

Annex D (Informative)

Poles and structures

Component	Failure description	Work request Operation Steps
Wooden Pole	Anti-perching damaged Bird droppings on pole Class 3, not stubbed Class 4 Earth wire separation Earth wire sub-standard joint Earth Wire not cut 500mm Incorrect plant depth Impact damage Pole leaning over 5° External decay or fire damage > 8 mm deep Unauthorised attachment Vacant holes in pole Vertical end crack Woodpecker nests Sub-standard Anti-climbing devices Pole cracked ₁	Repair/replace anti-perching as per standard Install anti-perching as per standard Stub pole as per standard Replace pole Join earth wire Replace joint on earth wire Cut earth wire as prescribed Replant pole as prescribed Replace pole Secure structure, excavate, straighten structure, backfill and compact. Replace pole Remove attachment Plug and treat holes with creosote Replace pole Plug and treat holes with creosote Repair anti-climbing device on site Replace pole

Component	Failure description	Work request Operation Steps
Cross-arm steel	Bird dropping Cross arm bent Galvanizing/Paint damaged Rusting/Corroding Pull out of line Steel flaking Twisted	Clean pollution and install anti-perching devices Replace cross arm Apply anti -oxidants Apply anti-oxidants Correct sagging on all three phases, correct cross-arm orientation and secure. Replace cross-arm Identify and correct cause of torsion and replace cross arm
Cross arm wood	Bird droppings Bird Nesting organic Bird nesting steel Bonding bird caging Bonding incomplete Bonding loose Bonding absent Bonding cut Earth wire not bonded Twisting Split/bent or broken Untreated vacant hole Foreign substance collecting at top Fire damage > 8 mm Wood shrinkage (end binders, pins bolts and nuts)	Clean pollution and install anti-perching devices. If exotic, remove nest. If indigenous report to Environmental Practitioner for action. If clear from conductors remove and report. If not remove during the next outage. Replace bonding Replace bonding Secure bonding at next outage Install bonding Join bonding Bond earth wire to bonding Identify cause of torsion and replace cross-arm Replace cross arm Plug hole and treat with creosote Report to Environmental Practitioner for investigation and report. Replace cross-arm Replace cross-arm

Component	Failure description	Work request Operation Steps
Anti Climbing devices	Barbed wire broken Sub-standard barbed wire Incorrect installation height Loose Frame Not installed/removed	Install new barbed wire Replace with new barbed wire Reposition anti-climbing device Secure frame to structure Install anti-climbing where necessary
Stay and wire	Wire strands broken (More than 2 strands) Poor clearance to conductors (11 kV < 200 mm, 22 kV < 320 mm, 33 kV < 430 mm) Conductor/performs rusting (Brittle) Stay insulator flash marks Stay insulator broken Stay insulator poor ground clearance Stay insulator not installed Anti climbing damaged/ removed rusted Incorrect stay/strain orientation Slack stay Stay rod damaged Stay rod extraction Stay/pole loop loose	Replace stay. Replace and re-position stay Replace component Replace stay insulator, ensure compliance to BIL management. Replace stay insulator Replace stay to standard Install stay insulator to standard Install new anti-climbing device as per standard Replace stay to correct orientation and remove old. Tension stay Replace stay Replace stay and stay rod to standard. Replace stay
Brace	Bent Not installed/removed Pole bolts loose X-Arm bolts loose Rusted Twisted	Replace brace Install brace Secure brace with new bolts, nuts and washers Secure brace with new bolts, nuts and washers Replace brace Identify and remove torsion and replace brace
Dead end hardware (Pistol grips, thimbles, dead ends)	Galvanic corrosion Unit Deformation Pin extraction Split pins/bolts or nuts missing	Replace unit ensuring correct tensioning and alignment

