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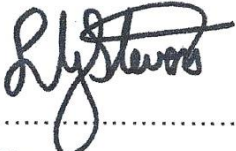


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1. INTRODUCTION

Eskom has an enormous investment in generators. Damage induced to generators as a result of foreign material ingress during outages has major financial loss implications for Eskom, which far outweigh the already considerable costs of repairing the machines themselves. This, in turn, can have adverse effects on the tariffs and quality of service to our customers.

This document sets out the minimum requirements which are to be met whenever these machines are opened up to be worked on. Failure to control the work process may lead to catastrophic machine failure.

2. SUPPORTING CLAUSES

2.1 SCOPE

2.1.1 Purpose

The purpose of this Work Instruction is to set out the Clean Conditions requirements to be adhered to by Eskom employees and contractors during the maintenance, modification and/or refurbishment of generators and rotating exciters.

2.1.2 Applicability

This Work Instruction is applicable to all Turbo-generators, generator rotating exciters and generator auxiliary systems for on-site work. This document is not applicable to the new build plant.

Peaking will be required to develop a custom site Works Instruction based on best practice as contained in this Works Instruction. This is mostly due to generator design differences, floorplan layout differences, as well as roles and responsibility differences.

2.1.3 Normative/Informative References

The following documents contain provisions that, through reference in the text, constitute requirements of this document. At the time of publication, the edition(s) indicated was (were) valid.

These documents are subject to revision and users are responsible to ensure that the most recent revisions of the documents listed below are used or referenced.

2.1.3.1 Normative

- [1] **240-56357338** Life management coil retaining rings in turbo generators and major motors
- [2] **240-56535978** Management of large generators during outages and works
- [3] **240-56356616** Generator Pipe work – Blanking Plates for Maintenance purposes
- [4] **240-94027445** Clean Conditions Search and Incident Investigation Work Instruction (ERI)
- [5] **H-1661** Risk and Resilience Clean Condition Flash Report (ERI)
- [6] **240-94026801** Lessons Learnt Communication
- [7] **240-125904456** Management and Control of Tools in a Tool store or a container
- [8] **240-137025973** Execution and Control of All Site Work
- [9] **ENK 281** Service agreement between Eskom Holdings & ERI

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2.1.3.2 Informative

- [10] **240-56227872:** Application of advanced and conventional condition monitoring tools to a generator return to service

2.2 DEFINITIONS

Clean Conditions High Risk Area	This is the area of the highest risk (from a foreign material management point of view) and includes the generator stator, exciter and rotor work areas
Clean Conditions Low Risk Area	This is the area of the lowest risk (from a foreign material management point of view) and is limited to the spares storage area
Confined Space	Enclosed, restricted or limited space in which, because of its construction, location, contents, or any work carried out therein, a hazardous substance may accumulate or an oxygen-deficient atmosphere may occur.
Ductape®	A vinyl, fabric-reinforced, multi-purpose pressure sensitive tape with a soft and tacky pressure sensitive adhesive.
Foreign Material Exclusion	A set of Work Instructions geared to minimise the possibility of intrusion into the machine of foreign materials before, during or after inspection, maintenance and refurbishment on site, at workshops and factories
Foreign Materials	Anything not normally present during the operation of the machine that might adversely affect its constituent components if left there
Magnetic Objects:	Material with magnetic properties
Swarf	Fine metal or other material chips, filings or turnings produced by machining
Velcro®	Fastener consisting of two strips of fabric which cling when pressed together
Dot Peen	Dot marking technology also called dot peen marking, stylus pin marking or micro-percussion marking consists in indenting series of dots into materials in 2D Data Matrix codes that can be scanned.
Site Work Instructions	Power Station specific documentation used to guide operating and maintenance practices according to Eskom governance documents and National as well as International Standards.

2.3 ABBREVIATIONS

Abbreviation	Description
CC&FME	Clean Conditions & Foreign Material Exclusion
CCC	Site Clean Conditions Champion
CCO	Clean Conditions Officer
CCTV	Closed Circuit Television
CO₂	Carbon Dioxide

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Abbreviation	Description
CoC	Certificate of Compliance
CRR's	Coil Retaining Rings
e.g.	For example [Latin: exempli gratia]
ER	External Reviewer
FME	Foreign Material Exclusion
GTO&S	Generation Technology Oversight and Support
H ₂	Hydrogen
HR	Human Relations
ILR	Internal Lead Reviewer
KPI	Key performance Indicator
MSDS	Material Safety Data Sheets
PPE	Personal Protective Equipment
PQP	Process Quality Plan
PSM	Power Station Manager
ERI	Eskom Rotek Industries
SHEQ	Safety Health Environment and Quality
SLA	Service Level Agreement
UCLF	Unplanned Capability Loss Factor
ISO	International Systems Organisation
ETOM	Eskom Task Order Manager
HRA	High Risk Area
LRA	Low Risk Area
ROAC	Roaming Official Access Controller
POAC	Principal Official Access Controller
SCI	Small Component Inspector
OHSA	Occupational Health and Safety Act
OAC	Official Access Controller
TES	Temporary Employment Services
GM	General Manager

2.4 ROLES AND RESPONSIBILITIES

As per 3.6, 3.7 and 3.8 in this document.

2.5 PROCESS FOR MONITORING

240-47859177: Generation policy on the control of Clean Conditions when working on generators

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When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the system.

2.6 RELATED/SUPPORTING DOCUMENTS

Refer to Section 2.1.3

3. REQUIREMENTS

3.1 SITE WORK INSTRUCTIONS

The minimum requirements which are applicable in the maintenance of generators are described in this Work Instruction.

It shall be the responsibility of the management of each site (as well as each off-site workshop) to develop its own local Work Instructions and appoint appropriately trained and experienced personnel for meeting the requirements of this Work Instruction.

Under no circumstances shall the site Work Instructions be inferior to the minimum requirements of this Work Instruction. Any site specific requirement that may necessitate a deviation from this Work Instruction shall be individually considered. Deviations from this Work Instruction will only be tolerated on site Work Instructions once an official concession is approved and authorised by the Clean Conditions Custodian (Group Technology – Production Engineering Integration).

3.2 APPLICABILITY

Any outage maintenance work on Generators and Generator rotating Exciters shall be strictly supervised, controlled, finally inspected and certified to be free of foreign materials. The control will be in the form of formal Clean Conditions resource deployment and regulated by an approved and authorised site specific Work Instruction, based on the minimum requirements of this Work Instruction. (Specific attention and consideration to be given to resource allocation as dictated by the Eskom/Turbo Gen Services and Risk & Resilience Service Level Agreement for Level 1 plant)

Further to the above, generator auxiliary systems (Stator Cooling Water, Secondary Cooling Water, Gas Systems, Seal Oil, and Bearing Lubrication Systems) pose a major Clean Conditions risk and therefore appropriate quality control and inspection mechanisms shall be put in place to avert induced risks on the machines as the result of foreign material being left inside these systems. Formal Clean Conditions Control (Level 1, 2 or 3) is not normally required for Generator Auxiliary System outage maintenance, only appropriate levels of quality control.

Staff shall be made aware of the importance of taking personal ownership and to promote (FME). It is vital that staff is convinced of the need to take positive steps to correct an unsatisfactory situation, rather than to ignore it or, worse, to cover it up. Appropriate training and accreditation programmes shall be developed and maintained by the Eskom Rotek Industries Training Manager to address this risk.

Note:

Clean Conditions is mandatory for:

- **Scope of work that is exposing the generator gas path / cooling circuit. (e.g. removing a H₂ cooler)**
- **Scope of work that eventually may lead to exposing the gas path / cooling circuit. (e.g. working on a bearing that may lead to pulling the rotor)**

Dismantling of a generator of any sort is prohibited until a formal Clean Conditions Outage Level Classification has been conducted and approved as specified in 3.3. There are no special cases or requirements that can overrule this minimum requirement.

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3.2.1 For Off-Site Clean Conditions Areas:

Where maintenance work on rotors or stators are being performed off-site in the Turbo Gen Services or OEM workshops, the requirements of this Work Instruction in most cases are impractical to adhere to. Turbo Gen Services or the OEMs should make available their own customised workshop Clean Conditions Work Instructions which should be aligned with sound FME and Clean Conditions principles.

It will be the responsibility of Turbo Gen Services to ensure that this Work Instruction is reviewed and supported by Turbo Gen Services Clean Conditions Custodian, Risk & Resilience Clean Conditions & FME Manager as well as the Eskom Group Technology Clean Conditions Custodian.

3.2.2 For On-Site Stator Rewinds or Stator Exchanges Clean Conditions Areas:

Where rewinds of stators or stator exchanges are being performed on-site, the requirements of this Work Instruction in most cases are impractical to adhere to. Where it is decided that the Clean Conditions Work Instruction cannot fully be utilised it will be required that a customised rewind or stator exchange Clean Conditions Work Instruction be drafted by the OEM and Site Engineering. This custom Work Instruction should be aligned with the sound FME and Clean Conditions principles as per this Work Instruction.

It will be the responsibility of site engineering to ensure that this Work Instruction is reviewed and supported by Turbo Gen Services Clean Conditions Custodian, Risk & Resilience Clean Conditions & FME Manager as well as the Eskom Group Technology Clean Conditions Custodian.

3.2.3 For Eskom Peaking Generation Sites:

Where work on rotors or stators are being performed on Eskom Peaking Generation sites, the requirements of this Work Instruction in most cases are impractical to adhere to. Peaking should make available their own customised Clean Conditions Work Instructions which should be aligned with sound FME and Clean Conditions principles as per this Work Instruction.

