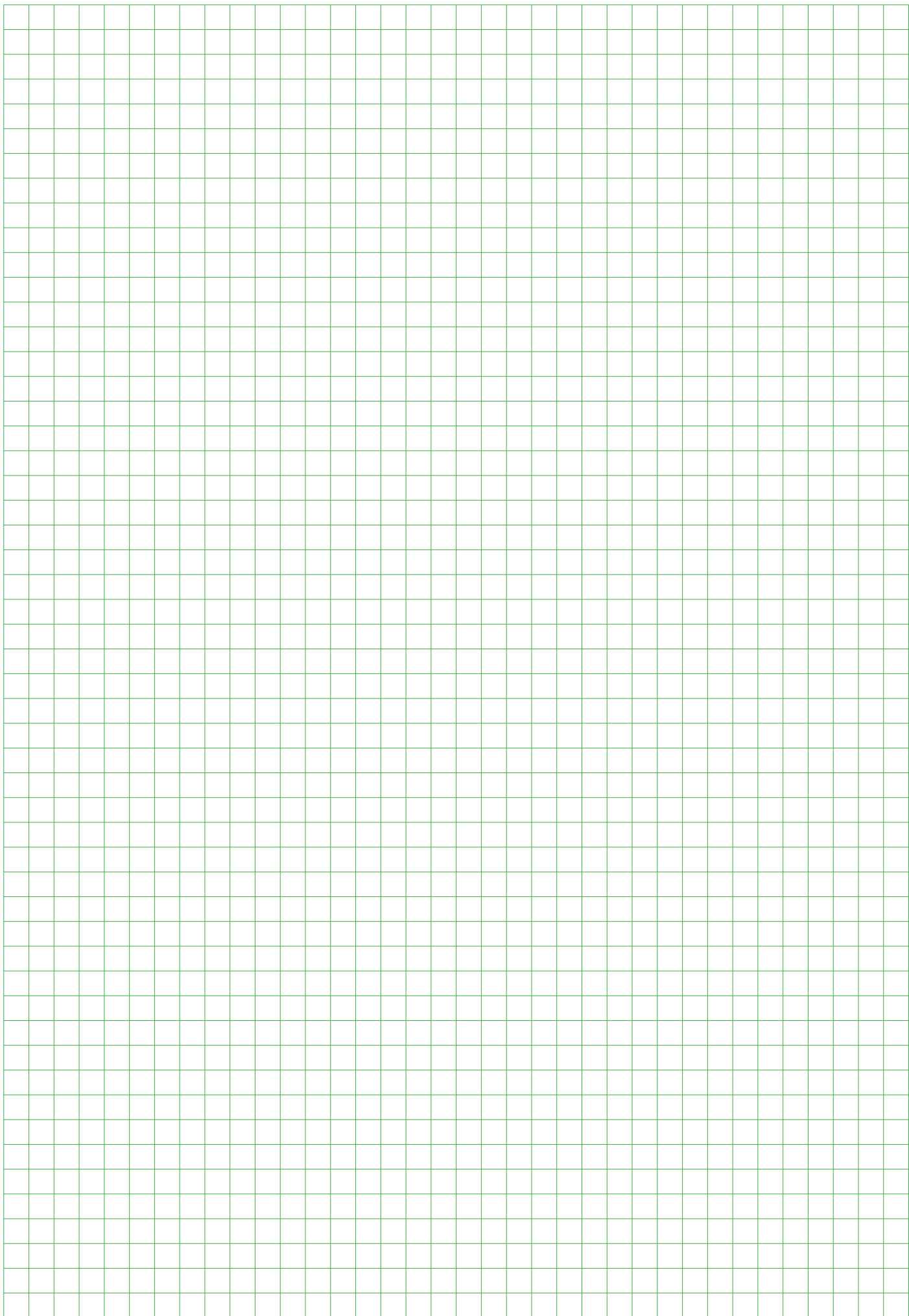


PLP ENGINEERING SERVICES

A unique service to assist professionals involved with electrical and mechanical product services including working prototype developments and forensic analysis of failed product







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INTRODUCTION TO PLP ENGINEERING SERVICES

Electropar (New Zealand) and Preformed Line Products (Australia), both part of the global PLP group of companies, have been market leaders and well respected in the fields of electrical and mechanical engineering for many years.



