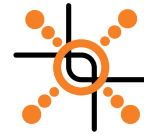


Polyrad® XT Flexible Rail & Transit Wire and Cable



POLYRAD®

General Cable's Polyrad® XT rail & transit wire and cable is the chosen solution for demanding environments throughout North America and the world. Polyrad® XT is used extensively on all types of rapid transit and freight cars, heavy- and light-rail cars, diesel-electric locomotives and off-road vehicles.

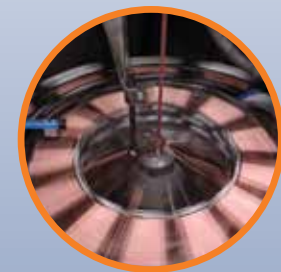
Polyrad® XT rail & transit cables are specifically designed for original equipment and retrofit use in power and control circuits and in motor leads. Polyrad® XT's superior heat, flexibility and abrasion resistance, combined with its reduced size, simplifies cable installation and permits higher ampacities. Fully tested to meet all applicable specifications, Polyrad® XT cables ensure lifelong dependable service for transit, off-road and diesel-powered locomotives.

Unlike conventional insulating systems, Polyrad® XT offers a better balance of electrical properties for superior stability and performance. Available in both 600 volt and 2000 volt constructions, Polyrad® XT single-conductor rail & transit cables are dual-rated at 125°C and 110°C. Available in 600 volt and 2000 volt constructions, Polyrad® XT multi-conductor shielded and non-shielded rail & transit cables are rated at 125°C.



Polyrad® XT – The Trusted Name in Rail & Transit Wire and Cable

For more than 40 years, General Cable's Polyrad® XT has been the most respected name in rail & transit wire and cable. First introduced to the marine market for offshore oil rigs, ships and mobile land rigs, Polyrad® XT was developed to perform in the most rugged conditions, passing a wide range of stringent test procedures and standards. Since its introduction to the rail & transit markets, Polyrad® XT has been the leading wire and cable choice for rapid transit and freight cars, heavy- and light-rail cars, diesel-electric locomotives and off-road vehicles.



Polyrad® XT's Dual Rating

As the industry's first rail & transit wire and cable with a dual 125°C/110°C temperature rating, Polyrad® XT combines the superior properties and performance of a 125°C product while meeting all industry requirements for traditional 110°C transit wire. For distributors, this unique dual rating practically reduces inventory by half. Polyrad® XT meets all performance requirements of AAR RP-585 and ICEA S-95-658, as well as transit industry specifications.

Insulation System and Construction

Polyrad® XT insulation features a highly engineered and refined low-smoke polyolefin formulation used in conjunction with soft annealed tinned copper conductors per ASTM B33. This innovative insulation technology combines **outstanding flame retardance with excellent moisture-stable electrical values**. The construction is further enhanced by radiation cross-linking, which transforms the original thermoplastic into a rugged thermosetting material. The end result is a compound with **excellent thermal stability – it will not soften or flow at elevated temperatures**.

- Increased durability
- Greater resistance to cut-through
- Superior oil resistance
- Excellent low-temperature performance
- Maximum flexibility

Product Features and Benefits

Polyrad® XT wire and cables combine **superior electrical properties and performance** for advanced rapid transit, locomotive and off-road equipment applications.

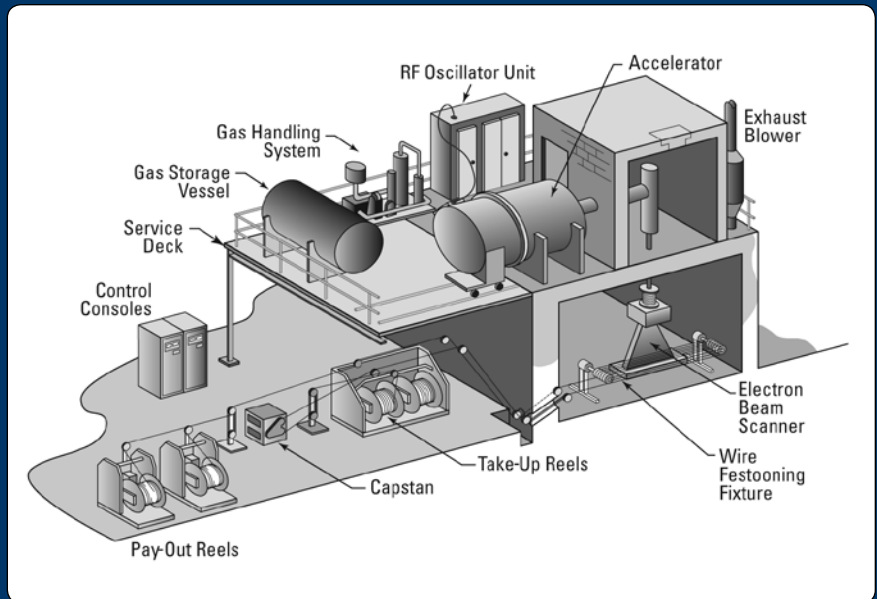
- Dual 125°C/110°C temperature rating for long life, higher ampacities and protection from thermal overloads (single wires)
- Maximum flame retardance as demonstrated by VW-1 and, for multi-conductor cables, IEEE 383 (70,000 BTU/hr.) and IEEE 1202 (70,000 BTU/hr.)
- Excellent oil and chemical resistance
- Maximum dependability and mechanical toughness
- Smaller outside diameter and flexible stranding and insulation simplify installation