It will be the responsibility of Peaking Generation to ensure that these Work Instructions are reviewed and supported by Turbo Gen Services, Risk & Resilience Clean Conditions & FME Manager as well as the Eskom Group Technology Clean Conditions Custodian.

3.2.4 For Eskom New Build Generation Sites:

Where construction of new generators is being performed on-site, the requirements of this Work Instruction in most cases are impractical to adhere to. Where it is decided that the Clean Conditions Work Instruction cannot fully be utilised it will be required that a customised rewind Clean Conditions Work Instruction be drafted by the OEM and site engineering. This custom Work Instruction should be aligned with the sound FME and Clean Conditions principles as per this Work Instruction.

It will be the responsibility of the new build site engineering to ensure that these Work Instructions are reviewed and supported by Turbo Gen Services Clean Conditions Custodian, Risk & Resilience Clean Conditions & FME Manager as well as the Eskom Group Technology Clean Conditions Custodian.

Note:

CC& FME's involvement is due to the fact that they need to be prepared for the first official outage on that unit.

3.3 CLEAN CONDITIONS OUTAGE CLASSIFICATION LEVELS

Generator maintenance, inspection and repair activities with varying SOW cannot be executed on the same deployment level due to practical limitations, cost and also down time effects. The work therefore must be classified in terms of the perceived Clean Conditions risk as well as defined boundaries and then an appropriate work Outage Classification Level be assigned to it. The levels will be differentiated from a level 1 to 3 (Level 1 being the maximum deployment level)

The outage classification level application form **240-49617475** must be completed and agreed by the:

- Generator System Engineer
- ILR
- CCO
- CC&FME Project Manager/CCC
- Turbo Gen Services Project Manager/Turbo Gen Services Site Manager

An appropriate SOW analysis and risk review must form part of the decision making process.

Should there be a change in scope of work, then it will be required to re-assess the Clean Conditions Outage Level and a new application form (**240-49617475**) must be completed.

Table 1: H₂ Seal Maintenance - Boundary Considerations

Due to frequent H₂ seal maintenance and H₂ seal inspection requirements the outage classification matrix below may assist in defining the minimum Clean Conditions Classification Level.

Station	Required Level	Boundary Component
Arnot	3	Brush Seal
Duvha, Tutuka, Majuba	3	Inner Oil Baffle
Hendrina	2	Inner Oil Baffle
Kendal	3	Inner Oil Baffle
Koeberg	2	Inner Oil Deflector
Kriel	1	None - Winding is exposed
Lethabo, Matla	2	Inner Oil Deflector
Matimba	2	Inner Oil Deflector
Grootvlei	1	None - Winding is exposed
Komati H ₂ Unit 1;2;3;4;8&9	2	Inner Oil deflector
Komati Air Unit 5;6;&7	N/A	Air cooled generator – no H ₂ seals

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Camden	3	Inner Oil Baffle
Medupi	3	Inner Oil Baffle
Kusile	3	Inner Oil Baffle

Note:

Any scope of work exceeding H₂ seal maintenance only (as per the table above) will require a re-classification to the next highest level of Clean Conditions deployment.

Table 2: Internal Inspection - Boundary Considerations

Inspections are normally associated with the determination of SOW. (For emergency inspections please refer to 3.3.1.1)

In order to undertake these inspections clean conditions must be maintained. Under normal circumstances where the stator windings or core is exposed a Level 1 Clean Conditions deployment would be required.

During inspections only, the table below should be followed as a minimum requirement in order to determine the appropriate Outage Level deployment.

Inspection Access Points (All generators)	Required Level	Comments
Bottom Hatch /manhole	3	For inspection only Windings or magnetic core exposed.
Side Hatch / manhole	3	For inspection only Windings or magnetic core exposed.
Via winding covers/winding cover inspection ports	2	For inspection only Full exposure to gas path / gen internals.
Bushing chamber/terminal box access door(s)	2	For inspection only Full exposure to gas path / gen internals

Notes:

- The SOW is limited to inspections only.
- Only a responsible individual nominated by the ILR will be allowed to perform the inspections.
- Full Clean Conditions PPE to be worn.
- All inspections to be conducted under the direct supervision of the Clean Conditions Champion / Roaming Official Access Controllers / CCO.
- Only the following tools will be allowed:
 - Flashlight

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- Inspection mirror
- Endoscope
- Camera. (Only site approved camera's allowed)
- Where oil spillage is noted and cleaning is required it is highly recommended that the appropriate Outage Level deployment be considered since the SOW will greatly exceed inspection only activities.

3.3.1 Special conditions for “Bypassing” the Clean Conditions controls (minimum requirement)

During normal operation of the generator it is possible for fault conditions to occur that may require extremely urgent internal inspections to be made. These inspections normally either confirm the fault condition or can be used to determine the repair scope of work. Inspections of this nature are easy to control and should pose minimum risk to the machine.

NOTE:

- ***More often than not the mobilisation/establishment Clean Conditions Control can be in place prior to work permits being issued.***
- **Budget constraints do not validate the bypass process for any Clean Conditions Scope of work of any kind. This matter must be addressed, communicated and resolved on a Senior Manager level.**

For situations where access to specific parts of the generator may not require the machine to be at standstill, such as the terminal box or back end of core areas the by-passing of clean conditions controls may be considered.

A Clean Conditions Concession for “Bypassing” normal Clean Conditions Control will be required and must incorporate the following:

- **Immediate notification to Eskom Rotek Industries CC&FME to establish appropriate Clean Conditions control measures. CC&FME need to be afforded to opportunity to confirm readiness time estimate. If the deployment of personnel can be done within a mutually agreed reasonable time then bypassing CANNOT be considered.**
- The Concession authorisation process can only proceed once the PSM has endorsed the “bypassing” process. (The Power Station therefore will carry the risk for not having an appropriate Clean Conditions control system in place according to the Classification Level process)
- Confirmation of the existence of the Clean Conditions Work Instruction, offering short deployment time inspections opportunities (i.e. Level 2 and 3 outages). For inspections to be performed on windings for example, and not using a Level 1 deployment, this risk needs to be clearly understood.
- Confirmation that no repair work will be done, but inspections only. Justification why a deviation of the Work Instruction may be required.
- Clean Conditions Risk Mitigation measures.
- Roles and responsibilities clearly defined. (i.e. who will be responsible for opening up the inspection door/ cover and who will do the inspection)
- Full Clean Conditions PPE to be worn.
- Record keeping systems (i.e. registers, concession approvals etc.) to be in place.

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NOTE:

- **Mandatory signatures on the “bypass” concession to be: The PSM/GM, Clean conditions custodians from both PEI and ERI and the CC&FME Project Manager for that specific site.**

3.3.2 Clean Condition Outage Level Transition Requirements

During the execution of maintenance work it may be required to change the classification level of the outage due to a scope of work variation.

The following minimum requirements must be met for a Classification Level transition:

1) Transitioning from a lower to a higher classification level:

- All work must be stopped
- All personnel, tools, materials, equipment, consumables and spare parts, etc. must be removed from the work area.
- All applicable registers must be reconciled and balanced.
- Review 8&9 (Level 2 outages) must be completed.
- The Clean Conditions outage level classification application process must be enforced
- All requirements of the higher classification level must be adhered to before work can commence.

2) Transitioning from a higher to a lower classification level:

- All work must be stopped
- All personnel, tools, materials, equipment, consumables and spare parts, etc. must be removed from the work area.
- All applicable registers must be reconciled and balanced.
- Review 1-7 (Level 1 outages) or Review 8 & 9 (Level 2 outages) must be completed.
- Any outstanding tools, materials, equipment, consumables and spare parts must be transferred to the applicable registers.
- The Clean Conditions outage level classification application process must be enforced
- All requirements of the lower classification level must be adhered to before work can commence.

3.3.3 Level 3 - Clean Conditions Outage

The work on this level is considered to have a Low Risk impact on the machine.

This scope of work will NOT expose the generator or exciter inner gas (H₂ or air) cooling path and is limited to external work only. The defined boundary for this type of outage is normally external or outboard to the generator H₂ seal. For work to be executed on air cooled exciters, the boundary will be all work external or outboard of the winding covers.

Note:

All periodic on-line maintenance associated with brush gear is excluded from these classification levels.

Some examples or applicability:

- Work on the generator (and exciter) bearings
- Work on the generator (and exciter) oil baffles.
- Work on couplings
- Work on generator (and exciter) piping i.e. oil, gas and water coolant pipes. (Note: this applies to the pipework directly connected to the Generator Stator or Exciter).

Requirements:

- Permit To Work (where applicable)
- Any necessary barricading will be identified by the appointed Eskom CCO and will be erected by Turbo Gen Services.
- The appointed Eskom CCO will manage all Clean Conditions related work activities.
- Must be supervised by a CC&FME Clean Conditions Champion. (logistical set-up, supervision and continual review)
- Tool, spares and material control registers to be in place as a quality control requirement. Site (Turbo Gen Services) maintenance personnel under the direct control of the CCO can manage these registers.
- Blank Flange Control Work Instruction must be followed (if applicable to SOW)
- An endoscope inspection of pipe internals is required after work has been completed. In the event that blank plates were fitted and controlled, an endoscope inspection of the pipe internals is optional.
- All registers and documentation to be archived for future reference.
- PPE requirements will be standard Eskom PPE (i.e. blue overalls are acceptable)
- No requirements for access permits
- No Clean Conditions Reviews are required.
- Level 0 "Return to Service" monitoring according to 240-56227872 is recommended.

3.3.4 Level 2 – Clean Conditions Outage

The work on this level is considered to have a Medium Risk impact on the machine.

