

General Cable's Indianapolis Technology Center

With global economies, resource demand and new technologies growing at an incredible pace, more advanced cable products are needed to meet the increasing requirements of today's demanding applications. For well over a century, General Cable has taken a fully integrated approach to providing quality cables that deliver maximum service life and superior reliability—while at the same time maintaining cost effectiveness. Supporting you, our customer, with innovative cable products requires an unprecedented commitment to R&D that starts with superior materials and results in proven performance.



General Cable addresses the challenge for cable technology advancement through its Indianapolis Technology Center (ITC), the heart of progress. Providing the foundation for extensive research and development efforts in the wire and cable industry, this center of excellence combines advanced materials development, cutting-edge compounding, extrusion and processing capabilities, and comprehensive testing and analysis with a highly qualified team of engineers and scientists whose sole mission is to deliver innovative cable technologies that meet the changing needs of our customers.

- 50,000 ft² of dedicated research and development space
- Advanced compound mixing and extrusion capabilities
- Comprehensive processing to produce cable samples for testing
- Aging electrical performance testing for low-, medium- and high-voltage compounds
- State-of-the-art physical, chemical, mechanical, flame and metallurgical testing

Advanced Compounding Equipment

ITC encompasses a variety of advanced compounding equipment that enables the sophisticated design and mixing of compounds for exceptional dispersion and quality.

- Two Brabender® mixing heads for small laboratory-sized batches
- Two sizes of Banbury® mixers and two mills dedicated for black and non-black mixing
- BUSS Kneader 46 mm compounding unit with gravimetric feed hoppers
- Underwater pelletizer with Gala® spin dryer
- 32 mm twin screw extruder with gravimetric feeders and pelletizers



BUSS Kneader

Comprehensive Processing Capabilities

ITC's cable extrusion and pilot wire setup provides General Cable with a first-hand opportunity to study the processability of compounds and produce both wire and cable samples for internal and external testing.


The facility's dry cure extrusion line is used for producing medium-voltage cable constructions such as a 15 kV, 1/0 AWG, 19/W aluminum cable with a 15 mil conductor shield, 175 mil insulation and 40 mil insulation shield. It features a dual-tandem 2 plus 1 extruder arrangement with 2½", 3½" and 4½" extruders that are capable of producing single, dual or triple layer cable constructions. The dry cure environment uses nitrogen and electric heaters for cross-linking of thermoset cables. Thermoplastic cable samples can also be produced on this line.

ITC's pilot wire line includes a 2½", 1¼" and 1" extruder setup that produces single, dual or triple layer wire constructions ranging from 16 AWG to 6 AWG, such as 14 AWG, 7/W copper wire with a 15 mil to 45 mil insulation wall.

From PVC, olefins and LSZH to moisture cure and engineering polymers, the pilot wire line is capable of extruding a full gamut of compounds over either round or square wires. The samples produced by the pilot wire line are ready to undergo comprehensive in-house and third-party performance testing.



Dry Cure CV Line



From advanced material development for superior performance to complete characterization and performance analysis, Indianapolis Technology Center provides you with the next generation of cable products with the insulation, jacket and shielding materials that continue to set the industry standard of purity, surface smoothness, uniformity and performance.

Electrical Performance Testing

ITC has a sophisticated and fully equipped electrical lab that generates quality test results for compound development and product approval. Here, advanced materials and cable designs are analyzed and evaluated for performance in low-, medium- and high-voltage applications.

To fully understand the aging electrical performance of compounds, specimens of wire and plaque are tested under stress (voltage and current) in both wet and dry conditions and at ambient or elevated temperatures over an extended period of time. Some of these tests include:

- Capacitance, tan delta, insulation resistance (IR) and volume resistivity (VR)
- AC breakdown of coiled wire, plaque and tape specimens
- IR measurement and AC withstand of 3-phase armored cables
- Current cycling aging of wire samples
- Impulse and insulation voltage endurance
- Square wire accelerated aging
- Dust and fog tracking
- Tree cell



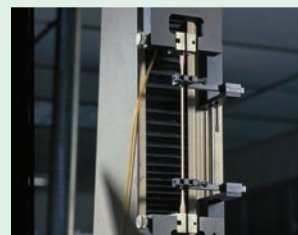
Fully Equipped Electrical Lab

Physical, Chemical, Thermal and Flame Lab Testing

Led by a team of scientists, experienced engineers and highly skilled technicians, ITC's state-of-the-art ISO certified material and mechanical testing lab is fully equipped to test and characterize metals, compounds, vulcanizates, plaque samples and finished cable specimens. All tests are reproducible and follow industry standards, and all test equipment and test procedures are regulated and routinely calibrated.

To provide formulators with a more advanced analysis of materials that can help them establish an empirical relationship between product performance and composition, a variety of equipment is used to evaluate properties such as:

- Tensile strength and elongation of un-aged, air oven aged and oil/fluid aged specimens
- Cure and rheological properties
- Thermal transitions and flame performance
- Chemical composition and abuse performance



Tensile and Elongation Tester



Varian 600 UMA FTIR Microscope

Indianapolis Technology Center Tests and Equipment

Physical Testing

- Zwick® universal tester
- Instron® tester
- Brittle point tester
- Optical microscope
- Air oven labs
- Impact resistance
- Scoring resistance
- Abrasion resistance
- Specific gravity

Flame Testing

- CSA FT1 and FT2
- UL VW-1 and FV-1
- Limiting oxygen index tester
- Microcalorimeter analyzer

Thermal Testing

- Differential scanning calorimetry (DSC)
- Thermogravimetric analysis (TGA)

Viscosity Testing

- Mooney MV 2000 viscometer
- Haake™ Viscotester™

Cure Testing

- Hot creep and hot set
- Moving die rheometer (MDR)
- Solvent extraction
- Heat deformation

Chemical Testing

- Fourier Transform Infrared (FTIR) analyzer
- Moisture analyzer

Metals Testing and Analysis

The newest addition to ITC's research and development capabilities is our metals testing and analysis lab. Capabilities such as wire drawing, heat treatment, microscopy, chemical analysis, mechanical testing, metallurgical testing and electrical testing allow our metallurgical staff to ensure the quality of incoming raw materials and deliver the most consistent product to meet customer demands.

Indianapolis Technology Center Services for Outside Customers

General Cable's ITC is also wired for business. Customers can reserve time on both the 15 kV cable line and the triple wire extrusion line to conduct development trials and to manufacture samples for testing purposes.



For more details and questions on services and the technology center, please contact:

Srini Siripurapu

Vice President R&D - ITC

7920 Rockville Road
Indianapolis, IN 46214
317-273-2901
SSiripurapu@generalcable.com

Bruce Johnston

Manager of Technical Services - ITC

7920 Rockville Road
Indianapolis, IN 46214
317-273-2904
BJohnston@generalcable.com



4 Tesseneer Drive, Highland Heights, Kentucky 41076-9753

GENERAL CABLE is a trademark of General Cable Technologies Corporation.
©2015, General Cable Technologies Corporation, Highland Heights, KY 41076
All rights reserved.

Printed in USA

Telephone: 859.572.8000
E-mail: info@generalcable.com
www.generalcable.com
Form No. COR-0084-0815
49029