



SHAWFLEX

**Wire, Cable
and Assembly
Solutions for
Nuclear Industry**



Shawflex Nuclear Solutions

At Shawflex, we offer more than just a catalog of products. We are a growth-oriented global materials technology company that supports the production of safe and clean nuclear energy through our extensive portfolio of nuclear cables. Our cables are engineered to withstand the demanding requirements found in nuclear power plants. We can assist with any type of nuclear project, whether it's refurbishing or decommissioning legacy plants, building new ones, or even working on next-generation SMR technology.



Dedicated Nuclear Team

We understand that nuclear projects are more complex and require more stringent design, testing and timeline requirements. That's why we manage each project from RFQ to delivery through our dedicated Nuclear Team, which includes Project Managers, Sales, Quality Assurance, and Engineers. Whether it's a large and long-term project or a small one-off order, our team is ready to meet the growing challenges facing the nuclear industry.



Cable Assemblies, Terminations and Accessories

At Shawflex, we design and manufacture custom cable assemblies and terminations. We collaborate with you to develop solutions tailored to specific installation plans, ensuring proper termination. Additionally, we provide cable accessories designed to seal and protect cable joints and terminations. Our portfolio of cable accessories includes nuclear-grade heat shrink tubing and splice kits, specifically intended for safety-related applications that require environmental qualification (EQ).



Custom Cable Solutions

Every nuclear order has unique requirements. At Shawflex, we customize all our nuclear products to meet those specific needs. From choosing specific materials and constructions to implementing unique test programs and traceability requirements, our team will make it happen. We provide our customers with flexibility and engineering support at every step of the process.



Global Reach

For over 30 years, Shawflex has supplied cables to nuclear reactors that have powered millions of homes and businesses around the world. We wholeheartedly embrace the global economy's transformation towards cleaner energy, and we are committed to working with all stakeholders to help achieve multinational zero-carbon emission goals.



Product Capabilities

- EQ (Class 1E), Nuclear Grade Cables
- Extra-Flexible Fuel Handling Cables
- Non-EQ (Non-Class 1E), Conventional Cables
- Umbilical Cables for Automation and Robotics
- High Temperature, High Radiation Resistant Cables
- CSA/UL-Certified, Conventional Cables
- Nuclear Cable Assemblies & Harnesses
- Nuclear Cable Accessories (Heat Shrink Tubing, Splice Kits)

Key Design Features

- Radiation resistance up to 250 Mrad
- Temperature Resistance up to 200°C
- Life expectancy qualified for up to 60 years
- Low acid gas (AG14 rated)
- Flame Retardant and Low Smoke, Zero Halogen Options
- DecaBDE-free Nuclear Cables

Qualification Standards





- IEEE 383 Qualifying Electric Cables and Splices for Nuclear Facilities
- IEEE 323 Qualifying Class 1E Equipment for Nuclear Power Generation Stations
- CSA N290.13 Environmental qualification of equipment for nuclear power plants
- LOCA/MSLB Design Basis Event Testing
- IEEE 1202/FT4 Flame Propagation Testing of Cables
- Utility Customer Product Specifications





Quality Standards

- CSA N299.2
- ISO 9001
- KHNP Class Q

Our Nuclear Product Portfolio



- 1  EQ (CLASS 1E), NUCLEAR GRADE CABLES
- 2  NON-EQ (NON-CLASS 1E), CONVENTIONAL CABLES
- 3  NUCLEAR CABLE ASSEMBLIES & HARNESSSES
- 4  NUCLEAR CABLE ACCESSORIES

- 5  FLEXIBLE, RADIATION RESISTANT FUEL HANDLING CABLES
- 6  HIGH TEMPERATURE, HIGH RADIATION RESISTANT CABLES
- 7  UMBILICAL CABLES FOR AUTOMATION AND ROBOTICS
- 8  CSA/UL-CERTIFIED, CONVENTIONAL CABLES

Proof from the Field

Increased durability & performance of fuel-handling cables

A major nuclear power operator in North America was experiencing recurring field failures of cables employed in its fuel handling system. The original cables were designed for 30-year operational life – but were failing well short of this target time frame.

Shawflex engineered a cable design and purpose-built a qualification test rig to simulate the 30-year service life required.

Test specifications included:

- Thermal aging to simulate service life
- Irradiation aging to 60 Mrad
- Mechanical flex testing for >100,000 cycles

The design validation program was highly successful, with the cables exhibiting full functionality. Cables were installed at the reactor site beginning in 2011 and continue performing as expected.



Features:

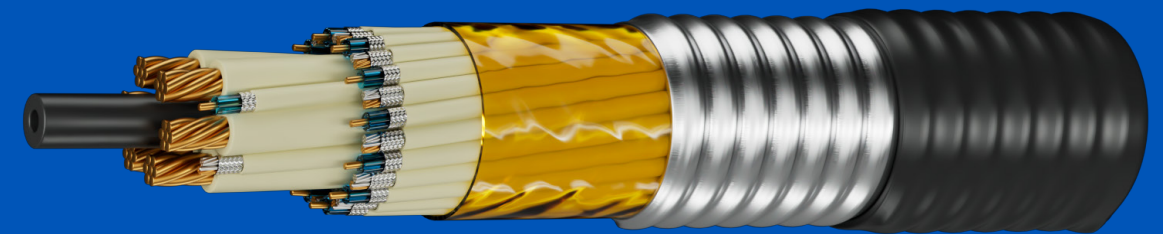


Unique umbilical design for reactor inspection & maintenance

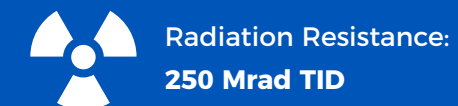
A major nuclear power plant operator in Canada developed an inspection tool to go inside the core tubes of a nuclear reactor, electronically survey each pressure tube assembly and make key repairs. The robot needed an umbilical to safely and reliably supply electrical and hydraulic power, as well as relay sensitive sensor data for analysis. The requirements were anything but straightforward:

- Operate in high radiation fields (gamma, alpha neutrons and x-ray) for extremely long periods without serious degradation of flexibility
- Perform in heavy water at 40-60 psi and 60°C without short circuiting or developing unacceptable signal attenuations or distortion
- Withstand tens of thousands of pressure cycles from zero to 3,500 psi, twists of $\pm 180^\circ$ and linear motion at high tension around tight bends
- Measure to an exact O.D. with a very specific tolerance range
- Contain few or no halogens, particularly fluorine

At Shawflex, we designed a sophisticated umbilical that met every one of these extreme requirements. Quality was ensured by inspecting and testing every inch of every component before it proceeded to the next operation. The tests we performed included visual, electrical and electronic, immersion in pressurized hot water, radiation exposure to 250 Mrad, and severe mechanical duty cycling.



Features:





Integrity Drives Everything We Do

Ensure electrical and mechanical reliability with the engineered products and solutions of Shawflex.

We are a trusted manufacturer of engineered wire, cable and assemblies products globally. With our resources, expertise and technologies, we're able to offer a complete range of custom cable and advanced cable accessories to simplify installation and to protect your electrical systems.

To know more about our products and service capabilities, contact our team today or visit shawflex.com.

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