Transformer or Product Failure Policy

When a product failure occurs the Engineering Manager must implement a formal tracking process with descriptions, serial numbers etc.

A transformer/ product failure folder much be created and then a sub folder with client name, the next folder with the description and serial number. All documents, emails etc. to be saved on the sharepoint system.

Engineering Managers role is to undertake detailed technical evaluations and root cause analysis with emphasis on developing a solution and technical response to the client, testing, site visits and anything else necessary to avoid company reputation risk and further failures occurring. Full assessment of all possible AS or IEC standards need to be taken into account.

Operations Managers role is to hold the Engineering Manager accountable to timelines and executing appropriate responses, document control and tracking or technical investigations etc. The Operations Manager must also ensure smooth communications and planning of company resources to derive a satisfactory outcome for the client's warranty or non-warranty claim. Cost capture and final document close out falls under the Operation Managers responsibility as well such as NCR, Warranty or non-warranty customer invoicing and final call to client ensuring our ongoing business relationship.

When a client warranty call occurs to any person in the company, the Operations Manager and Engineering Manager must be immediately informed of the matter. The Operations Manager must open a job card in MYOB with the help of Admin and must open an NCR within the companies ISO management system. This must all occur within 3 hours of query arising from the customer.

Confirmation of whether it is a warranty or non-warranty matter needs to be ascertained by the Operations or Engineering Manager. Both situations require the same high level and immediate attention with a response before COB same day to the client informing them that we are investigating and will respond as soon as possible with an action plan.

Should one of these managers be away on other work-related matters or personal leave the other manager should take full control.

This policy is applicable to local manufacturing and imported products.

The goal is to support the client and ensure they feel we are treating this as a priority with our total focus on determining the exact cause of failure and then executing a plan to avoid this same failure occurring again. This means technical, packaging, transport, site conditions all must be considered.

Operations Manager must be keeping track of all costs within the MYOB job card (auto build section) with the help of the Admin team to determine the company's losses regardless of warranty or not warranty type claim and the end of the process.

The use of AI to help navigate and research is recommended but the Manager must ensure the data and communications is fully vetted by themselves. We do not want to sound like robots with any response derived by AI.

Transformer Failure Engineering Check Boxes and Steps

Customer: [Insert]
Project: [Insert]
Transformer Serial Number: [Insert]
Failure Reference: [Insert]
Project Manager: [Insert]
Engineering Manager: [Insert]
Date Opened: [Insert]

A. Immediate Response

☐ Confirm the transformer rating, serial number and manufacturer.
☐ Establish the exact time and sequence of the failure.
☐ Confirm whether there was fire, smoke, oil release or personnel risk.
☐ Confirm which protection devices operated.
☐ Preserve relay records, fault records and photographs.
☐ Instruct the customer not to disturb failed components unnecessarily.
☐ Arrange preservation or return of failed components.
☐ Identify all similar transformers supplied.
☐ Assess whether production should be stopped for same application orders.
☐ Assess whether shipment should be stopped for product on route to same applications.
☐ Assess whether installation or energisation should be stopped.
☐ Notify the CEO of any major, systemic or reputational risk.
☐ Open a formal NCR or corrective action record.

B. Site and Operating Conditions

☐ Confirm appropriate standards were used and considered

☐ Confirm actual loading at the time of failure.
☐ Review historical loading.
☐ Confirm ambient temperature.
☐ Confirm ventilation conditions.
☐ Confirm harmonic loading.
☐ Confirm voltage variation.

☐ Confirm switching frequency and duty.
☐ Confirm downstream motor or rectifier loads.
☐ Confirm upstream fault levels.
☐ Confirm recent network faults.
☐ Confirm protection settings and coordination.
☐ Confirm earthing arrangements.
☐ Confirm installation clearances.
☐ Confirm cable sizes and terminations.
☐ Confirm site commissioning test results.
☐ Confirm transport and installation history.
☐ Determine whether site conditions were within the specified design duty.

C. Design Review (engage OEM when applicable)

Core

☐ Confirm core material grade.
☐ Confirm core mass.
☐ Confirm core cross-sectional area.
☐ Confirm operating flux density.
☐ Confirm overflux capability.
☐ Review core clamping.
☐ Review core earthing.
☐ Compare core design with a proven alternative design.