This scope of work is defined as non-intrusive to the generator (and exciter) windings (including bushing chamber).

The defined boundary for a Level 2 outage is the winding covers (including the fan H₂ blades) of the machine.

Work external to the winding covers of the generator (or exciter) is considered a Level 2 outage; however it must be managed by deploying Clean Conditions Control measures as defined in this Work Instruction. (Also refer to boundary definition tables in Section 3.3 of the Work Instruction)

Some Examples or Applicability:

- H₂ cooler maintenance.
- Inspections via the H₂ cooler compartment.
- H₂ seal maintenance (as per table 1)

Note:

Extreme caution should be taken when manholes/inspection doors are being opened on the winding side of the generator casing since the risk of foreign materials being left behind may induce future risk to the generator. It is therefore required that this opening, inspection and closing be done under constant supervision of a roaming Official Access Controller.

- A Generator Internal inspection where one or more H₂ coolers is required to be removed.
- The replacement or maintenance of one or more H₂ coolers.
- Minor work such as Generator internal oil spillage clean-up.
- For H₂ Seal repairs or replacement, refer to Outage Level Classification Matrix

Note:

Any work beyond the winding covers or in the bushing/terminal box poses a higher risk and therefore should be classified as a level 1 outage.

Requirements:

- The Eskom appointed CCO will manage and control the Generator Clean Conditions Area.
- The floor plan agreed and approved for the specific scope of work.
- Limited barricading to be erected around work area with a single access point.
- Access control container, dedicated generator tool container and “three door” small component container to be incorporated in the floor plan
- Only pre-identified individuals will have access permits for the work area.
- The work area will be deemed a High Risk Area and Clean Conditions PPE must be worn.
- Recommended CC & FME personnel will be prescribed by the SOW and typically will consist of:
 - One Clean Conditions Champion for day shift
 - One Principle Official Access Controller for the night shift.
 - Two Official Access Controllers per shift
 - One Roaming Official Access Controller per shift.
- Registers to be maintained that will include control of personnel, tools, materials, spares, consumables and any other item not mentioned here.
- As soon as the cooler compartment is accessible it will be required that all openings to generator internals such as the stator windings and rotor shall be covered under supervision by a Roaming Official Access Controller. Appropriate Clean Conditions inspection check sheets to be used. (Typically a “before” and “after” inspections to be done).

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- All registers and documentation to be archived for future reference.
- Level 2 “Return to service” monitoring according to 240-56227872 is recommended.
- Review 8 and 9 to form part of the Level 2 outages

3.3.5 Level 1 – Clean Conditions Outage

The work on this level is considered to have the Highest Risk impact on the machine.

This scope of work is defined as intrusive to the generator (and exciter) windings and the generator bushing chamber area.

The potential generator Clean Conditions risk of this type of outage is considered very significant and therefore the Level 1 outage has the highest level of Clean Conditions related risk mitigation

Some examples or applicability:

- Any outage exceeding the work scope of the “level 2”.

Requirements:

- Full Clean Conditions compliance to this Work Instruction is required.
- Level 2 or 3 return to service monitoring according to 240-56227872 is recommended.

Typical area requirements over and above that of a Level 2 outage are:

- Review 1 to 7 to form part of the Level 1 outages.
- Complete barricaded area (according to the approved floor plan) to be erected that includes a HRA and LRA with a single access point.
- HRA floor area to be covered with Novilon
- Sticky carpets at predefined access points.
- CCTV camera's to be implemented.
- All Clean Conditions appointments to be in writing.
- Personnel photo permits to be issued.
- Recommended CC &FME personnel will be prescribed by the SOW and area floor plan.
- Review 1 to 7 to form part of the Generator Quality Plan.

3.4 SAFETY REQUIREMENTS IN THE CLEAN CONDITIONS AREA

It is necessary to ensure proper safety measures are in place to protect both the plant and the personnel in the case on an emergency. All safety requirements have to be aligned with OHSA

Some examples of the minimum requirements which are more relevant to level 1 and 2 clean conditions outage are:

- CO₂ fire extinguishers (at least six or otherwise advised by the site SRM) in strategic positions as per the approved floor plan. Each Power Station's Safety Risk Section must ensure that the placement and number of extinguishers are sufficient for the floor lay out.
- Emergency evacuation plan to be displayed in the main access point.

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- Emergency evacuations and re-instatement for any reasons shall be treated as a Lock Up and Go situation. (Refer to 3.13.1.5.4)
- Clean Conditions organization structure with names and contact details for the specific outage to be displayed in Clean Conditions access container.
- Emergency exits to be designated on barricading and on the tent (where applicable).
- One member of each Risk & Resilience CC&FME shift team to be trained on level one first aid.
- First aid kit located at the main access point/cabin.
- Clear arrangements should be in place for making/declaring emergencies as and when generated in the Clean Conditions Area.
- All containers in the Clean Conditions area with power supplies to have valid certificates of electrical installation compliance (CoC's).
- One member of each Risk & Resilience CC&FME shift team to be trained in basic fire fighting
- A telephone line shall be installed in the main access cabin for making on-site calls especially in the case of any emergency.
- Appropriate OHS Act actions to be taken when working in confined spaces.
- The Power Station emergency contact telephone number should be clearly displayed in the access cabin. In case of an unmanaged emergency this number should be contacted in order to obtain Power Station emergency assistance.

3.5 CLEAN CONDITIONS AREA MANAGEMENT AND STRUCTURE

Effective and safe control of generator Clean Conditions necessitates the employment of dedicated, responsible, well trained personnel that will ensure effective implementation of this Work Instruction.

Where any other party (i.e. the OEM) is the main contractor on the Generator it is recommended that the Clean Conditions Control responsibility is resolved at contract award phase. However, this document must form part of the technical scope of work.

Therefore, the Clean Conditions Control service must fully comply with the requirements of this Work Instruction.

Note:

All Clean Conditions appointments have to be made in writing. Their names and contact details have to be clearly indicated on the Clean Conditions reporting structures.

3.5.1 Clean Conditions Reporting Structure (Power Stations)

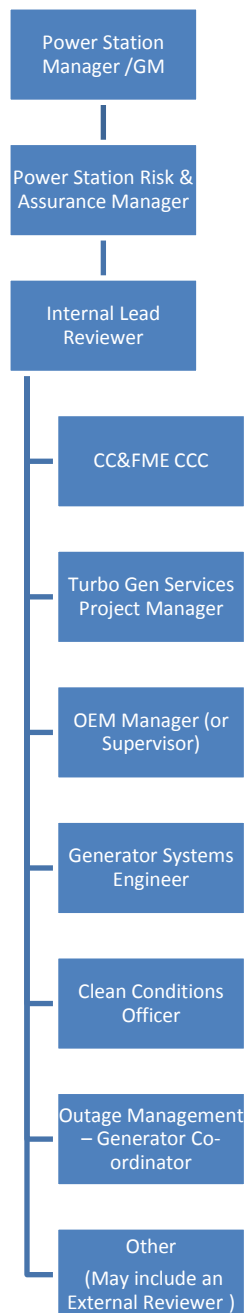


Figure 1: Typical Power Station Clean Conditions Reporting Structure

¹ The Power Station Management may decide to involve additional support staff on a specific outage and therefore the clean condition support team may be expanded. Generator failure recovery outages for example may have a very high Clean Conditions risk. For normal planned outages this additional support may not be necessary.

² The above reporting structure is for Clean Conditions duties only. This implies that the Internal Lead Reviewer (ILR) is the highest authority in the Power Station Clean Conditions process and must ensure full compliance to this Work Instruction. The appointed ILR will ultimately provide (via the Risk and Assurance manager) to the PSM the assurance that all potential Clean Conditions risks are adequately mitigated and managed.

PUBLIC DOMAIN

Note:

- The above Organisational Structure serves as an example only, and may change in due course to align with operational changes.
- The above structure also serves as an example of typical Internal Lead Review Team Members.

3.5.2 Clean Conditions Reporting Structure (Risk and Resilience)

Figure 2: Typical Risk and Resilience Reporting Structure

Note: The Organisational Structure (in Figure 2) serves as an example only, and may change to align with operational changes.

Manpower Clarifications:

- Site Clean Conditions Champion (CCC) – One per outage on morning shift.
- Principle Official Access Controller (POAC) – One* per shift
- Official Access Controller (OAC) – Two* per shift
- Roaming Official Access Controller (ROAC) – One* per shift.