Component	Failure description	Work request Operation Steps
Surge arrestors	Shattered Drop out operated Knock out operated Flash marks across Flash/pit marks on holder Leads over tensioned Not installed Inappropriate installation location Polluted Fitting loose Skirts damaged	Replace surge arrestor ensuring placement close to equipment to be protected. Replace drop out surge arrestor Replace surge arrestor ensuring placement close to equipment to be protected Replace surge arrestor and ensure good earthing resistance. Replace surge arrestor and ensure good earthing resistance Install leads or appropriate length Install surge arrestor ensuring placement close to equipment to be protected Relocate Surge Arrestor close to equipment to be protected Clean surge arrestor Secure fittings by tightening or replacing bolts and nuts. Replace surge arrestor ensure placing close to equipment to be protected
Equipment mounting platform	Incomplete Incorrect component selection Bed bolts loose Equipment/bed bolts loose Equipment/bed bolts missing Coach screws missing Coach screws extraction Pole clamps oversize Bed not level/ hanging over	Introduce missing components to platform Replace platform with appropriate units Secure bed to structure Install bolts and nuts as per standard Install bolts and nuts as per standard Install coach screws Re-position coach screws Replace pole clamp with appropriate unit Level bed and secure as required.
Vibration dampers	Bell broken off Bolts loose Conductor damage at bell Poor bell orientation Bell collapsed Bell migration on conductor	Replace vibration damper and orientate to standard Replace vibration damper Install conductor repair kit and orientate to standard Replace vibration damper and orientate to standard Replace vibration damper and orientate to standard Replace vibration damper and orientate to standard
Flight path diverters	Damaged Discolouration Fallen to ground	Replace flight path diverters Replace flight path diverters Replace flight path diverters

Component	Failure description	Work request Operation Steps
Insulators glass/porcelain (Clevis and tong or Ball and socket)	Shattered Insulator skirts damaged Glazing deteriorated Flash marks on surface Side tension on insulator Incorrect selection (Insulation or loading) Incorrect strain alignment Insulator pins loose/missing/extracting Inconsistent cleanliness' in string Pollution on insulators Pit marks on end (pins/stem)	Replace insulators, confirm all in string are clean and BIL management to standard Replace insulators, confirm all in string are clean and BIL management to standard Replace insulators, confirm all in string are clean and BIL management to standard Replace insulators, confirm all in string are clean and BIL management to standard Remove tension, mesh linkages and components and tension to standard Remove tension, and insulator, replace with appropriate units and tension to standard Remove tension, correct orientation and tension to standard Remove tension, replace primary and hunch-back pins. Clean insulators evenly or replace complete string of insulators. Replace insulators and present polluted ones to Technology and Quality. Remove tension and replace insulators. Ensure BIL management to standard
Insulator Non ceramic (Long Rods)	Skirts missing damaged Rod exposed Contaminated Incorrect orientation Insulator under tension Damaged/rusted pins and eye bolts Poor meshing (insulator and eye bolts) Pit marks on end (pins or stem) Flash marks	Remove tension; replace insulator and tension to standard. Remove tension, replace insulator and tension to standard Remove tension, replace unit, present old unit to Technology and Quality Remove tension, re-orientate insulator and tension to standard Remove tension, mesh linkages and tension to standard Remove tension, replace hardware and tension to standard Remove tension and correct meshing between linkages Remove tension, replace insulator. Ensure BIL management to standard Remove tension, replace insulator. Ensure BIL management to standard
Insulator (Pin or post)	Skirts missing damaged (> 20%) Contaminated Skirts punctured Insulator under tension Pit marks on ties, conductor or pin. Side tie unravelling	Replace insulator Remove tension, replace unit, present old unit to Technology and Quality Replace insulator Remove tension, secure insulator and tension as per standard. Replace insulator. Replace side tie and bind to standard

Component	Failure description	Work request Operation Steps
Jumpers	Bird caging Broken strands Hot connection on joints No APG clamps on perform PG clams on jumpers Substandard clearance Multiple joints on jumper	Replace jumper Replace jumper Replace joints Install APG clamps on perform Replace with non-tension compression joints Install new jumper re-routed to ensure clearance to other conductors and earth Install new jumpers and join with non-tension compression joints
Pre-form joints on conductor	Broken strands Burn marks Heat discoloration Rusting discoloration Oxidation Incorrect application Conductor slippage in joint Incorrect pre-form selection Multiple joints in span Joint incomplete	Replace with full tension compression joints Replace span conductor and join with compression joints Replace with full tension compression joints
Crimp Joints on conductor	Crimp deformation (banana shape) Uneven crimping across length Conductor extraction Heat discolouration Rusting Conductor slippage Multiple joints in span Incorrect selection and application Cracking along joint	Replace with full tension compression joint. Replace with full tension compression joint Replace span conductor and join with full tension compression joints Replace with full tension compression joints Replace with full tension compression joints
Concentric Air Dac	Conductor Exposed Poor. No drip loop Sub-standard ground clearance Wall/Roof anchorage substandard Pig tail damaged Wedge clamps sub-standard	Redo cable end or replace service connection if required. Install drip loop if slack provides. Replace service connection Re-tension if practicable or install appropriate structure Install stubbing pole Replace pig tail and ensure correct tensioning Replace wedge clamps and ensure correct tensioning