Windings

☐ Confirm HV conductor material and mass.
☐ Confirm LV conductor material and mass.
☐ Confirm HV current density.
☐ Confirm LV current density.
☐ Confirm conductor dimensions.
☐ Confirm winding geometry.
☐ Confirm strand arrangement.
☐ Confirm transposition requirements.
☐ Confirm radial duct arrangement.
☐ Confirm axial duct arrangement.
☐ Review eddy-current and stray-loss risks.
☐ Review hot-spot calculations.

Mechanical Strength

☐ Review winding axial forces.
☐ Review winding radial forces.
☐ Review short-circuit force calculations.
☐ Review clamping pressure.
☐ Review blocks, spacers and support rings.

☐ Review lead supports.
☐ Review core and coil assembly restraint.
☐ Review tank mechanical strength.
☐ Review transport bracing.
☐ Confirm short-circuit withstand design margins.

Insulation

☐ Review turn insulation.
☐ Review layer insulation.
☐ Review barrier insulation.
☐ Review end insulation.
☐ Review phase-to-phase clearances.
☐ Review phase-to-earth clearances.
☐ Review creepage distances.
☐ Review impulse distribution.
☐ Review partial discharge risk.
☐ Confirm insulation thermal class.
☐ Confirm drying and moisture limits.
☐ Confirm insulation changes address the root cause rather than only the symptom.

Thermal Performance

☐ Review total losses.
☐ Review no-load losses.
☐ Review load losses.
☐ Review stray losses.
☐ Review oil volume.
☐ Review oil circulation paths.
☐ Review radiator sizing.
☐ Review cooling surface area.
☐ Review top-oil temperature rise.
☐ Review average winding temperature rise.
☐ Review winding hot-spot temperature.
☐ Confirm thermal margins under actual site duty.

Tank and Accessories

☐ Review tank wall thickness.
☐ Review tank reinforcement.
☐ Review weld quality requirements.
☐ Review vacuum withstand.
☐ Review pressure withstand.
☐ Review pressure relief device sizing.
☐ Review bushings.
☐ Review cable boxes.
☐ Review tap changer rating.
☐ Review internal connections.
☐ Review oil level and temperature devices.

D. Mandatory Comparative Review

☐ Compare the failed transformer with the customer specification.
☐ Compare it with applicable Australian and international standards.
☐ Compare it with previous successful Grant designs.
☐ Compare it with another approved Grant factory.
☐ Compare it with a known reliable competitor or alternative supplier.

For each comparison, record:

☐ Total transformer mass.
☐ Active part mass.
☐ Core mass.
☐ Conductor mass.
☐ Oil mass.
☐ Tank and structural mass.
☐ Core dimensions.
☐ Winding dimensions.
☐ Current density.
☐ Flux density.
☐ Oil volume.
☐ Cooling surface.
☐ Losses.
☐ Impedance.
☐ Temperature rise.
☐ Short-circuit strength.
☐ Insulation levels.
☐ Mechanical bracing.

Significant Weight Difference Review

Where another transformer is materially heavier:

☐ Determine the exact weight difference.
☐ Determine whether the difference is in the core.
☐ Determine whether the difference is in conductor mass.
☐ Determine whether the difference is in oil volume.
☐ Determine whether the difference is in tank strength.
☐ Determine whether the difference is in cooling equipment.
☐ Determine whether the heavier design uses lower flux density.
☐ Determine whether the heavier design uses lower current density.
☐ Determine whether the heavier design provides better thermal margins.
☐ Determine whether the heavier design provides greater short-circuit strength.
☐ Formally raise the difference with the factory.
☐ Obtain calculations supporting the lighter design.
☐ Reject unsupported claims that the lighter design is equivalent.

Engineering explanation of mass difference:

[Insert]

E. Manufacturing Review

☐ Review approved drawings against as-built construction.
☐ Review material certificates.
☐ Review conductor certificates.(local)
☐ Review core steel certificates. (local)
☐ Review insulation material certificates. (local)
☐ Review winding tension controls. (local)
☐ Review winding dimensional checks. (local)
☐ Review brazing and connection quality. (local)
☐ Review core stacking process. (local)
☐ Review clamping process. (local)
☐ Review drying cycle records.
☐ Review vacuum records.
☐ Review oil-filling records.
☐ Review oil quality.
☐ Review cleanliness controls.
☐ Review factory photographs.
☐ Review hold-point inspections.
☐ Review deviations and concessions.
☐ Determine whether undocumented substitutions occurred.
☐ Determine whether the factory complied with the approved design.