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**Specific manpower requirements are dependent on the site Clean Conditions area lay-out as well as the scope of work involved (i.e. level 1, 2 or 3 outages). Detailed manpower requirements will therefore have to be negotiated prior to each outage.*

3.5.3 Reporting Structure (Turbo Gen Services)

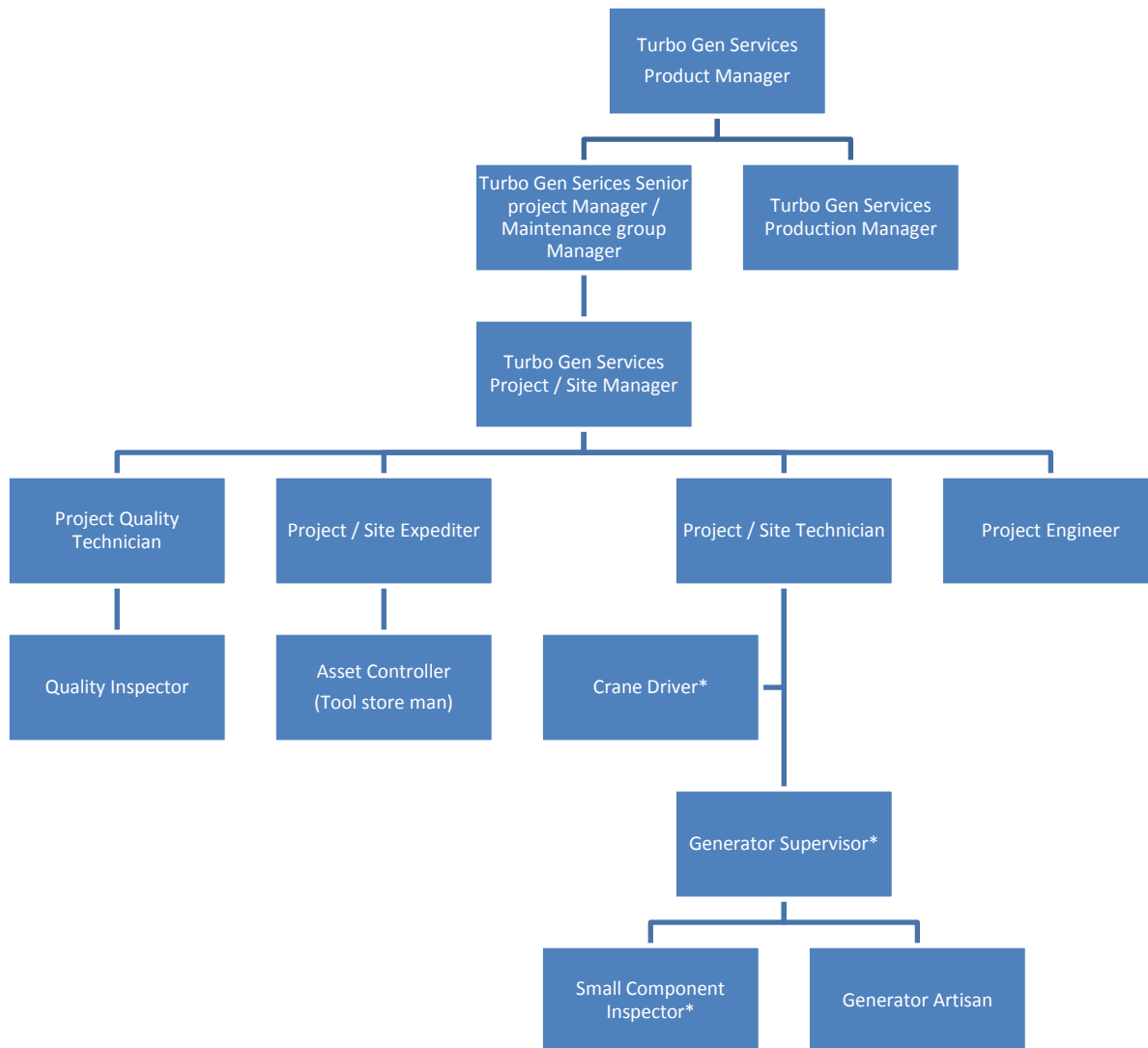


Figure 3: Typical Turbo Gen Service Reporting Structure

Note: The above applicable Organisational Structure serves as an example only, and may change in due course to align with operational changes.

**The Turbo Gen Services Generator Supervisor, Crane Driver as well as the Small Component Inspector have Clean Conditions duties but do not report directly to the CCC. They report to the Project Technician.*

The CCC and the Turbo Gen Services Project Manager will resolve Clean Conditions related matters. Both the CCC and the Turbo Gen Services Project Manager are also members of the Power Stations Internal Review Team.

3.5.4 Clean Conditions Appointments

The following Clean Conditions appointments must be made in writing before work on the generator is undertaken:

Power Station Generation staff

- Internal Lead Reviewer (ILR)
- Clean Conditions Officer (CCO)
- Generator Outage Co-ordinator (Outage Management)
- Generator Systems Engineer
- Internal Review Member
- External Reviewer (if and when applicable)

Eskom Rotek Industries Risk Resilience:

- Clean Conditions Champion (CCC)
- Principle Official Access Controller (POAC)
- Official Access Controller(s) (OAC)
- Roaming Official Access Controller (ROAC)
- Internal Review Member

Turbo Gen Services:

- Project Manager / Site Manager
- Project Technician
- Generator Supervisor(s) (GS)
- Quality Technician (QT)
- Small Component Inspector (SCI)
- Quality Inspector (QI)
- Generator Artisan(s) (GA)
- Semi-Skilled Worker
- Generator Asset Controller
- Crane Driver
- Internal Review Member

Contractor:

- Contractor Project Manager (if and when applicable)
- Contractor Supervisor (if and when applicable)
- Internal Review Member

Table 3: Clean Conditions Roles and Appointments

Organisation	Clean Conditions Roles	Appointment made by
Generation	Risk & Assurance Manager	By default
	Internal Lead Reviewer	Risk & Assurance Manager
	Clean Conditions Officer	Outage Manager
	Generator Systems Engineer	By default
	Generator Outage Co-Ordinator	Outage Manager
Eskom Rotek Industries Risk & Resilience (CC&FME)	Project Manager	By default
	Clean Conditions Champion	Project manager
	Principle Official Access Controller	Clean Conditions Champion
	Official Access Controller	Clean Conditions Champion
	Roaming Official Access Controller	Clean Conditions Champion
Turbo Gen Services	Senior Project Manager	By default
	Maintenance Group Manager	By default
	Project Manager/ Site Manager	By default
	Small Component Inspector	Project Manager
	Generator Supervisor	Project Manager
	Generator Artisan	Project Manager
	Quality Technician	Project Manager
	Quality Inspector	Project Manager
	Crane Driver	Project Manager
	Asset Controller	Project Manager
	Semi-Skilled Worker	Project Manager

PUBLIC DOMAIN

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3.6 ROLES AND RESPONSIBILITIES FOR THE CC AREA MANAGEMENT AND WORK EXECUTION

At the time of compiling this Works Instruction the organisation is restructuring and names and designations as mentioned in this document may change.

3.6.1 Clean Conditions Roles and Responsibilities (Power Station)

Note: Should the below mentioned persons not be available for some reason, then their duties must be delegated in writing and authorised

3.6.1.1 Power Station / General Manager

The PSM is the plant (i.e. generator system) custodian and therefore carries overall responsibility for ensuring that the requirements of this Work Instruction are implemented.

Note:

On certain sites this appointment may have General Manager (GM) status. Please read therefore either PSM or GM in this document.

Further duties include, but are not limited to:

- Ensure that the Power Station has a site specific Clean Conditions works instruction in line with the requirements of this governance Clean Conditions Work Instruction.

3.6.1.2 Risk and Assurance Manager

The Risk and Assurance Manager's duties will include, but are not limited to:

- Provide assurance to the PSM that the necessary Clean Conditions controls are in place.
- Manage and escalate all declared Clean Conditions related risks to the PSM.
- Appoint in writing the on-site Internal Lead Reviewer (ILR) as well as Internal Review Team members.
- When and where necessary liaise with Clean Conditions external auditors.

3.6.1.3 Internal Lead Reviewer

The ILR reports in a Clean Conditions capacity directly to the Power Station Risk and Assurance Manager.

The ILR need not directly reside within the Risk and Assurance Section, but can be any senior responsible nominated individual reporting directly to the Power Station.

The ILR's duties include, but are not limited to:

- Ensure that the Clean Condition Outage Level Classification is correct (i.e. level 1, 2 or 3).
- Ensure that the local Clean Conditions Work Instruction (aligned with this Work Instruction) is implemented.
- Ensure that all Internal Review Team Members are appointed, in writing by the Risk & Assurance Manager.
- Ensure that the Clean Conditions reviews are scheduled and executed as per this Work Instruction.

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- The authority to prohibit work from proceeding should a risk be identified. The CCO and the review team will be notified of this instruction in writing. (Rapid resolution will be the priority since unnecessary work stoppage may affect the outage cost, quality or work duration)
- Ensure that the Turbo Gen Services (and/or the Contractor) PQP contain the necessary Clean Conditions Review hold points and that they are duly signed off.
- Liaise with all appointed Internal Review Team Members for periodic planned (if deemed necessary) as well as emergency meetings. Minutes of all these meetings will be recorded by the ILR (including an attendance register) and must be captured in the Clean Conditions filing system.
- Arrange for internal ad-hoc Clean Conditions Area audits.

3.6.1.4 Internal Review Team Member (s)

All Internal Review Team Members report to the ILR in a Clean Conditions capacity only. (Refer to 3.5.1)

Duties include, but are not limited to:

- Assist the ILR with optimizing interface and process arrangements in the Clean Conditions work area.
- Bring to the attention of the ILR any emerging risks or potential outage delays on the account of Clean Conditions.
- Be available as and when the PQP document requires the reviews to be executed in order to avoid unnecessary delay impacts on the outage.
- Perform ad-hoc Clean Conditions inspections and may advise the ILR on findings and or improvements to be made.
- Be available for Clean Conditions Area periodic reviews as arranged by the ILR and conducts these reviews.
- Assist the ILR on any mutually agreed tasks during the Clean Conditions process.

3.6.1.5 Clean Conditions Officer

The CCO represents the Power Station in all aspects of the Generator Clean Conditions process. The CCO is appointed by the Power Station Outage Manager and reports to the ILR in a Clean Conditions capacity only.

It is highly recommended that the CCO be an Eskom Generation employee and be positioned as such to be unbiased and independent (i.e. not Turbo Gen Services or Eskom Rotek Industries Risk & Resilience employee) in all aspects of decision making.