With both companies working together to meet the challenging demands of the overhead power industry, involved in electrical, mechanical and structural engineering, combined with a disciplined requirement to comply with relevant standards and quality levels, has resulted in a unique skill set that integrates explicit and tacit knowledge within the one combined engineering skill base.

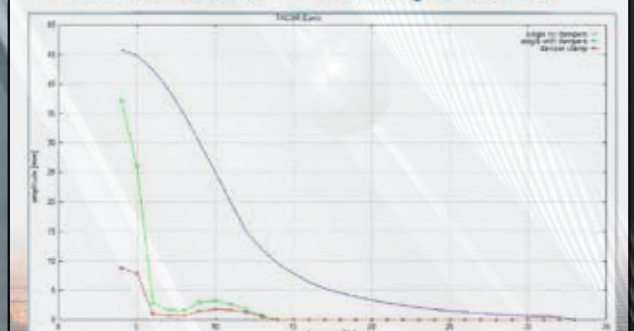
PLP offers the client experience in a uniquely broad range of design and manufacturing disciplines, both theoretical and practical experience. A detailed breakdown of these disciplines can be found on the following pages, however they stretch from design concept right through to internationally recognised test certificates for a fully tooled product ready for launch – and any part of the process in between to suit the client's individual needs.

“your link between academic and practical engineering”



Where PLP does not have the expertise in house to provide a world class service, it can draw on one of many accredited partners to provide that service, so that all designs and reports are academically robust - but practical at the same time.

Diana simulation – existing scenario



COMPANIES THAT DISTRIBUTE AND TRANSMIT ELECTRICAL POWER WILL NEED A COMPETENT COMPONENT DESIGN PARTNER

Electropar and Preformed Line Products (Australia) have a long and proven history in designing new products for the distribution and transmission markets, including substation switching:-



1

PLP designs disconnectors, racks, cabinets and other hardware to meet the rigours of Bellcore Zone 4 seismic testing and high wind events.

2

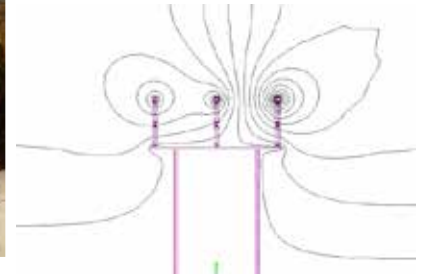
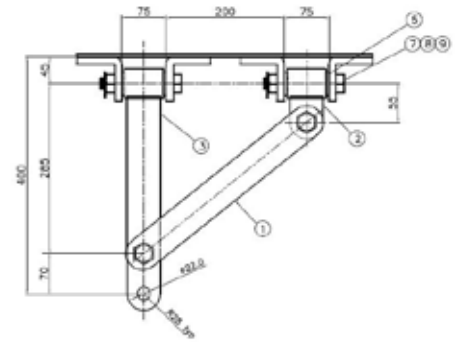
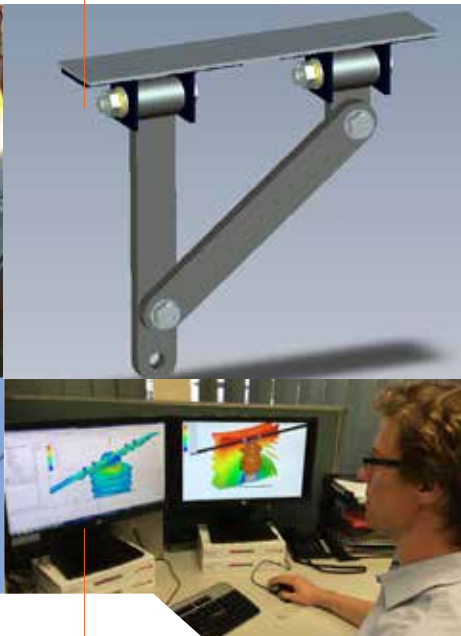
Aged and damaged fittings analysis.