Component	Failure description	Work request Operation Steps
Span Conductor	Bird caging Broken strands Burn, pit marks Substandard clearance to road Substandard clearance to Telephone line Substandard clearance to Buildings Substandard clearance to LV Lines Substandard clearance to HV lines Impact damage Poor phase clearance symmetry Poor sagging Over/under tension visible Incorrect tie down	Replace span and tension to standard Repair conductor with crimp joint Repair conductor, re-tension checking phase clearance and span length. Refer to Maintenance Specialist for investigation and report Refer to Maintenance Specialist for investigation and report Refer to Delivery Controller for investigation and customer action Refer to Maintenance Specialist for investigation and report Refer to Maintenance Specialist for investigation and report Replace span conductor and tension to standard Tension to standard, ensure span length is correct, ensure standard structure designs Re-tension all phases on the span Re-tension all phases on the span Replace tie downs
Fargo joints	Hot connection Joint body impact Joint oxidation/rusting Joint slipping	Replace Fargo joint
Line taps	Audible crackling Discolouration Hot connection Incorrect application Conductor damage	Replace line tap with crimp joint Replace line tap with crimp joint Replace line tap with crimp joint Replace line tap with crimp joint Repair conductor with pre-form

Component	Failure description	Work request Operation Steps
Link (Isolator)	Fuse blown Fuse holder burnt Fuse holder damaged Fuse grading suspect Hot connection top Hot connection bottom Insulator damaged Insulators flashed over Insulator loose at base Insulator skirts broken Mechanism damaged	Replace fuse as per fusing philosophy Replace fuse holder Replace fuse-holder Enquire to correct fuse grading and replace as directed Redo termination during next outage or live work Redo termination during next outage or live work Replace isolator Replace drop out fuse link and ensure surge arrestor placement/earthing is adequate Replace isolator Replace isolator Replace isolator
Booster/regulator	Flash marks on insulators Bushing Glazing deteriorated Insulator cracked Bushing Terminal Hot connection Insulator polluted Bushing Oil leak	Replace insulators and ensure surge arrestor placement/earthing is adequate Replace insulator. Replace insulator Replace termination Clean insulators Drop oil level, replace seals, secure insulators and replenish oil.
Switch	Hot connection top Hot connection bottom Insulator damaged Insulators flashed over Insulator loose at base Insulator skirts broken Link arm damaged Link arm miss-alignment Snap Mechanism damaged Turbulator damaged	Replace turbulators, moving and static contacts. Set according to specification Replace link assembly Replace link assembly Replace link assembly and ensure surge arrestor placement/earthing is adequate Replace link assembly Replace link assembly Replace link arm Mesh linking and mechanism by adjustment. Replace switch Replace turbulators.

Component	Failure description	Work request Operation Steps
Current Transformers Reclosers Sectionalisers	Flash marks on Bushing Glazing deteriorated Insulator cracked Insulator skirts broken (<20%) Terminal Hot connection Insulator polluted Oil leaks Silica Gel sub standard Noisy unit Low oil level Paintwork damaged Ground Clearance Screws loose/missing	Replace bushing and ensure surge arrestor placement/earthing is adequate Replace bushing Replace current transformer and commission to standard Seal Replace clamps and terminations Clean insulator Replace current transformer and commission to standard Replace current transformer and commission to standard Replace current transformer and commission to standard Top up oil level, ensure the unit is not leaking oil Paint to standard Reposition unit Tighten screws and nuts

Component	Failure description	Work request Operation Steps
Power Transformers	Silica-gel pink, white or missing HV Earth wire broken LV Earth wire broken HV/LV earthing not split HV/LV no surge arrestor Oil leaks Low oil level Paint damaged Oxidation of tank Sub-standard ground clearance Surge arrestors not mounted on tank Transformer noisy Flash marks on insulators Bushing Glazing deteriorated Insulator cracked Bushing Terminal Hot connection Insulator polluted Bushing Oil leak	Replace silica-gel and replenish oil filter to standard Replace HV earthing Replace LV earthing Install earthing as per standard Install voltage clamp between HV and LV as per specification Repair oil leaks or replace transformer Top up oil or replace transformer Paint transformer as per standard Treat transformer with anti-oxidant and paint according to standard Reposition transformer to standard Reposition surge arrestors and ensure appropriate earthing resistance Investigate case of noise and act accordingly. Replace transformer, ensure correct surge arrestor placement and earthing resistance Replace transformer Replace transformer Redo termination Clean insulators