It will be the responsibility of the Power Station Outage Manager to identify and appoint an appropriate individual to perform this duty. (Note: In certain outages and depending on the SOW and associated risks, it is highly recommended to appoint multiple CCO's)

Note:

In the event that such an Eskom individual is not available within the specific Power Station or elsewhere in the Eskom organisation, then an external service provider may be utilised.

This external service provider should make available individuals for the duties of CCO with the following minimum criteria:

- Have a technical qualification (N4 or higher in engineering)
- Individuals must have completed an Eskom accredited clean conditions training program
- Preferably have generator related experience of at least 2 years.
- Have shift work capability

The CCO must report to the ILR in a Clean Conditions capacity.

The main responsibility of the CCO is to review the daily work execution (per shift) in the Clean Conditions Area against the requirements of this Work Instruction.

Further duties of the CCO include, but are not limited to:

- Provide the ILR with the necessary assurance that the Clean Conditions Area control is adequately executed based on the minimum requirements of this Work Instruction.
- Approve Clean Conditions Area Permit Applications. The CCO further has the authority to reject or revoke permits based on valid reasons and must inform the ILR and CCC of this.
- In the event that the Outage Management Generator Coordinator cannot issue the permits the CCO will issue the Clean Conditions Area photo permits.
- Draw up (and update) the Clean Conditions Organisation Chart (including contact numbers) and ensure that it is displayed in the Access Container.
- The authorisation of allowing a visitor into the Clean Conditions High Risk and or Low Risk. The authorisation of a visitor will be documented in the Clean Conditions file.
- Review the daily log books as maintained by CC&FME. The purpose of the log book is to record observations, suggestions and deviations that cannot be recorded in the registers.
- Ensure that the Clean Conditions files are maintained by Turbo Gen Services and Risk & Resilience and that there is compliance with the requirements of this Work Instruction.
- Ensure that Clean Conditions Area equipment is in a fit for use condition.
- Ensure compliance of the approved floor plan.
- Ensure that Clean Conditions Area inspections are conducted as per the review requirements.
- Report Official Access Controller poor performance related issues to the ILR and CCC.
- Report poor housekeeping and cleanliness of the Clean Conditions work area and cabins to the CCC and POAC.
- Ensure that the fire extinguisher test certificates are valid for the duration of that outage.
- Ensure that the generator Tool Container is audited by the Asset Controller, CCC or POAC against the tool inventory list. Further to this the CCO must ensure that the contents of the Tool Container are inspected daily and that the tools are without any defects. Defects should be recorded in a dedicated lost or damaged tool register and must indicate the corrective actions taken.
- Ensure that the relevant Generator Clean Conditions internal inspection sheets are available.
- Ensure that the Generator Tool Container Inventory list and the relevant Generator Spare Parts List is available
- Responsible to perform Clean Conditions Reviews as per the review requirements of this Work Instruction and sign off the necessary PQP hold points.

- Highlight any potential Clean Conditions risks (including mitigation measures) to the ILR for further action.
- Ensure that work requirements that deviate from the normal work practices are approved via the concession process as detailed in this Work Instruction.

3.6.1.6 Generator Systems Engineer

The Generator System Engineer has an Engineering responsibility during the generator maintenance period and will concentrate on the technical and quality assurance aspects of the generator. Where Clean Conditions inputs or actions are required from the Systems Engineer during the Clean Conditions phase, the systems engineer will execute those tasks.

The systems engineer will report to the ILR in a Clean Conditions capacity.

Duties include, but are not limited to:

- Compile a site specific Clean Conditions Works Instruction in-line with this governance document. Ensure that the requirements laid down in 3.13.5.2 “Work Activities with Elevated Risk implications” form part of the Site Specific Works Instruction. Consultation with the CC&FME Project Manager is required in order to obtain the best practice / vast operational experience feedback.
- Ensure that the scope of work for the generator is in place in order for timeous Clean Conditions planning to take effect.
- Ensure that the PQP documents are reviewed and approved and contain the necessary Clean Conditions hold points as defined in this Works Instruction.
- Ensure Quality Assurance for all work performed on the generator. Ensure that the generator compartment / zone Clean Conditions inspections check sheets are in place.
- Ensure that the Generator inspections are performed and that the relevant inspection check sheets are signed off.
- Ensure that the final inspections on the stator and rotor are witnessed.
- Compile Clean Conditions Risk Assessments upon the request from the Risk and Assurance Manager.
- Compile Clean Conditions Concessions. Only for unique activities not covered by Appendix C.
- Ensure that there is a predefined inventory list according to the Contractor / OEM design quantities.

The inventory must as a minimum include:

- Component design description
- Component design quantity
- Component design dimensions (where applicable)
- Component picture or illustration
- Component drawings and photographs

3.6.1.7 Outage Management (Generator Co-ordinator)

The requirement for the establishment and execution of generator Clean Conditions must form part of the Work Instruction generator scope of work. This should be reflected on the stations outage planning system and must have clear reference to the relevant power station Clean Conditions Work Instruction.

The Outage Management Generator Co-ordinator must ensure that the logistics around the establishment of the Clean Conditions Area form an integral part of the outage plan with a clear understanding of the roles and responsibilities as well as the contractor, Turbo Gen Services and Risk & Resilience interface requirements.

Note:

Outage time and cost pressures shall not render an excuse for taking Clean Conditions shortcuts.

Clean Conditions Reviews will take considerable time and will affect outage durations. The Outage Management Generator Co-ordinator must ensure that effective planning is done in order to minimise potential delays.

Further Clean Conditions duties of the Outage Management Generator Co-ordinator include, but are not limited to:

- Issue Clean Conditions Area photo permits. Should the Outage Management - Generator Co-ordinator not be available this duty will reside with the CCO.
- Update and maintain the Clean Conditions Area Access List for the applicable outage.
- Ensure that Turbo Gen Services and Risk & Resilience are informed about their potential Clean Conditions involvement during upcoming outages. (Both planned and unplanned outages)
- Ensure that Turbo Gen Services erect the Clean Conditions Area at least one week prior to the outage start date.
- Communicate the Clean Conditions logistical requirements at outage meetings.
- Liaise with the on-site Training Section for Clean Conditions awareness training as and when required (even after hours).
- Ensure that all the necessary Clean Conditions PPE and consumables are available as stock items in the main store. These include overalls, safety shoes, over shoes, tacky carpets, numbered rags etc.
- Ensure that Safety Risk Management get instruction to deliver CO₂ fire extinguishers. (Deliver before the outage and collect on completion of the outage).
- Ensure that the Clean Conditions files are stored in the station documentation centre after the outage.
- Arrange for LAN and telephone (open line) connections to the Clean Conditions Access Container.
- Have inputs in the Risk & Resilience KPI's via the ETOM.

3.6.1.8 Power Stations Heads of Sections

All Managers having employees performing work in the Generator Clean Conditions Area are responsible for providing Clean Conditions PPE to their personnel.

Ensure that the necessary Clean Conditions Awareness Training is attended by all personnel required to perform work on the generators.

Ensure that the Clean Conditions role players undergo formal training as per this Work Instruction.

3.6.1.9 Power Station Protective Services

Protective Services duties include but are not limited to:

- Ensure that a storage facility exist for safekeeping the generator Clean Conditions Area keys (if and when required).
- Patrol the generator Clean Conditions Area at least once a shift during working and non-working hours and must ensure that the perimeter barricading is in good order. This should be logged in the shift register along with the date and time and which security officer performed the inspection.

3.6.1.10 Power Station Safety Risk Management

Safety Risk Management duties include but are not limited to:

- Make available CO₂ fire extinguishers (in working order and with valid certificates) for use in the Generator Clean Conditions Area.
- Deliver and collect these extinguishers with prior arrangement with the Outage Management section.
- Ensure that fire extinguisher certificates are valid for the entire duration of the outage.
- Ensuring that the placement and number and type of fire extinguishers are sufficient and according to the approved floor plan.
- Ensure that adequate signage is installed in the Clean Conditions Area that will clearly indicate the position of each of the fire extinguishers.
- Review and make recommendations on any safety risk observed in the Clean Conditions Area.

3.6.1.11 Visitors

A visitor to the Clean Conditions High Risk and or Low Risk Area is defined as a person not executing related generator scope of work.

The authorisation for allowing a visitor into the Clean Conditions High Risk and or Low Risk Area is the responsibility of the CCO. The authorisation of a visitor will be documented in the Clean Conditions file.

Constant supervision by the CCO (or his formal delegate) is required in order to mitigate risk.

Typical examples of visitors are:

- Management representative wanting to observe activities
- Generator Consultants/Specialist
- Auditor performing auditing duties
- Emergency services representative/s
- Scaffold builders.

Note:

- Although physical work is being performed by these individuals the work is not considered generator related.
- Access into the HRA is subjected to the Official Access Controllers performing a physical search of the individual in ensuring that no foreign materials are present in their PPE. It will then be required that a one piece pocket less disposable overall be worn over the normal PPE. Safety shoes will have to be inspected and Duct tape applied over shoe laces.

- It is highly recommended that a few select individuals be allowed to do the physical scaffold building and remain in the HRA until completion of the work. The feeding of materials into the HRA should be executed by others.