F. Test Review

☐ Review winding resistance results.
☐ Review transformer turns ratio results.
☐ Review vector group results.
☐ Review no-load loss results.
☐ Review excitation current results.
☐ Review load loss results.
☐ Review impedance results.
☐ Review insulation resistance results.
☐ Review dielectric test results.
☐ Review induced voltage test results.
☐ Review applied voltage test results.
☐ Review partial discharge results, where applicable.
☐ Review impulse test results, where applicable.
☐ Review temperature-rise results, where applicable.
☐ Review oil test results.
☐ Check for abnormal phase variation.

☐ Check for trends that were accepted but should have been investigated.
☐ Determine whether the original test program was sufficient to identify the weakness.

G. Root Cause Analysis

☐ Identify the immediate failure mechanism.
☐ Identify the underlying design weakness.
☐ Identify the material or manufacturing weakness.
☐ Identify the quality-control failure.
☐ Explain why the issue was not detected earlier.
☐ Determine whether more than one cause contributed.
☐ Complete a Five Whys analysis.
☐ Complete a fault tree, fishbone or FMEA where appropriate.
☐ Separate evidence from assumptions.
☐ Record unresolved questions.
☐ Do not close the investigation with a generic conclusion.

Confirmed failure mechanism:

[Insert]

Underlying root cause:

[Insert]

H. Factory Direction

☐ Issue the factory with a formal corrective action request.
☐ Clearly describe the failure.
☐ Provide the evidence collected.
☐ State Grant’s preliminary technical findings.
☐ Require revised design calculations.
☐ Require material and mass comparisons.
☐ Require revised drawings.
☐ Require manufacturing process changes.
☐ Require quality-control changes.
☐ Require an affected serial-number list.
☐ Require a proposal for transformers already manufactured.
☐ Require a proposal for transformers already supplied.
☐ Specify validation testing.
☐ Set clear due dates.
☐ Identify the responsible factory engineer.
☐ Reject vague statements such as “we will improve quality.”
☐ Reject unsupported factory explanations.
☐ Escalate delays or resistance to the CEO.

I. Corrective Action Verification

☐ Revised calculations independently reviewed.
☐ Revised drawings approved by Grant.
☐ Material changes verified.
☐ Weight changes verified.
☐ Manufacturing process changes verified.
☐ Inspection and test plan updated.
☐ Factory personnel trained.
☐ Production records reviewed.
☐ Photographic evidence reviewed.
☐ Critical manufacturing stages witnessed.
☐ Additional tests witnessed.
☐ Type or special testing completed where required.
☐ Corrective action applied to existing production.
☐ Corrective action applied to affected stock.
☐ Corrective action considered for installed units.
☐ Residual risk formally accepted.

J. Customer and Commercial Review

☐ Determine whether the customer must be notified immediately.
☐ Prepare a technically accurate customer explanation.
☐ Avoid blaming the factory before evidence is confirmed.
☐ Identify warranty obligations.
☐ Identify replacement requirements.
☐ Identify site labour requirements.
☐ Identify freight requirements.
☐ Identify liquidated damages exposure.
☐ Identify lost revenue exposure.
☐ Identify future tender risk.
☐ Identify reputational risk.
☐ Obtain CEO approval for major customer commitments.

K. Closure Requirements

The investigation must not be closed until all items below are complete:

☐ Failure mechanism identified.
☐ Root cause identified.
☐ Evidence supports the conclusion.
☐ Comparable designs reviewed.
☐ Significant weight and material differences explained.

☐ Affected transformer population identified.
☐ Factory corrective action completed.
☐ Corrective action independently verified.
☐ Existing units assessed.
☐ Customer actions completed.
☐ Commercial exposure recorded.
☐ Lessons learned issued.
☐ Standard specifications updated where required.
☐ Engineering checklists updated where required.
☐ CEO approval obtained for major or critical failures.

Sign-Off

Project Manager: _____
Date: _____

Engineering Manager: _____
Date: _____

Operations Manager: _____
Date: _____

Marco Da Silva
Chief Executive Officer