

PIPE TYPE CABLE SYSTEMS

Pipe Type Cable continues to be the standard system specified for underground transmission cable in North America. The typical voltage ratings are 69kV, 115kV, 138kV, 161kV, 230kV and 345kV.

The conductor is insulated with layers of either kraft paper or laminate paper impregnated with a high quality dielectric fluid. The cable construction is completed with shielding layers and an overall skid wire.

Pipe Type Cable was invented by Mr. Charles Bennett of The Okonite Company in 1932. At

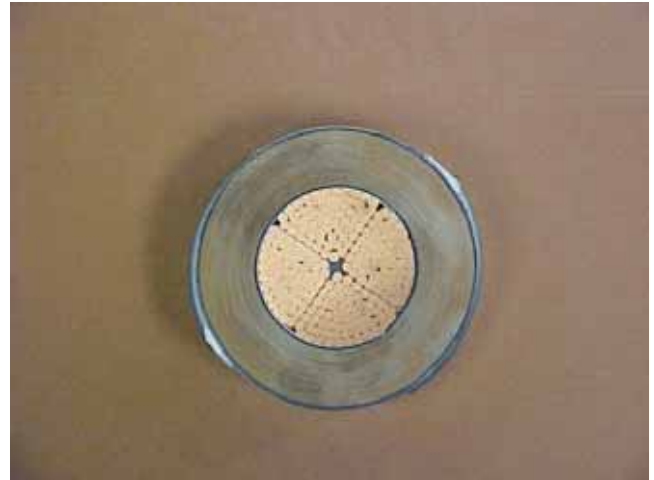


Figure B

the turn of the 19th century, electrical systems in the USA were being converted from DC to AC. The AC technology related to generators, transformers, circuit breakers, switches, etc developed rapidly as did the higher voltage operations for utility transmission systems. The need to pressurize the existing paper insulating system to permit operation at these higher voltage ratings was a primary objective. The operating voltages have since grown from 69kV to 345kV. Pipe Type Cable operates at a nominal fluid pressure of 200 PSI for all voltage classes or at 200 PSI nominal nitrogen pressure for systems 138 kV and below.

Pipe Type Cables are installed in a buried steel pipe. The three insulated phases are installed simultaneously in a defined vault to vault length. The steel pipe permits all parts of the cable system to be sealed end to end within the pipe. The installed system is vacuum treated prior to dielectric fluid pressurization. The ambient envi-

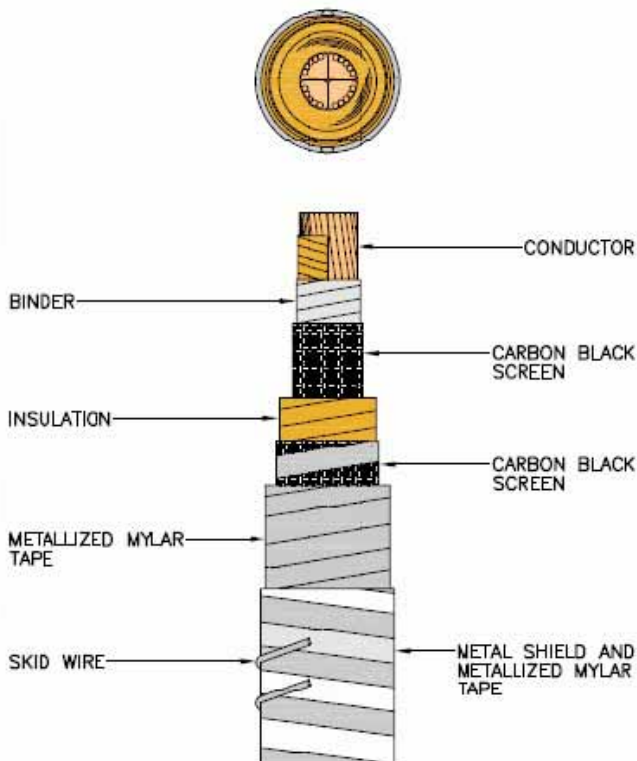


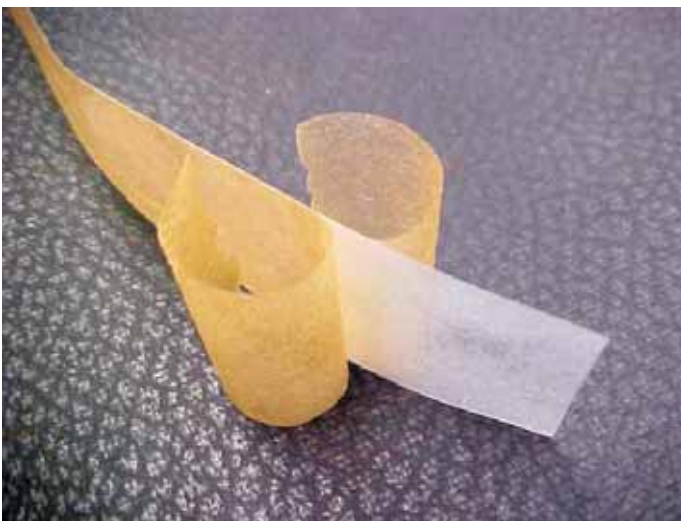
Figure A

ronment is removed by this completely welded system end to end.

The basic construction of a pipe cable is shown in Figures A and B and the installed system is depicted in Figure C.

The industry specification for pipe cable is AEIC CS2-97, 6th edition "Specification for Impregnated Paper and Laminated Paper Polypropylene Insulated Cable High-Pressure Pipe-Type". It can be said that this specification is one of the most thorough and mature insulated conductor standards in our industry. Other competing systems do not have the established quality credentials offered by pipe type cable.

In the late 1980's, industry and Okonite's in-house engineering research introduced the paper-polypropylene-paper laminate tape to the pipe cable industry. The higher electrical strength and reduced dielectric loss permits this technology to offer a cost effective installed system compared to the conventional kraft paper insulation and to other competitive systems. The three part laminate tape is shown below.



Pipe Type Cable benefits are:

- Longer pulling lengths
- Established installation procedures



Figure C

- Simplified splicing procedures - all three splices are installed within one casing sleeve
- Minimal EMF field exposure, 1 to 2 milligauss
- Established service record at all voltage levels
- Complicated cable shield/sheath components not required

Longer pulling lengths and simple splicing and terminating procedures are pipe cable attributes in addition to its established outstanding service life since 1932, position pipe type cable as the premium first choice underground transmission cable.

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