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Polyrad® XT Wire and Cable Testing

General Cable has perfected the technique of radiation processing. Cross-linking the insulation and jacket using our unique radiation process creates a more flexible product. In radiation cross-linking, a scanner accurately and uniformly directs a high-energy electron beam from a power source over the wire insulation, resulting in a precise degree of cross-linking. This technique enables General Cable to effectively process smaller wires with thin insulation walls to meet the transit market's critical demand for high-density cabling.



Electrical Properties

Requirement ICEA S-95-658	Typical General Cable*	
Insulation Resistance @ 125°C (megohms-Mft)	2.0 Min.	8.3
Insulation Resistance Constant (K)	10,000 Min.	30,600
Long-Term Insulation Resistance 26 Weeks @ 90°C in water (megohms-Mft)	10 Min.	15
Accelerated Water Absorption Electrical SIC 24 hours @ 75°C	6.0 Max.	4.9
Increase in Capacitance, Percent		
1-14 Days	3.0 Max.	2.5
7-14 Days	1.5 Max.	1.3
Stability Factor after 14 days	1.0 Max.	0.18

Physical Properties

Requirement AAR RP-585 (S-501)	Typical General Cable*	
Unaged Requirement		
Tensile Strength, Min. PSI	1,400 Min.	2,710
Elongation at Rupture, Min. %	200 Min.	260
Aged Requirement		
After Air Oven 7 days @ 158°C ± 2°C		
Tensile Strength (% of original)	90 Min.	100
Elongation (% of original)	50 Min.	69
Oil Immersion Aging – ASTM #2 18 hours @ 120°C		
Tensile Strength (% of original)	50 Min.	69
Elongation (% of original)	50 Min.	65
7 days @ 70°C		
Tensile Strength (% of original)	70 Min.	76
Elongation (% of original)	70 Min.	74
Hot Oil Resistance, % Swell 100 hours @ 150°C	60 Max.	32
Cold Bend @ -55°C	No Cracks	No Cracks
Cold Shock 1 hour @ -40°C	No Cracks	No Cracks
Cut-Through Penetration 10 minutes @ 125°C	No Failure	Pass

* Typical values are from various General Cable and independent laboratory testing.

Important Advantages of Radiation Cross-Linking

Advantage	Reason
More flexible cable	Pressure-applied insulation and jacket are not required
No separator tapes	Less pressure is applied during the radiation process
Free stripping	Insulation is not driven into the conductor stranding
Better electrical properties	No chemical catalyst required. No residues which lower electrical properties and corrode copper
Cables and interstices kept free of water	Water is not used in the radiation cure operation
Range of insulation thickness	Radiation process can economically cross-link thin or heavy walls
Permanent colors	Radiation does not change or fade colors. Tracer colors remain vivid

Standards

Polyrad® XT cables are manufactured, tested and inspected in accordance with the latest issue of the following standards:

AAR RP-585	Wiring and Cable Specification
ASTM B33	Tinned Soft or Annealed Copper Wire
ASTM D149	Test for Dielectric Breakdown Voltage and Dielectric Strength of Electrical Insulating Materials at Commercial Power Frequencies
ICEA S-95-658	Standard for Non-Shielded Power Cables Rated 2000 V or Less for the Distribution of Electrical Energy
UL 44	Standard for Rubber Insulated Wire and Cable
IEEE 1202	Standard for Flame Testing of cables for use in cable tray within Industrial and Commercial occupancies
NFPA® 130	Standard for Fixed Guideway Transit and Passenger Rail Systems



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Flame Test Comparison

The flammability of a cable is normally the ability of the material to cease burning once the source of heat is removed. Several tests have been formulated to measure this requirement.

UL FLAME TESTS

UL 1581 Vertical Tray Flame Test:

This test is conducted on cables lashed to a vertical metal ladder tray 8 feet in height. The combustion source is a ribbon burner with a flame temperature of approximately 1500°F which supplies 70,000 BTU of heat per hour. The flame application time is 20 minutes. This test requires the cable to self-extinguish prior to reaching the top of the tray which is 8 feet in height. A UL Type TC (Tray-Rated) cable must meet this test. UL 1581 is an equivalent test for IEEE 383-1974.

