



**KINECTRICS**

# **Connector Testing Services**

Facilities & Expertise To Enhance  
System Reliability



# Importance of Independent Testing

Testing Connectors

✔ Increased Reliability of the Line ✔ Performance Insurance



” Testing connectors is an inexpensive way to prevent an expensive problem.

Connectors in transmission lines represent a small portion of the line’s overall budget; however, once in the line, replacing them can be a very expensive proposition. The large number of connectors in the network makes them an important target from a system reliability perspective.

Installation and manufacturing factors can cause in-service failure of connectors, compromising the reliability of the power supply (and other safety concerns). Problems inside the connectors are not easily identifiable and condition assessment should involve periodical inspection and testing.

## When and Why to Test?



### Design & Production phase

- Validate the design criteria and variables
- Ensure the connector will last for the design life of the OHL
- Ensure that production parameters and variables match design criteria



### Installation phase

- Ensure that connectors installed in the field comply with QA/QC parameters of connectors tested in the lab during design phase



### Operation & Maintenance phase

- Simulate excessive and /or unique stresses
- Health assessment of connectors for AM decisions (ex. end of useful life, HI)
- Determine failure mode and root cause to avoid further unexpected failures

## Qualification for Lifetime Performance

To meet ever-increasing load growth, existing and future overhead line components, including connectors, will be required to operate at higher and higher temperatures.

Confidence in the reliable performance of these components is critical, because their failure can lead to a downed line. Operation at elevated temperatures also accelerates the aging process, making the issue of lifetime performance even more critical. Kinectrics provides reliable, confidential performance testing services for clients worldwide, to assess the lifetime performance of these components.



## Connector Testing

Kinectrics conducts qualification and performance tests for the thermal, mechanical, environmental and electrical performance of transmission, distribution and substation connectors according to industry standards and manufacturers' specifications. Other studies are also conducted to confirm the failure mode of overhead connectors, and to determine the most cost-effective measures to prevent future failures.

## Infrared Imaging Capability

Kinectrics is equipped to offer in-depth analysis using infrared camera and state-of-the-art research software, which provide detailed information on temperature distribution on the surface of the connector.



## One-Stop Testing Facility

Kinectrics offers one-stop, fully equipped laboratories, managed by highly qualified staff, to provide a wide range of mechanical, electrical and environmental testing services for the electric utility industry.

Kinectrics has the broad-based capabilities and state-of-the-art equipment available in-house to provide fast, efficient and comprehensive testing. We handle everything from new product and aged component testing to custom projects and special studies – all from one location.

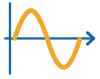
### We Test and Analyze



- Transmission and Distribution Connectors
- Electric Power Connections for Substations
- Ground Grid Connectors
- High Temperature Connectors
- Substation Connectors
- Temporary and Permanent Repair Connectors (example: shunts, repair rods)
- Swaged, Implosive and Exothermic Connections
- High Temperature Accessories including spacer, spacer-damper, and suspension assemblies



## Examples of Connector Tests



### Current Cycle

Evaluate electrical & thermal performance of the connectors via accelerated thermal aging test.



### Heat Rise

Evaluate electrical performance of the substation connectors by evaluating the thermal profile of connectors.



### Pullout Strength

Evaluate mechanical capacity of the connectors when subjected to heavy ice and/or wind loading, or other steady or cyclic loads.



### Torque Strength

Evaluate torque strength of the bolted connectors.



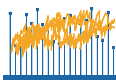
### Corrosion Tests: Salt Fog, Acid Bath

Evaluate effects of corrosive environment on transmission/distribution and underground connectors.



### Freeze-Thaw

Evaluate effects of temperature changes on underground connectors.



### Vibration

Evaluate the performance of clamps and other hardware when subjected to aeolian vibration.



### Condition Assessment of Aged Connectors

Evaluate performance of existing connectors in the line to identify key parameters for inspection of faulty connectors. Assist utilities in identifying potential problems and increase the reliability of the line.



### Failure Analysis

Evaluate causal factors to identify the root cause of the failure and take necessary steps to increase the reliability of the line.



### Fault Current

Evaluates the ability of new or aged connectors to withstand typical fault current levels in the line. Especially important for preformed, bolted or automatic connectors.

