



Accredited Africa Training Institute for Capacity Development

Unit FO409, Hatfield Plaza · 1122 Burnett St, Hatfield 0028 · Pretoria, Gauteng · South Africa

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COURSE BROCHURE

Sag And Tension Overhead Conductors On Ohte Under Isolated And Earthed Conditions Training

Physical Planning and Construction / Civil Engineering Construction

Unit Standard 119890 · NQF Level 4 · 12 Credits · 9 Days

COURSE OVERVIEW

This course equips learners with the skills to calculate sag and tension for overhead conductors on overhead transmission and distribution lines (OHTL) under isolated and earthed conditions. It ensures safe and efficient installation and maintenance of power lines in compliance with South African standards.

Category	Physical Planning and Construction
Subfield	Civil Engineering Construction
Unit Standard	119890
Accreditation	SAQA Accredited · NQF Level 4 · 12 Credits
Duration	9 days
Training Method	Online, On-Campus, In-House
Certificate	Issued via AATICD LMS – verifiable online

LEARNING OUTCOMES

- Apply principles of sag and tension to calculate conductor parameters under isolated and earthed conditions.
- Analyze the effects of temperature, wind, and ice loading on conductor sag and tension.
- Evaluate the safety implications of sag and tension variations for OHTL under different operating conditions.
- Demonstrate correct procedures for measuring and adjusting sag on overhead conductors.
- Implement strategies to maintain safe clearances and conductor tensions in compliance with regulations.
- Design basic sag-tension charts for typical OHTL configurations.

WHO SHOULD ATTEND

- This course is designed for electrical technicians, linemen, and engineers involved in the construction, maintenance, and inspection of overhead power lines.

COURSE OUTLINE

Day 1: Fundamentals of Overhead Line Theory and Safety

- Overview of overhead power lines (OHTL) and their role in the grid.
- Safety regulations: OHS Act, SANS 10219, and relevant standards.
- Introduction to conductor materials (ACSR, AAC, AAAC).
- Basic mechanical properties: tensile strength, elasticity, and thermal expansion.
- Key terms: sag, tension, span, ruling span, and clearance.
- Personal protective equipment (PPE) and safe work procedures.
- Risk assessment and method statements for line work.

Day 2: Principles of Sag and Tension Calculation

- Conductor as a flexible cable: catenary vs. parabola.
- Derivation of the catenary equation ($y = c \cosh(x/c)$).
- Parabolic approximation for small sag-to-span ratios.
- Effect of conductor weight and span length on sag.
- Sag-tension relationships: tension as a function of sag.
- Use of sag templates and sag-tension nomographs.
- Practical exercise: manual sag calculation for a level span.

Day 3: Environmental Effects and Loading Conditions

- Thermal effects: expansion coefficient, stringing temperature, and operating temperature.
- Wind loading: pressure coefficients and projected area.
- Ice loading: radial ice thickness and density.
- Combined loading: wind-on-ice and wind-on-conductor.
- Loading districts in South Africa: light, medium, heavy.
- Safety factors and maximum allowable tension.
- Example: recalculating sag for extreme weather.

Day 4: Sag and Tension Calculations for Isolated and Earthed Conditions

- Definitions: isolated (de-energised, no fault current) vs earthed (grounded for maintenance or fault).
- Thermal behaviour under no-load (isolated) vs short-circuit (earthed) currents.
- Sag increase due to heating from fault current.
- Calculation methods for transient thermal effects.
- Clearance requirements for earthed conductors during faults.
- Practical differences: stringing sag vs operating sag.
- Case studies: typical scenarios for isolated and earthed conditions.

Day 5: Conductor Stringing and Initial Sagging

- Stringing plan: pulling tension, reel placement, and snatch blocks.
- Sagging methods: visual (transit), tension-based (dynamometer), and sag-tension charts.
- Initial sag tables: temperature correction and creep allowance.
- Conducting a sagging operation: step-by-step.
- Measuring and recording sag after stringing.
- Common errors and troubleshooting.
- Safety during stringing: guarding and earth bonding.