All services described in the booklet relate to electrical and mechanically engineered products. For other engineering disciplines consult PLP (see back cover).

4 On Site Training.



5 Special overhead line fittings design and build.

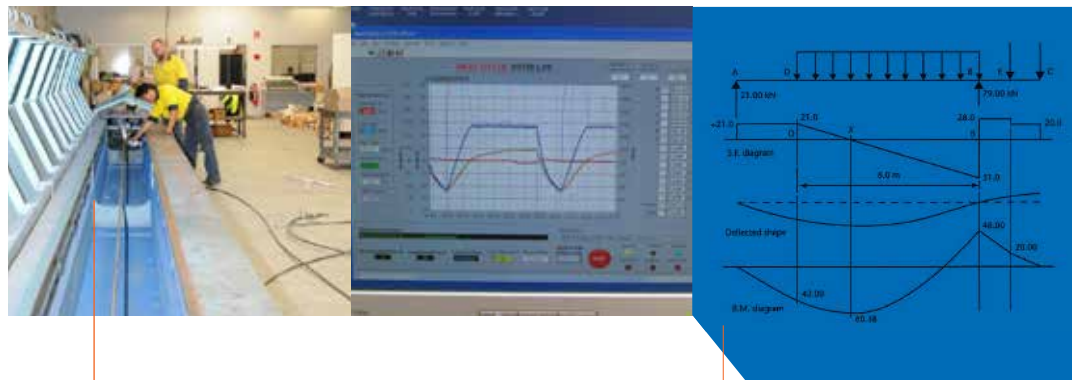


3 PLP composite cross arms were developed to reduce weight allowing for easier and safer installation practice whilst increasing cross arm life beyond that of timber.

6 Corona and electric field analysis employing ANSYS Maxwell®.

LAW FIRMS RUNNING A “FAILED PRODUCT” CASE WILL NEED A FORENSIC ANALYSIS BASED ON PRACTICAL EXPERIENCE AS WELL AS THEORY

PLP Engineering Services can provide a new dimension in understanding product failures by providing:-

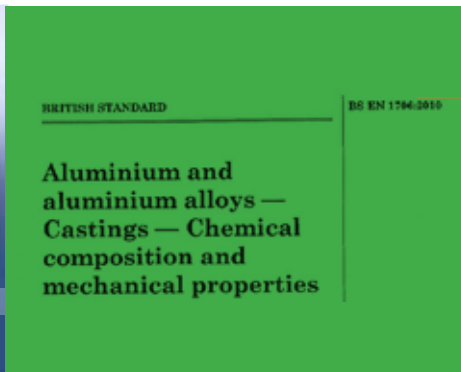
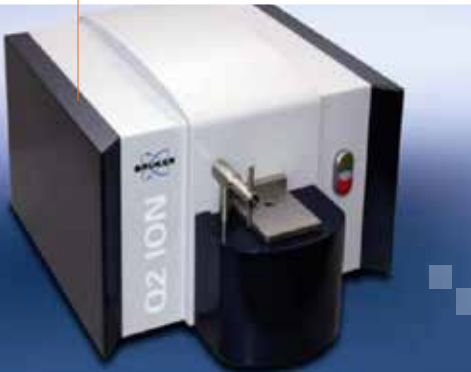


1 in house testing for mechanical and electrical products including sustained load and heat cycle testing

2 in house calculation reports for theoretical failure rates

All services described in the booklet relate to electrical and mechanically engineered products. For other engineering disciplines consult PLP (see back cover).