### We test to Industry Standards

- ✓ IEEE 837
- ✓ IEC 61284
- ✓ IEC 61238-1
- ✓ ANSI C119
- ✓ NEMA CC-1
- ✓ CSA C57-98

### We test to...

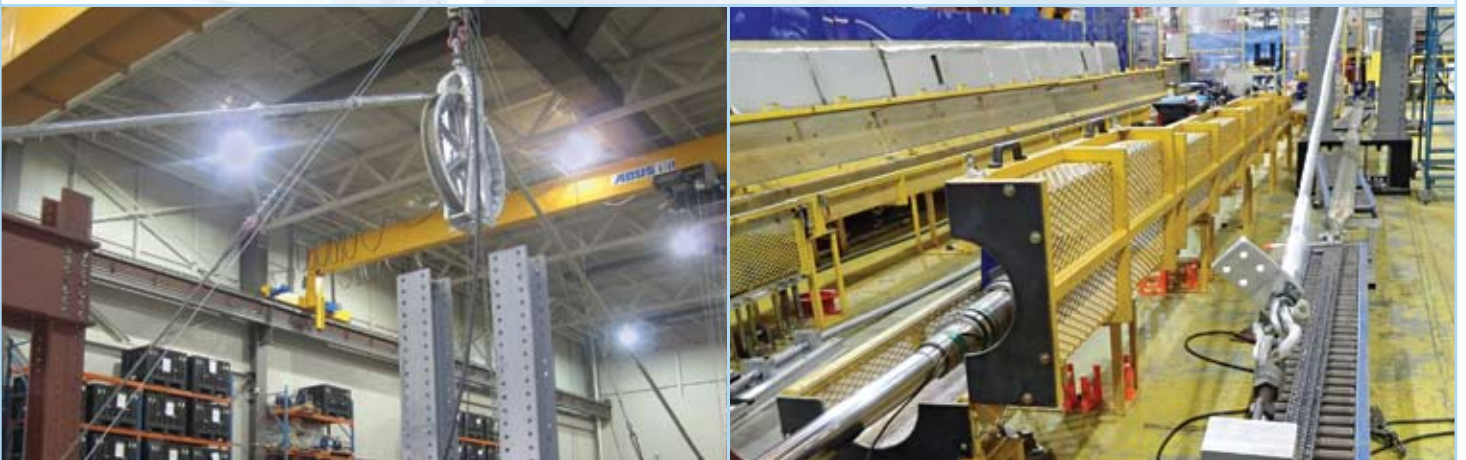
- ✓ Manufacturers' Specifications
- ✓ Custom Specifications
- ✓ Other Required Standards

## Sheave Test

During installation of conductors in transmission lines, splices (when used) are installed at the tensioner and then are pulled together with the conductor over the stringing blocks. This eliminates the need for additional splicing sites. Since the splices are rated as full tension joints, the length of the conductor that can be pulled from one site can be increased and therefore will have fewer pulling sites. Fewer sites equals fewer access roads and less impact on the environment. Ultimately these advantages could represent considerable budgetary and time savings for the contractor and the utility and help environmental approvals.

The desire to use splices in the stringing operations must be tempered with the need for testing the effects of passing the splice through the stringing blocks on the mechanical integrity of the connector/conductor assembly. This has been addressed to a certain degree, in the CSA C57-2016 (Annex E) where the main parameters are the rollover angle, mechanical tension and the number of passes. Kinectrics has the knowledge, understanding and the experience to test to CSA C57.

Kinectrics has the capacity to customize the parameters to meet the needs of the utilities and manufacturers to ensure that when splices are used in the stringing operations, they will not compromise the quality and reliability of the line.



## Commitment to Quality

Kinectrics is accredited to ISO/IEC 17025:2017 by the Standards Council of Canada (SCC). The SCC is a member of the International Laboratory Accreditation Cooperation (ILAC) and a signatory member of the ILAC's Mutual Recognition.



**Standards Council of Canada**  
**Conseil canadien des normes**

Kinectrics' accreditation is recognized internationally and demonstrates our unrivalled technical capabilities to provide a full range of engineering and testing services for connectors and accessories.



## Commitment to Safety

Kinectrics promotes a safe work environment and empowers all employees to create and maintain a safe and healthy environment. We believe that no task is so important that we cannot make the effort to do it safely.

## Commitment to Our Customers

Our vision is to be the premier technical solutions provider from concept to completion. Our mission is to improve our customers' business by delivering sustainable and innovative life cycle management solutions to nuclear and electricity industries, through our facilities, processes, and people.

## About Kinectrics

Kinectrics' origins can be traced to 1912. With over 100 years of delivering technical excellence, Kinectrics is the category leader in providing life cycle management services for the electricity industry. Trusted by clients worldwide, our experts in engineering, testing, inspection and certification is backed by our independent laboratory and testing facilities, a diverse fleet of field inspection equipment and an award-winning team of over 1,000 engineers and technical experts.

Kinectrics is an internationally recognized company with a reputation for technical excellence in engineering and long-established experience in providing testing services to the electric utility industry. We are uniquely positioned to provide superior services in connector testing, as well as related specialized support for transmission and distribution systems.



**Over 1,000**  
**Engineers**

From initial design and type testing to operational deployment and maintenance services, Kinectrics collaborates closely with customers to ensure that utility assets perform safely, reliably and efficiently throughout their entire life cycle.





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