.
- New accessory type, fully training

Thank you!