4 raw material testing and analysis



5 Interpretation of international standards



Failure Modes And Effects Analysis Worksheet

Process Name: *PIP (Preformed)* Creation Date: *10/10/2011*

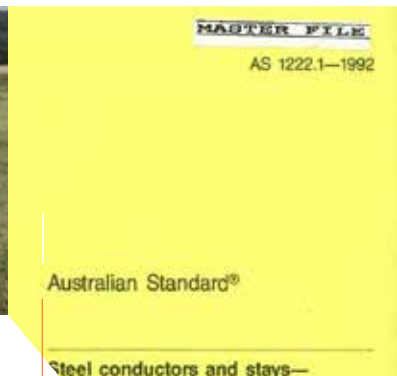
Effect of Failure	Severity of Failure	Process Capability	Frequency of Occurrence	Recommended Action(s)
Dimension	10	10	10	Review control plan
Material Characteristics	10	10	10	Change
Quantity/Production	10	10	10	Change
Quality	10	10	10	Change

3 model creation and testing

6 failure mode and effect analysis

PATENT ATTORNEYS IN NEED OF PRACTICAL PRODUCT ADVICE NEED PRACTICAL EXPERIENCE IN WRITING A MORE COMPREHENSIVE LIST OF CLAIMS

PLP Engineering Services has a skilled team of electrical and mechanical designers, CAD modellers and toolmakers on hand to prototype and test ideas, performed under the protection of non-disclosure agreements. These services include:-

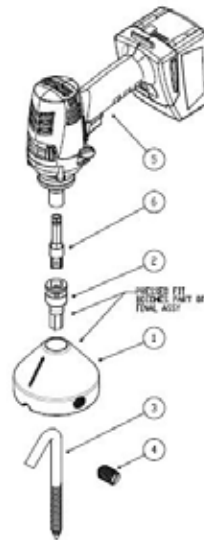


1 Solidworks, Creo or Inventor - 3D fully rendered models

2 Access to a vast library of Australian and New Zealand standards

All services described in the booklet relate to electrical and mechanically engineered products. For other engineering disciplines consult PLP (see back cover).

4 rapid tooling from our fully equipped tool room



EUROCOMP Design Code

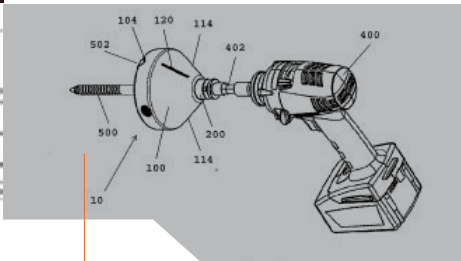
2.1.1.1 E-glass

P(1) E-glass fibre shall be selected when the highest strength-to-weight composites are required. It is the most widely used composite.

P(2) The relevant standard is ISO 9000 Textile glass - Yarn specification.

Table 1.1 Typical properties of fibres before process 2.1, 2.2

	E-glass	C-glass
Specific gravity	2.54	2.58



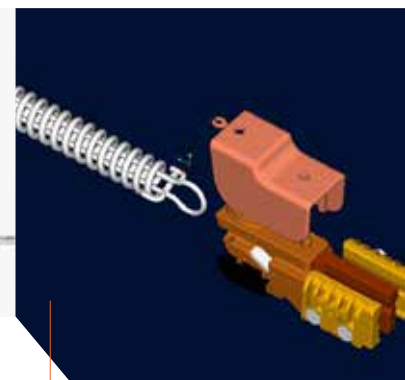
3 mechanical and electrical engineering calculations checked (including limit state design)

5 Practical assistance in CAD design through to line drawings that are patent ready.

VENTURE CAPITALISTS IN NEED OF PRODUCT REALISATION WHEN A WORKING PROTOTYPE IS AN ABSOLUTE MUST

PLP Engineering Services can provide a complete turnkey service from concept to internationally approved product ready for launch, or any part of the new product life cycle in between.