3.6.1.12 Outage Manager

The Outage Manager's duties include but are not limited to:

- Ensure that the requirements of this Work Instruction are being met.
- Responsible for the Clean Conditions services as per the requirements of this Work Instruction for both planned and non-planned outages.
- Appoint a CCO/s to meet the outage clean conditions resource requirements. (Note: In certain outages and depending on the SOW and associated risks, it is highly recommended to appoint multiple CCO's to meet shift work requirements). It is highly recommended that the CCO be from the Power Station Maintenance Department.
- In cases where the Power Station requires external CCO services, the Outage Manager must ensure that the necessary is contracted in and that they have met the requirements of section 3.6.1.5

3.7 CLEAN CONDITIONS ROLES AND RESPONSIBILITIES (RISK AND RESILIENCE)

3.7.1 Clean Conditions and FME Manager

The CC&FME Manager reports to the Risk & Resilience Manager on all issues in connection with providing an independent Clean Conditions service to Generation. The CC&FME Manager will carry overall accountability for the Clean Conditions service rendered to the Power Station.

Further duties include, but are not limited to:

- Manage the Risk & Resilience CC&FME Department, Resources, HR and Finance
- Be the overall Champion of the Clean Condition service rendering;
- Consolidate and submit monthly clean condition report to the Risk & Resilience Manager;
- Drive the implementation of clean condition processes;
- Ensure and conduct continuous improvement of the clean condition control processes;
- Conduct unscheduled audits in all areas where clean condition is required;
- Supports Risk & Resilience Project Managers and site teams during the execution of the clean condition processes;

3.7.2 Clean Conditions Project Manager

- The Clean Conditions Project Manager reports directly to the CC&FME Manager on all aspects relating to the Clean Conditions process.

Further duties include, but are not limited to:

- Adhere to Safety, Health and Environment objectives set out by the Risk & Resilience Manager.
- Apply the commercial process for implementation of CC&FME on all agreed projects.
- Ensure that all project milestones and completion dates are achieved, without any clean conditions risk to the generator.

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- Ensure that there are no breaches or contraventions of Eskom and/or Site Specific CC & FME Work Instructions.
- Ensure that any requests for concessions to this Work Instruction have been discussed and accepted on behalf of Risk & Resilience CC&FME Projects.
- Provide rapid response to emergency Clean Conditions investigation(s).
- Provide Management response and actions to address all official Eskom audit and internal audit findings/recommendations relating to CC & FME.
- Provide an independent Access Control service on Generator plant during outages and overhauls.
- Interact with clients with regards to the CC&FME reviews and improvements, document and communicate changes.
- Ensure that all CC& FME personnel training and authorizations area are in place.
- Manage CC&FME Champions to meet the requirements of the Eskom and site specific CC&FME control Work Instruction(s) on Turbo-generator Plant.
- Carry out investigations in conjunction with seconded personnel on any Turbo Gen Services incidents and provide formal recommendations to the Client, Project & Site Managers.
- Carry out performance reviews on the CC&FME Champions and correct performance accordingly.
- Manage the Risk & Resilience KPI process.
- Plan and mobilise the Clean Conditions Access Control team to site.
- Assist with the compilation of Clean Condition Work Instruction for Generation. (if required).
- Support site teams during the execution of the Clean Conditions processes.
- Support the Power Station during official Clean Conditions Audits.

3.7.3 Clean Conditions Champion (CCC)

The site Clean Condition Champion carries the overall responsibility of the daily Clean Conditions control at the specific site. The CCC reports directly to the Clean Conditions Project Manager.

Further duties include, but are not limited to:

Appointment of Risk & Resilience personnel in their respective Clean Conditions capacity, such as the:

- Principle Official Access Controller
- Official Access Controllers
- Roaming Official Access Controllers
- Ensure that all Clean Conditions Area establishments are correctly implemented as per the floor plan.
- Responsible for the full Clean Conditions Control process during any generator maintenance and/or inspection activities.
- Ensure that Clean Conditions induction training take place.
- Submit weekly report to the Clean Conditions Project Manager and CCO.
- Conduct scheduled and unscheduled audits to verify compliance to processes and report to the Clean Conditions Project Manager and CCO.

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- Conduct and document daily reviews on Clean Condition processes and sign of the relevant checklists and or registers.
- Supervise the Principle Official Access Controller and Official Access Controllers liaise with the Turbo Gen Services Manager on any specific requirements of Turbo Gen Services personnel with related Clean Conditions duties.
- Report all Clean Conditions incidents or violations in writing in the form of a clean condition flash report to the Clean Conditions Project Manager as well as to the CCO during the same shift as the incident.
- Compile lessons learnt communication (240-94026801) and submit it to the Project Manager who will proof read for correctness, edit if necessary and communicated to the complete CC&FME team, Turbo Gen Services and Eskom Generation no later than end of business of the 2nd day after the incident.
- Request the Turbo Gen Services Project Manager to implement a search for lost or missing items. (This must be undertaken formally via e-mail or log book instructions). The CCO and Generator Outage Co-ordinator should also be notified by similar means.
- Ensure, on a daily basis that the Clean Conditions filing is up to date and completed correctly.
- Carry out performance reviews on the Principle Official Access Controller and Official Access Controllers.
- Ensure good housekeeping and cleanliness of the area and cabins.
- Ensure that the fire extinguishers are inspected at regular intervals.
- Ensure that the perimeter barricading is inspected daily.
- Ensure that the CCTV system is correctly installed and is functioning correctly.
- Ensure that only personnel with valid permits are allowed to enter the Clean Condition Area. Visitors need to be referred to the CCO to gain access into the area.
- Ensure that an audited Generator Tool Container inventory is correct prior to allowing generator tools into the HRA.
- Ensure that the contents of the Tool Container are inspected on a daily basis and that the tools are without any defects. Defects should be corrected and recorded in the Findings Register.
- Prevents a valid permit holder access to the Clean Condition Area if there is a reasonable cause to do so. This need to be communicated to the CCO
- Assist the Generator Systems Engineer with the compilation of Risk Assessments as and when required.
- Must ensure that all containers equipped with power supplies have valid CoC's.
- Ensure that any requests for concessions to this Work Instruction have been discussed & accepted on behalf of Risk & Resilience CC&FME projects before implementation.
- Ensure that the following consumables are available:
 - Uniquely numbered (preferably by embroidering) rags and overshoes.
 - Tacky/Sticky carpets at the entrance of the High Risk Area.

Maintain a Safe working environment by:

- Adherence to quality management system policies, Work Instructions and related requirements of the ISO 9001 Work Instruction.

PUBLIC DOMAIN

- Adherence to occupational health and safety policies, Work Instructions and related requirements of the OHSA.
- CC&FME Champions to ensure that where they share a building with TGS or Eskom including their own cabins/containers they must have an arrangement on inspection of emergency lights.
- Adherence to environmental aspects, related impacts and legal requirements associated with work activities.
- Ensure subordinates compliance in terms of Safety Health and Environmental policies and Work Instructions by daily toolbox talks, Hazard identification risk assessments, conducting safety talks and communicating all management safety feedback to subordinates.
- Enforce the use of all required PPE in the Clean Conditions Area.
- Ensure sufficient safety and hygiene Work Instructions are enforced in the Clean Conditions Area.

3.7.4 Principle Official Access Controller (POAC)

The Principle Official Access Controller is appointed by the CCC in writing to strictly supervise and control the access of personnel, equipment, materials and tools into the Clean Conditions Area. The Principle Official Access Controller will be on duty in the Access Control Cabin whenever work is carried out in the Clean Condition Area.

The qualifications of the generator POAC shall be:

- A permanent employee of Risk & Resilience employed in accordance with the approved job description for the Generator POAC.
- A contract worker qualified as a Mechanical Artisan (Projects) or Electrical/Armature Winder (Generator Services) trained in Access Control certified by the training department.

Further duties include, but are not limited to:

- Ensure proper implementation of the Clean Conditions Work Instruction. Advise the CCC of discrepancies in the Work Instruction.
- Supervise and control the full Clean Condition process as per the Work Instruction.
- Ensure that all personnel, tools, materials and equipment are accounted for at all times.
- Ensure that dryers and heating blankets, for storage purposes are functioning.
- Ensure that audit logs are complete and correct as well as physical checks to ensure that all tools and equipment used in the Clean Conditions Area is fit for purpose, certificated where required and defect free.
- Conduct scheduled and unscheduled log book audits. Responsible to report to the CCC any deviations as well confirming compliance to process.
- Conduct daily shift reviews on Clean Condition Control and Foreign Material Exclusion processes, verifies and sign all relevant checklists.
- Assist Turbo Gen Services with the "Search for lost Item" Work Instruction as and when necessary.
- Ensure that Official Access Controllers maintain required housekeeping and cleanliness of the Clean Conditions Area and Access Control Cabins.
- Validate and verify all access control permits against the official Access List.
- Ensure that permit holders do not remove their permits from the Access control Cabin and need to be permanently placed in the "in" – "out" permit roll call board.

PUBLIC DOMAIN

- Ensure that visitors are accompanied at all times by the CCO.
- Identify the need for additional resources tools and equipment as and when required.
- Ensure the correct staffing levels are available for the planned SOW and inform the CCC accordingly.
- Immediately contact the CCC if unable to resolve any Clean Conditions control issues or Client related requirements.
- Manage the daily team issues with regards to HR/IR issues and liaise with CCC.
- Carry out performance assessment reviews on the Access & Roaming Controllers and liaise with the CCC to improve performance accordingly.

Maintain a Safe working environment by:

- Adherence to quality management system policies, Work Instructions and related requirements of the ISO 9001 Work Instruction.
- Adherence to occupational health and safety policies, Work Instructions and related requirements of the OHSA.
- Adherence to environmental aspects, related impacts and legal requirements associated with work activities.
- Ensure subordinates compliance in terms of Safety Health and Environmental policies and Work Instructions by daily toolbox talks, Hazard identification risk assessments, conducting safety talks and communicating all management safety feedback to subordinates.
- Enforce the use of all required PPE in the Clean Conditions Area.
- Ensure sufficient safety and hygiene Work Instructions are enforced in the Clean Conditions Area.