UL 1581 VW-1 Vertical Wire Flame Test:

This is a small-scale test conducted on a single 24" length of wire. The flame source is a Tirrill burner (similar to a Bunsen burner) with a heat output of approximately 3,000 BTU per hour. The flame is applied for 15 seconds and then is reapplied four more times. If the sample burns longer than 60 seconds after any application, or if the indicator flag or the cotton laid below the wire is ignited during the test, the cable fails the test.

Per AAR RP-585 – Application of the flame shall be 5 times with 15-second rest periods with 10 seconds maximum burn after each flame application.

Per NYCT - Application of the flame shall be 5 times with 15-second rest periods and 3 seconds maximum burn after each flame application.

NFPA 130 FLAME & SMOKE TEST

Per UL 1685 with FT4/IEEE 1202

Flame Exposure:

This test is conducted on cables attached to a vertical metal ladder tray 8 feet in height. The combustion source is a ribbon burner with a flame temperature of approximately 1500°F which supplies 70,000 BTUs/hr. The flame application time is 20 minutes. To pass this test, the resulting char distance must not be greater than 1.5 meters (59 inches) from the point of flame application, the total smoke released in 20 minutes shall not exceed 150 square meters, and peak smoke release rate shall not exceed 0.40 square meters per second.

TOXICITY TESTS

PER BSS 7239:

This test determines the toxic gas generated using the National Bureau of Standards (NBS) Smoke Density Chamber for sample combustion. Gases specifically measured are carbon monoxide (CO), hydrogen cyanide (HCN), sulfur dioxide (SO₂), hydrogen chloride (HCL), hydrogen fluoride (HF), nitrogen oxide (NO) and nitrogen dioxide (NO₂).

PER SMP-800C:

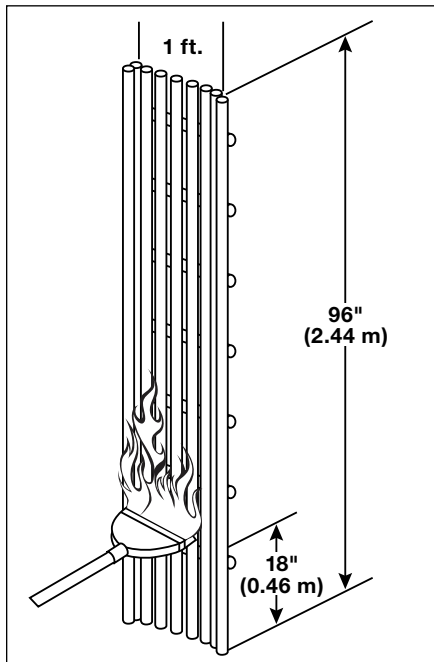
This test determines the toxic gas generated in a specified, calibrated chamber (typically ASTM E-662) during standard rate of smoke generation in both flaming and non-flaming test modes. Gases typically measured are carbon monoxide (CO), hydrogen cyanide (HCN), sulfur dioxide (SO₂), hydrogen chloride (HCL), hydrogen fluoride (HF), carbon dioxide (CO₂) and hydrogen bromide (HBr).

CSA FLAME TESTS

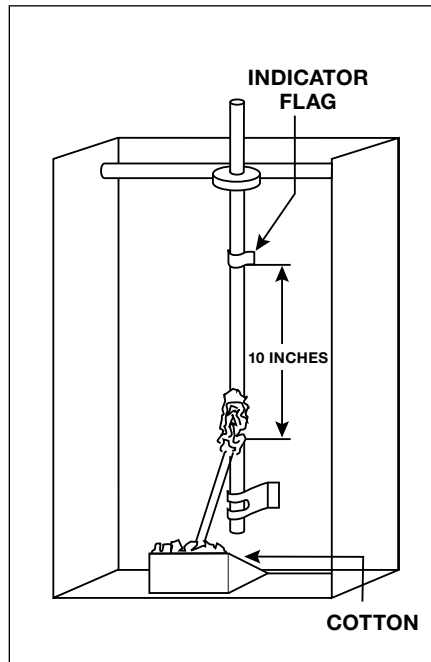
CSA FT4 Vertical Tray Flame Test (CSA C22.2 No. 03):

This test is conducted on cables lashed to a vertical metal ladder tray 8 feet in height. The combustion source is a ribbon burner with a flame temperature of approximately 1500°F which supplies 70,000 BTU of heat per hour. The flame application time is 20 minutes. To pass this test, the resulting char distance must not be greater than 1.5 meters (4.92 feet) from the point of flame application. This test is very similar to the IEEE 1202 flame test. It is also similar to but more severe than the UL 1581 Vertical Tray Flame Test.

[See UL 1581 Vertical Flame Test]



UL 1581 Vertical Tray Flame Test



UL 1581 VW-1 Flame Test