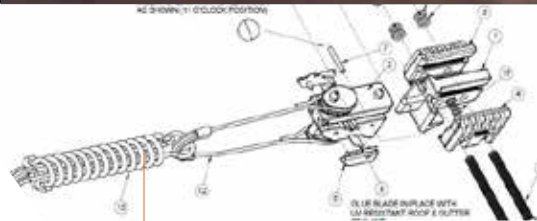
From the description of the customer problem to be solved, PLP Engineering Services can then project manage through the product realisation process, to provide:-



1 Concept failure mode and effect analysis incorporating concept harmony in design

2 3D CAD modelling to working prototype

All services described in the booklet relate to electrical and mechanically engineered products. For other engineering disciplines consult PLP (see back cover).



3 detail design suitable for tooling

4 type testing and first article inspection

5 Business to business marketing and promotion

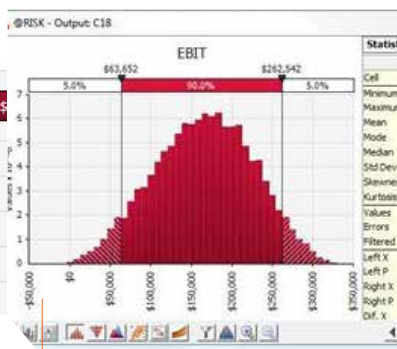
INDUSTRIAL DESIGNERS IN NEED OF PRACTICAL HELP CAN PROVE A PRODUCT WORKS FIRST

Failure Modes And Effects Analysis Worksheet
Process Responsibility: PhilTimball

Effects of Failure	A ₁₀	Causes of Failure	F ₁₀	P ₁₀	Mod	R
-Life danger	10	Design	4	-All forces, springs, contacts	5	** Mec
-Customer Dissatisfaction	5	Design	3	-All forces, springs, contacts	5	75 Des
-Improper Operation	10	Design	3	-Visual inspection	5	** Des
-Overheat	3	Design	4	-All forces, springs, contacts	5	** Sher

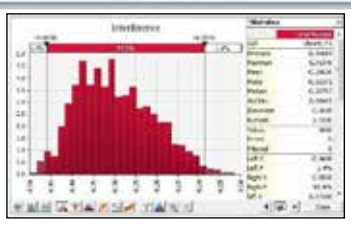
EBIT
Inputs Ranked By Effect on Output Mean

Input	Value	Effect on Output Mean
Input 1	\$62,243.86	\$133,895.15
Input 2	\$161,882.53	\$169,515.48
Input 3	\$162,404.10	\$169,536.19
Input 4	\$163,177.71	\$168,915.98
Input 5	\$163,597.39	\$169,248.95



1 Failure Mode and Effect Analysis.

2 Probabilistic spreadsheets give a much better insight into the real world than deterministic spreadsheets – PLP can develop and execute these models including probabilistic tolerance stacking



All services described in the booklet relate to electrical and mechanically engineered products. For other engineering disciplines consult PLP (see back cover).

TO EVERYONE WHO READS THIS BROCHURE

PLP Engineering Services has extensive experience working within the following areas:-



3 Data centres and computer rooms designing systems to minimise cooling requirements through the design and deployment of cold aisle containment.

4 PLP can also offer laser cutting, water cutting, powder coating, metal spray, additive manufacturing, investment casting, tool making, copper alloy casting, aluminium casting, sheet metal work, vacuum formed plastics and develop new processes to solve unique problems.

5 electrical connection expertise from milliamps and millivolts to thousands of amps and kilovolts.

MECHANICAL TESTING PERFORMED WITH NATIONAL OR INTERNATIONAL ACCREDITATION

At PLP Australia the Engineering Department is responsible not only for design and product development, but also for ensuring quality standards are met through NATA (ILACS recognised for mechanical testing) and ISO accreditation.

- AS Australian Standards
- ANSI American Standards
- BSI British Standards
- IEC International Standards
- NATA Accredited



Thus the testing function, the QA department and the engineering responsibilities are all intertwined. Manufacturing processes are monitored, audited, tested and improved, based on statistical process control techniques using SPSS software.

The test laboratory employs externally calibrated equipment to test tensile loads from 1N to 500kN, industrial hardness, galvanising and fatigue testing and heat cycling for overhead conductors.