Day 6: Advanced Sag and Tension Analysis: Ruling Span and Sag Templates

- Ruling span definition and calculation.
- Equivalent span method for irregular terrain.
- Sag template construction: plotting conductor curve on profile.
- Using sag templates for structure spotting and clearance checks.
- Tension distribution in multi-span sections.
- Effect of insulator strings and hardware weight.
- Software tools for sag-tension analysis (overview).

Day 7: Practical Field Measurements and Data Collection

- Field equipment: theodolite, total station, clinometer, and tension dynamometer.
- Measuring sag: methods and accuracy.
- Measuring conductor temperature: contact vs non-contact.
- Recording weather conditions: ambient temperature, wind speed.
- Data logging and documentation.
- Comparison of measured vs calculated values.
- Practical exercise: field measurement at a training line.

Day 8: Compliance, Standards, and Reporting

- SANS 10219: overhead line design and construction.
- NRS 034: distribution systems.
- Clearance requirements: ground, vegetation, buildings, and crossings.
- Reporting format: scope, methodology, results, and conclusions.
- Case study: clearance violation analysis.
- Corrective actions: re-tensioning, raising structures, or reconductoring.
- Assessment criteria for unit standard 119890.

Day 9: Integration, Practical Assessment, and Certification

- Integrated project: design a sag and tension plan for a sample line.
- Practical assessment: stringing sag calculation, field measurement, and report writing.
- Oral questioning and portfolio evidence review.
- Feedback session and areas for improvement.
- Issuance of certificate of competence.
- Course evaluation and closing.

ASSESSMENT & CERTIFICATION

Delegates are assessed through exercises and a final test. A mark of **50% or above** earns an **AATICD Certificate of Completion**, issued digitally with a unique verification code. This course carries **12 NQF credits** at **NQF Level 4**.

PRICING (PER DELEGATE, EX-VAT)

Delegates	Training Method	Price per Delegate	Total
1	Online	R 33,300.00	R 33,300.00
1	In-House	R 43,300.00	R 43,300.00
1	On-Campus (Pretoria)	R 50,000.00	R 50,000.00

UPCOMING SESSIONS

Start	End	Method	Venue
07 Aug 2026	19 Aug 2026	On-Campus	Dubai, UAE
10 Aug 2026	20 Aug 2026	On-Campus	Abu Dhabi, UAE
11 Aug 2026	21 Aug 2026	On-Campus	Durban, South Africa
11 Aug 2026	21 Aug 2026	On-Campus	Mauritius
12 Aug 2026	24 Aug 2026	On-Campus	Cape Town, South Africa
13 Aug 2026	25 Aug 2026	On-Campus	Dubai, UAE
14 Aug 2026	26 Aug 2026	On-Campus	Pretoria, South Africa
17 Aug 2026	27 Aug 2026	On-Campus	Durban, South Africa

Contact us if no suitable date is listed – on-demand sessions can be arranged for groups.

HOW TO GET A QUOTE OR APPLY

1. **Get an instant quotation online:** visit www.aaticd.co.za, open the page for this course (Unit Standard 119890) and click **Get A Quote / Apply**. Select your training method and number of delegates – your quotation is generated immediately and emailed to you with the course brochure attached.
2. **Apply by email:** send the course title, your preferred training method (Online, In-House or On-Campus Pretoria), the number of delegates and your preferred dates to apply@aaticd.co.za – our team will reply with a formal quotation.
3. **Apply by phone or WhatsApp:** call +27 12 004 8389 or WhatsApp +27 65 077 6310 and we will prepare your quotation and reserve your seats.
4. **Confirm your booking:** accept the quotation and settle the invoice. As soon as payment is confirmed your delegates are enrolled and receive their AATICD LMS login details by email, along with joining instructions for their chosen training method.

Group discounts apply automatically – the more delegates you enrol, the lower the price per delegate. No payment is required to request a quotation.

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