3.7.5 Official Access Controller (OAC)

A Responsible person appointed by the CCC in writing to strictly control the access of personnel, materials and tools to the Clean Conditions Area. The Official Access Controller will be on duty in the Access Control Cabin whenever work is carried out in the Clean Condition Area. Official Access Controllers report directly to the Principle Official Access Controller.

Note:

An Official Access Controller also fulfils the function of a Tool Controller when tools pass through the Access Control cabin.

The minimum acceptance criteria for a Generator Official Access Controller are:

- A permanent employee of Risk & Resilience employed in accordance with the approved job description for the Generator Official Access Controller.
- A contract worker qualified as a Mechanical Artisan (for site work) or Electrical Armature Winder (For ERI workshop work) trained in Access Control and accredited by the ERI Training Department Manager.

Further duties include, but are not limited to:

- Control of entrance and exit of valid permit holders as per the Work Instruction.
- Control entrance and exit of components, tools, materials, equipment, consumables, PPE, keys and associated parts and equipment into/out of the Clean Conditions Areas, using registers as per the Work Instruction.

PUBLIC DOMAIN

- Ensure compliance to the clean conditions dress code as per Work Instruction.
- Ensure that all persons entering the area will pass through the metal detector or use a handheld detector when necessary.
- Ensure proper housekeeping of the main access point cabin.
- Monitor of CCTV cameras. Any non-conformances witnessed must be recorded in the log book and reported to POAC.
- Ensure that only Tool Containers accompanied by a detailed and audited tool list are allowed inside the Clean Conditions LRA.
- All other tools, or special tools that enter the area, must have a unique identification number.
- Ensure that all tools that enter or exit the Clean Condition Area are fit for purpose and without any defects
- Quantify and clearly describe components, materials, equipment and tools to the exact quantity and be aware of hidden components and attachments or connections.
- Record consumables accurately with quantity in, quantity out and container components such as lids and caps.
- Control and record all components and parts that leave or enter the area for overhaul or replacement.
- Enquire and check that all personnel entering this HRA remove all metallic parts, belt buckles, pens, jewellery, watches, coins, etc. All items removed from personnel or visitors are to be recorded on the applicable form and stored in a lockable cabinet.
- Keep the Clean Conditions control files up to date.
- Record any findings in the Findings Register and report to the POAC.
- Ensure visitors' permits are kept in the Access Control Cabin and not handed out.
- When the platform below the generator is part of the Clean Condition Area, and has an access gate, the Access Control gate must be locked during non-working shifts or when work has stopped. The keys must be kept in the Access Control Cabin and controlled in a key register.
- Reconcile all registers before the end of every shift. Material, equipment and tools that cannot be booked back must be transferred onto a long term register. The long term register must be reviewed on a daily basis.
- Must not allow more than two persons into the cabin for access at a time.
- Ensure that all portable/ small generator components i.e. bolts, nuts, washers, etc. have the small component inspector's signature before entering the Clean Conditions Area;
- Complete a daily log book and report to the POAC.
- Compare and ensure all component quantities are correct as per pre stripping column of the component and part list (Component inventory list) before passing through access point.
- The component and part list file to be kept in the access control cabin. The list to be handed to the supervisor or roaming Official Access Controller on request. The original lists are not to be copied and must be used as a working copy. On completion it must be handed back to the Official Access Controller to verify the components as indicated in the previous paragraph;
- **Note:** Scratching or Tippex® out register information is not allowed. Should information for some reason be required to be changed the CCC, and or POAC as well as the CCO are the only persons

authorised to do so. The changes should be signed and dated in the applicable register and must then be recorded as such in the findings register. Ensure that material, equipment or tools that will remain in the HRA for a time period longer than the shift must be booked into the Long Term Register. The Long Term Register will be reviewed on a daily basis. This arrangement must be agreed with the CCC or POAC.

3.7.6 Roaming Official Access Controller (ROAC)

The roaming Official Access Controller is appointed by the CCC in writing to control and log the access of material, components and tools to and from the High Risk Area and the LRA over the barricading.

The ROAC will also control and log the access of personnel, material, equipment, tools and components to the generator terminal chamber.

The minimum acceptance criteria for a Generator Roaming Official Access Controller are:

- A permanent employee of Risk & Resilience employed in accordance with the approved job description for the Generator Official Access Controller.
- A contract worker qualified as a Mechanical or Electrical Artisan or Armature Winder. This contract worker must be trained and declared competent as an Access Controller by the ERI Training Department.”

Further duties include, but are not limited to:

- Record and inspect all items leaving/entering the Clean Conditions Area by overhead crane. Once recorded, the lifting activity needs to be witnessed until the component reaches its end destination. (The ROAC must be aware of the end destination before any lifting may commence)
- Assist the Generator Supervisor with inspection and quantifying the generator components and parts in various stages as per site specific requirements and compare them to the design quantities.
- Inspect and declare all blanking plates, generator special tools, rotor removal tools and Clean Conditions Tent components that enter or exit the Clean Conditions Area.
- Report any findings or deviations (Personnel not adhering to processes, missing tools, missing spares, breakages of tools/components) to the POAC
- Also verify that all personnel are working according to the Work Instruction.
- Ensure that after each shift the area is cleared of all tools, equipment and consumables. In the event that any of these tools, equipment and consumables cannot be removed, these items must be recorded in the Long Term Register.
- Check the housekeeping. Any defect must be reported to the POAC or CCO and logged.
- Declare unattended tools, unless the reason is communicated to him/her.
- Monitor the functionality of the coil retaining rings heater blankets and dryers used for storage when placed in-service.
- Inspect generator bottom and terminal box access platform, periodically for Clean Conditions adherence. When work is performed in this area an Official Access Controller will man the entrance point and record all activities in the relevant registers.

3.8 CLEAN CONDITIONS ROLES AND RESPONSIBILITIES (TURBO GEN SERVICES)

3.8.1 Turbo Gen Services Senior Project Manager or Maintenance Group Manager

- Drive the site project implementation of clean condition processes;
- Continuous improvement of the clean condition control processes;
- Conduct unscheduled audits in all areas where clean condition is required;
- Supports Risk & Resilience Project Managers and site teams during the execution of the clean condition processes;
- Ensure that the clean condition operational audit findings and observations are correctly closed out on or before due dates.
- Ensure that any requests for concessions to the Work Instruction have an action plan which will mitigate all operational clean condition risks, prior to submission to Turbo Gen Services Engineering Manager.

3.8.2 Turbo Gen Services Project Manager/Site Manager

The Turbo Gen Services Project Manager or where applicable, the Turbo Gen Service Site Manager, will be the overall Operational Champion of the Clean Condition processes.

Further duties include, but are not limited to:

- Drive the project implementation of clean condition processes;
- Continuous improvement of the clean condition control processes;
- Conduct unscheduled audits in all areas where clean condition is required;
- Supports Risk & Resilience Project Managers and site teams during the execution of the clean condition processes;
- Adhere to Safety, Health and Environment objectives set out by the Risk & Resilience Manager.
- All project milestones and completion dates are achieved without any clean conditions risks
- Ensure no breaches or contraventions of Eskom and/or Site Specific CC FME Work Instructions.
- Ensure that any requests for concessions to Work Instruction have been discussed and accepted on behalf of Turbo Gen Services projects.
- Responsible for providing a quick response to emergency investigation(s).
- Provide Management response and actions to address all official Eskom audit and internal audit findings/recommendations relating to CC & FME.
- Interacts with clients with regards to the CC and FME reviews and improvements.
- Proof read the lessons learnt communication (240-94026801) and submit to the complete CC&FME team, Turbo Gen Services and Eskom Generation no later than end of business of the 2nd day after the incident.
- Ensure that all personnel training and authorizations into CC & FME area are in place.
- Manage Turbo Gen Services Project Personnel (or site personnel where applicable) in order to meet the requirements of the Eskom and site specific CC & FME control Work Instruction(s) on Turbo-generator Plant.

PUBLIC DOMAIN

- Carry out investigations on any Turbo Generator incidents and provide formal recommendations to the Client, Turbo Gen Services, Senior Project Manager and Maintenance Group Manager.
- Ensure that the Clean Conditions Area is established according to the Clean Condition Floor plan and Work Instructions.
- Support site teams during the execution of the clean condition processes.
- Support the Power Station during official Clean Conditions Audits.
- Ensure that there is a pre-defined inventory list is in place prior to the start of the outage.
- Ensure that the crane driver is permitted to refuse movement of components if such movements are not witnessed by a ROAC.
- Appointment of Turbo Gen Services personnel in their respective Clean Conditions capacity, such as the:
 - Generator Supervisors (Turbo Gen Services and or Contractor)
 - Crane Drivers
 - Small Component Inspectors
 - Generator Asset Controller

3.8.3 Turbo Gen Services Project Technician (PT)

The PT reports directly to the Turbo Gen Services Project Manager.

Further duties include, but are not limited to:

- Ensure that the process quality plans for the entire project are compiled and submitted to the Project Engineer and client for their approval.
- Ensure that all process quality plans and check sheets are implemented and controlled according to the work instructions in the business management system manuals.
- Provide technical support and recommendations where necessary or on request from the Project Engineer and supervisors.
- Ensure full compliance with Generator Clean Conditions Control Work Instruction
- Ensure that all activities are executed safely.
- Comply with the Generation and Site Specific Clean Conditions Work Instruction during the execution of his/her duties.
- Carry out Clean Conditions inspections as requested by Turbo Gen Services Project Manager.
- Ensure that no breaches or contraventions of Eskom and/or Site Specific CC & FME Work Instructions
- Supervise Turbo Gen Services Project Personnel (or site personnel where applicable) in order to meet the requirements of the Eskom and site specific CC & FME control Work Instruction(s) on Turbo-generator Plant.
- Drive the implementation and improvement of the clean condition control processes;
- Manage Turbo Gen Services Project Personnel (or site personnel where applicable) in order to meet the requirements of the Eskom and site specific CC & FME control Work Instruction(s) on Turbo-generator Plant.