DIMENSIONAL TESTS

- Profile projector
- Vernier callipers
- Micrometers
- Digital and analogue height indicators
- MEL lasers
- Go and No-Go gauges

MECHANICAL ENDURANCE TESTS

- Induction shaker force rating 980N
- Frequency range 1.5-3000Hz

MECHANICAL TESTS – TENSILE AND COMPRESSION

- 0-300kN Vertical test facility
- 10N Minimum tensile or compression
- 0-500kN Horizontal test facility to 20m test length
- Twist, wrap and torsion tests by the methods of - AS 1222, 1531, 3607
- 30kN Cantilever flex test
- Clamp slip test
- Tension tests on products without strain rate control, excluding proof stress tests in the range 0.2 to 500kN by the methods of - AS 1154, 2947 and EGAT Specification Section F Sections 8.a.2 to 8.a.6 and 8.d.1 to 8.d.2 and similar standards

CYCLIC THERMAL TESTS

- Heat cycle of conductors with data logger capability to 240° C

ULTRASONIC TESTS

- Ultrasonic flaw and RIF detection

MATERIAL STRUCTURE ANALYSIS

- Grippo grinder polisher
- Microscope



HARDNESS TESTS

- Brinell at 7.35, 4.9, 9.8 and 29.4 kN
- Rockwell testing using B, C scales
- Vickers
- Shore
- Barcol

VIBRATION ANALYSIS

- 2 x 30.5m Test spans equipped to measure vibration damper performance
- Vibration analysis measuring:
 - Damper mechanical impedance
 - Damper fatigue
 - Damper efficiency

POROSITY TESTS

- Integrity testing of porcelain insulators

APPLICATION ORIENTED ENDURANCE TESTS

- Fatigue testing of transmission line in-span conductor spacers

GALVANISING THICKNESS MEASUREMENT

- Magnetic method

THERMAL SHOCK

- Extreme temperature change test on porcelain insulators

THERMAL ENDURANCE

- Prolonged elevated temperature test on spiral vibration dampers

ELECTRICAL TESTING PERFORMED WITH NATIONAL OR INTERNATIONAL ACCREDITATION

- AS Australian Standards
- ANSI American Standards
- BSI British Standards
- IEC International Standards
- NATA Accredited

HEAT CYCLE TESTS

- IANZ Accreditation for IEC61238 (power cables up to 30kV) and IEC61284 (overhead lines).

IANZ is an ILAC Mutual Recognition Authorized Signatory. EPLP can co-accredit IANZ Reports with other ILAC Accreditations such as : NATA(Au)/ CGCRE(Br)/ CNAS(Ch)/ NABL(Id)/ KAN(In)/ SM(Ma)/ PAO(Ph)/ SANAS(SA)/ NSC(Th) / UKAS(UK).

- Lab equipment and methods can be adapted to accommodate other equivalent standards eg. BS3288:1, AS1154.1
- Four heat units / instrumentation systems of varying capacity:
 - **Heat Unit 1** – 23kVA Max Output:
1533A@13.5V or 2000A@9.78V (Continuous)
1932A@13.5V or 2300A@9.78V (Short-term)
 - **Heat Unit 2** – 7kVA Max Output:
1000A@5.85V (Continuous)
1200A@5.85V (Short-term)
 - **Heat Unit 3** – 75kVA Max Output:
2500A@27V (Continuous)
3000A@27V (Short-term)
 - **Heat Unit 4** – 25kVA Max Output:
2500A@10V (Continuous)
3000A@10V (Short-term)
- Externally calibrated instrumentation and measurement systems. Data logging and electronic control of heat units performed via National Instruments' Labview systems



SHORT CIRCUIT TESTS

- IANZ Accreditation for IEC61238 (power cables up to 30kV)
- Short circuit unit supplied by 11kV supply via two 400kVA transformers on site
- Max Output: 25kA@40.6V (~6s duration)
- Temperature monitoring

MAGNETIC POWER LOSS TESTS

- IANZ Accreditation for IEC61284 (overhead lines)
- Heat units 2 and 4 provide pure sine wave current supply
- Externally calibrated instrumentation and measurement systems