Component	Failure description	Work request Operation Steps
External Cabling	Armouring damaged Exposed conductor Gland/cable extraction Gland shroud missing Gland shroud perished Lose glands Cable loose from structure Cable laying on ground Poor clearance to conductors	Remake cable end, shroud and gland to standard Remake cable end, shroud and gland to standard Tighten gland Secure to structure
Meter/terminal boxes	Back plate damaged Back plate loose Back plate rusted Blanking plated missing Box/attachments damaged Box attachments loose Box paintwork/galvanising poor Door damaged Door seals damaged Door hinges damaged Exposed conductors Wiring loose terminals Audible crackling or hissing sound Vermin encroachment Moisture collecting	Replace back-plate, secure and re-commission meters and installation Secure back-plate Replace back-plate, secure and re-commission meters and installation Install blanking plates Replace box and re-commission meters and installation. Secure box to structure or plinth Treat with anti-oxidants and re-paint as per standard Replace door and hinges Replace door seals Replace door hinges Replace conductors and covers to SANS 10142-1 standard Redo terminations Investigate loose connection with caution and correct Clear box and ensure anti-vermin measures are corrected Dry box and ensure sealing is appropriate
Tariff and statistical meters/Control gear	Meter/relay seals broken Meters by-passed Substandard revenue protection Exposed conductors and no covers Incorrect MCB size Poor SABS 10142 beyond point of supply Meters physically damaged	Investigate energy theft, replace seals and report to Delivery Controller Investigate energy theft and report to Delivery Controller Investigate energy theft and report to Delivery Controller. Replace seals. Replace conductors and install covers where required. Replace MCB with appropriate units and notify Delivery Controller Conduct follow up investigation by Installation Inspector Replace and re-commission meters

Component	Failure description	Work request Operation Steps
Signage and notices	Danger label not installed Danger label loose Danger label illegible Pole number missing Pole number incorrect Pole number illegible Fuse rating plate missing Fuse rating plate illegible Fuse rating plate incorrect	Install danger labels Secure danger label to structure Install pole number Install pole number Replace pole numbers as required Replace pole number Replace/ install fuse rating plate Replace fuse rating plate Replace fuse rating plate
Single line diagram and asset data	Incorrect pole numbers on diagram Incorrect pole number as built Incorrect connectivity on diagram Incorrect asset data on diagram	Correct single line and operating diagrams Replace pole numbers as per standard and "red-line" operating and SLD's Correct single line and operating diagrams "Red-lining" Correct single line and operating diagrams "red-lining"

Component	Failure description	Work request Operation Steps
Vegetation	Tree into line (Danger tree) Tree under line in close proximity Tree under line good clearance High tree outside way-leave Vegetation at structure base Legally declared weeds and invader plants (servitudes only) Legally protected trees	Cut clear with link-stick sheers and high cutters and report. Cut down tree to standard Cut down tree to standard Report for vegetation management action Report for vegetation management action Report for vegetation management action Clear total width of servitude Apply for permits to cut and obtain written permission.
Environmental impact	Exotic bird dead under line Raptor dead under line Indigenous bird dead under line Dead domestic animal under line Dead game under line Dead cats under line Erosion of access roads	Report to Environmental Practitioner for investigation and report Report to Environmental Practitioner for investigation and report Report to Environmental Practitioner for investigation and report Report to Environmental Practitioner and Delivery Controller for investigation. Report to Environmental Practitioner and Delivery Controller for investigation. Report to Environmental Practitioner and Delivery Controller for investigation. Report to Environmental Practitioner for investigation and report.
Servitude/way-leave	Fence damaged by Supply Authority Game fence-no access Supply Authority locked out Supply Authority's gate damaged Oil spills Redundant material in servitude Risky building activity in proximity (In/formal) Risky farming activity	Repair fence to standard Forward to Delivery Controller for customer interaction Forward to Delivery Controller for customer interaction Maintain gate to standard Conduct hazmat operation Remove redundant material Notify Delivery Controller for resolution Notify Delivery Controller for resolution