JOINT ANALYSIS

- Analysis of ex-service joints to determine failure mechanism(s)
- Availability of live-line instruments and analytical tools including Ohmstik, Voltstik, and Reluctance tester

ENVIRONMENTAL ELECTRICAL TESTS

- Programmable environmental chamber -40°C to 100°C
- Tensions up to 100kN
- Up to 6kV

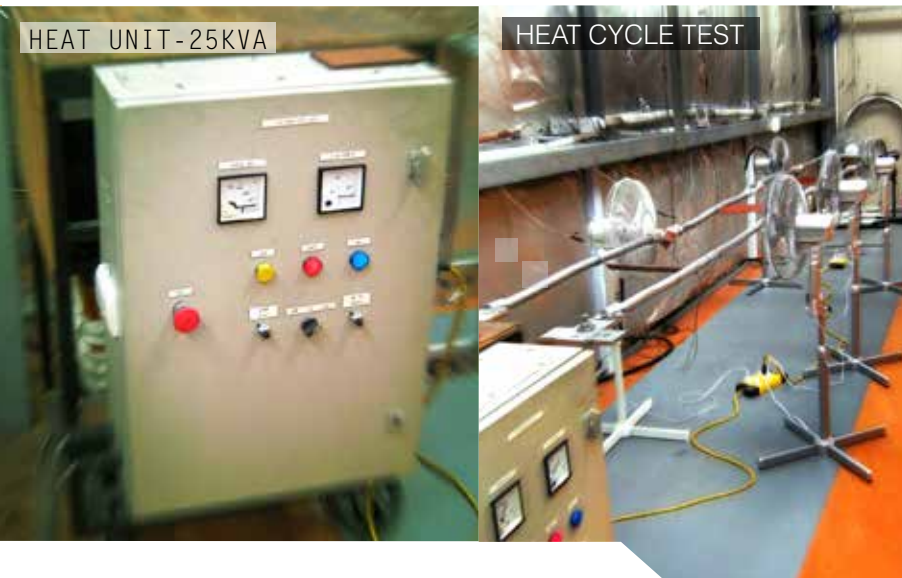
GLOBAL-MARK QA ACCREDITATION 100660

Most companies nowadays rely heavily on ISO9001 Certification to reflect an organisations commitment to quality, leadership, systems and the sound and stable processes which can deliver consistently safe products or services that meet their customer's expectations.

This gives PLP's customers confidence in our ability to deliver quality goods and saves them from having to conduct time consuming and expensive second party audits.

Whilst this is well and good a great deal of reliance is placed on the competency of the organisation's facilities and personnel to be able to comply with the guidelines and procedures as required by ISO9001 Certification.

The QA Accreditation only ensures that the relevant processes are in place. It can not in itself ensure that these processes are being carried out competently by adequately trained staff with sufficient resources, facilities and training.



NATA ACCREDITATION NO. 922

NATA accreditation provides a means of determining, formally recognising and promoting the competence of facilities to perform specific types of testing, inspection, calibration, and other related activities.

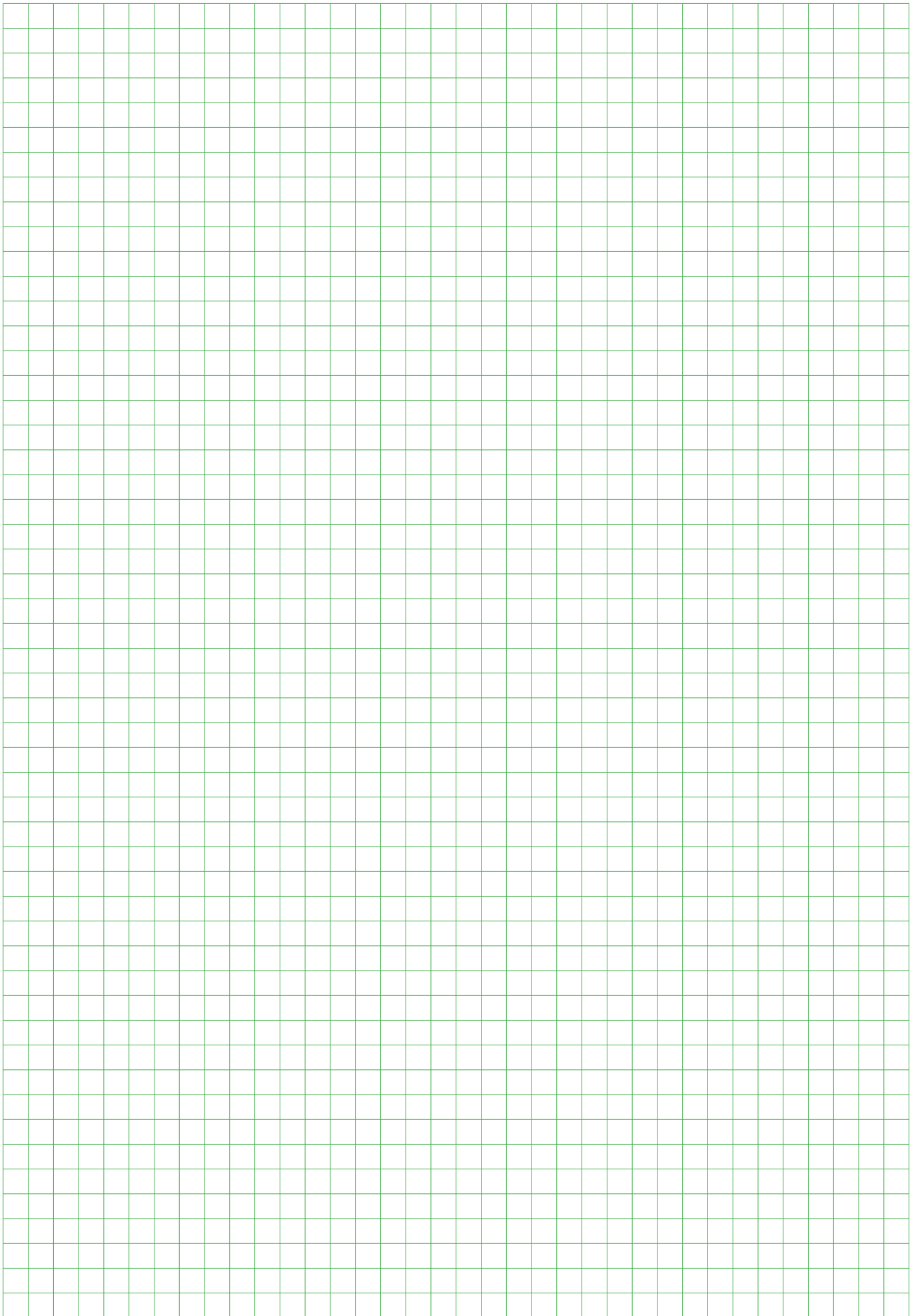
Accreditation is distinct from certification, which focuses on an organisation's overall compliance with systems and products standards rather than technical competence. Facilities accredited by NATA become members of the Association.

NATA's accreditation is based on a peer-review process made possible by some 3000 volunteer experts who assist with the assessment of facilities and sit on NATA's various technical committees. To maintain accreditation, facilities must be re-assessed regularly.

The criteria for determining a facility's competence are based on the relevant international standard (eg ISO/IEC 17025, ISO 15189, ISO/IEC 17020) and include: the qualifications, training and experience of staff; correct equipment that is properly calibrated and maintained; adequate quality assurance procedures and appropriate sampling practices.

Test Facilities comply with the requirements of ISO/IEC 17025:2005 including the following sections:

- 13.01 Metals and metal products
- 13.44 Mechanical tests on assemblies
- 13.94 Coatings





PREFORMED
LINE PRODUCTS

For more information, please contact the Engineering Services Manager on +61 (0) 422 378 086 between **9am** Auckland time and **4pm** Perth time or email engineeringervices@preformed.com.au

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