PUBLIC DOMAIN

- Ensure that the Clean Conditions Area is established according to the Clean Condition Floor plan and Work Instructions.
- Support site teams during the execution of the clean condition process
- Ensure that there is a pre-defined inventory list in place prior to the start of the outage.
- Ensure that the crane driver refuse movement of components if not being witnessed by a ROAC.
- Confirm appointment of Turbo Gen Services personnel in their respective Clean Conditions capacity, such as the:
 - Generator Supervisors (Turbo Gen Services and or Contractor)
 - Crane Drivers
 - Small Component Inspectors
 - Generator Asset Controller
- Obtain customer approval for all concessions and specifications.
- Ensure that a register is kept and quality control occurs on all components leaving from and returning to site and on every component leaving and returning to site.

3.8.4 Turbo Gen Services Small Component Inspector (SCI)

The SCI reports directly to the Turbo Gen Services Generator Supervisor. The Small Component Inspector is appointed by the Turbo Gen Services Project Manager in a Clean Conditions capacity.

The small component inspector must be a Mechanical Artisan (Turbo Gen Services) or Electrical/Armature Winder (Generator Services) by trade.

The SCI also reports to the CCC and or the Principle Official Access Controller (POAC) only in a Clean Conditions Capacity.

Further duties include, but are not limited to:

- Take overall responsibility for the 'Hold', 'IN', & 'OUT' containers;
- Be responsible for the accounting of all bolts, nuts, washers, locking plates, insulators in the containers.
- Keep record of all components booked in and out of his/her control area.
- Inspect all small components and if necessary request "replacement components" via the relevant registers/forms.
- Ensure that components stored in the OUT container have signed Turbo Gen Services "green stickers".
- Ensure that components stored in the HOLD container have signed Turbo Gen Services "red stickers".
- Only issue components from the OUT container to the generator artisans and record in relevant register.
- Ensure that all components are labelled quantities are recorded and verified correct against the known Contractor "design quantities".

3.8.5 Turbo Gen Services Generator Supervisor (GS)

The Generator Supervisor is appointed by the Turbo Gen Services Project Manager in a Clean Conditions capacity.

The Generator Supervisor reports directly to the Project Technician or Maintenance Technician. The Generator Supervisor is responsible for the maintenance work at any stage of the planned outage or opportunity maintenance work.

The Generator Supervisor is usually but not limited to the generator Contractor's maintenance supervisors (i.e. Turbo Gen Services or the Contractor).

The Generator Supervisor has two responsibilities namely:

- Supervision of maintenance work on the generator.
- Responsibilities as per the applicable Clean Conditions Work Instruction (see below).

Clean Conditions duties include, but are not limited to:

- The Generator Supervisor must interact with the Official Access Controllers on a continual basis and must give assurance that the maintenance works are done in compliance to the site Work Instruction.
- Ensure that all subordinates have attended the clean condition training and have been declared competent.
- Ensure that all subordinates are issued with the correct Clean Conditions PPE.
- Inform the CCC and the POAC timely of any deviations to the site Clean Conditions Work Instruction as per his/her duties.
- Ensure that the PQP documentation includes the necessary Clean Conditions hold and other point requirements. Agreement is hereby also reached that work will not proceed to the next step prior to the relevant Clean Conditions Review hold point is signed off.
- Erecting (and dismantling) the Clean Conditions work area as per the approved floor plan.
- General housekeeping and cleanliness of the Clean Conditions area. The Tool/Official Access Controller may point out certain Clean Conditions requirements to the Generator Supervisor for rectification. All such requests must be logged in the daily log book by the Tool/Official Access Controller.
- Ultimately responsible for reporting broken or missing tools that may arise from the maintenance work activities
- Responsible for the condition of the tools in the generator tool container. This includes the responsibility to ensure that all the tools in the generator tool container are fit for purpose and must ensure that defective tools get properly discarded and replaced with new tools. No attempts will be made to repair tools.
- Responsible for maintaining the tool inventory of the tool container and must provide such inventory to the Principle Official Access Controller prior to the outage.
- Arrange with the CCC and CCO for a tool container audit prior to the outage and again after the outage before the container leaves site. If so desired, ad hoc audits may also be arranged. All findings will be recorded in the log book.
- Discuss the shift's work with the CCC and or the POAC and must ensure that all hold and other points with regards to the Clean Conditions reviews is adhered to.
- Ensure that all items are booked in and out of the clean condition area correctly.

PUBLIC DOMAIN

- Ensure that at the end of each shift that all registers are balanced.
- Carry out all the inspections as required by the PQP.
- Carry out inspections in the Clean Condition Area to ensure there are no loose or foreign objects unaccounted for.
- Sign Generator handover certificate.

3.8.6 Turbo Gen Services Generator Artisan (GA)

The Generator Artisan reports directly to the generator Supervisor.

The Generator Artisan is appointed by the Turbo Gen Services Project Manager in his/her Clean Conditions capacity.

The duties of the GA include, but are not limited to:

- Execute all work activities safely.
- Comply with the Work Instructions.
- Ensure that all items are recorded in and out of the Clean Condition Area correctly. This includes the description, number of items and the condition of the items.
- Leave the work area in a neat and tidy condition.
- Must immediately report any damaged or missing tools, components, equipment to the GS.

3.8.7 Turbo Gen Services Quality Technician (QT)

The Quality Technician reports directly to the Turbo Gen Services Project Manager. The Quality technician is appointed by the Turbo Gen Services Project Manager in a Clean Conditions capacity.

The duties of the QT include but are not limited to:

- Comply with the Generation and Site Specific Clean Conditions Work Instruction during the execution of his/her duties.
- Verify the Generator pre-defined inventory list for correctness as and when requested.
- Ensure that the pre-defined label cards are filled in accurately and are signed off by means of daily unscheduled audits.
- Carry out inspections as requested by Turbo Gen Services Project Manager.
- Carry out unscheduled random audits on compliance to Generation and Site Specific processes and Work Instructions.
- Carry out all the Generator reviews with the CCO and ILR.
- Report any findings to the CCC and CCO.

3.8.8 Turbo Gen Services Quality Inspector (QI)

The Quality Inspector reports directly to the Quality Technician. The Quality Inspector is appointed by the Turbo Gen Services Project Manager in a Clean Conditions capacity.

The duties of the Quality Inspector include the following but are not limited to:

- Comply with the Generator and site specific Clean Condition and Execution and Control of all Work Instructions and requirements during the execution of his/her duties.
- Verify the generator pre-defined inventory list for correctness as and when requested.
- Ensure that the Clean Condition site establishment comply with the requirements for the clean condition area and documented floor plan.
- Witness and record the checking of the Balance weights locking and locking mechanism of all internal generator components.
- Verify conformance to the site specific blanking Work Instruction requirements.
- Perform daily unscheduled audits on the tool store for compliance in accordance with 240-125904456 and 240-56178527.
- Perform daily unscheduled audits on Small component store for compliance in accordance with 240-56178527 and 240-137025973.
- Perform daily unscheduled audit for compliance on the Hold and Quarantine areas in accordance with 240-56178527 and 240-137025973.
- Report all documented finding to the Quality Technician, Generator Supervisor and CCC (where applicable).
- Verify the generator daily reviews with CCO for completeness as and when requested.
- Ensure housekeeping in Clean Condition area is as per requirements. Report deviations.

3.8.9 Turbo Gen Services Crane Driver (s)

The Crane Driver(s) is appointed by the Turbo Gen Services Project Manager in a Clean Conditions capacity.

The crane driver duties include, but are not limited to:

- Inspect the overhead cranes daily according to the relevant check sheets.
- Hand over the completed check sheets to the CCC or the POAC. These check sheets must be reviewed daily by the CCC and or the POAC. Any abnormalities found should be reported to the CCC and CCO immediately.
- Ensure that a Roaming Official Access Controller witnesses movement of components over barricading. The crane driver must refuse movement of components if this condition is not met.

3.8.10 Turbo Gen Services Asset Controller (Tool Store person)

The Asset Controller reports directly to the Expediter. The Asset Controller is appointed by the Turbo Gen Services Project Manager in a Clean Conditions capacity

Responsibilities include, but are not limited to:

- Manage all assets, make them available and ensure that they are in working conditions in accordance with Turbo Gen Services Work Instruction TT-F-2.
- Continuous inspection of assets and ensure defective tools are not issued. Any Tools received in a defective condition must be immediately reported to the Official Access Controllers, for Clean Conditions purpose recording/reporting. The defective tool must be labelled and placed in the "Hold Area" until replaced/repaired.
- Maintain the asset register and report deviations to the Expediter.

PUBLIC DOMAIN

- Responsible for housekeeping of the Tool Container.
- Maintain the relevant tools registers and filing systems.
- Ensure the numbers appears on asset and that they correspond with the asset register.
- Perform an audit before and after Clean Conditions on all tools and equipment inside the Tool Container.

3.8.11 Turbo Gen Services Semi-Skilled Worker(s)

The Semi-Skilled Worker is appointed by the Turbo Gen Services Project Manager in a Clean Conditions capacity, but may not perform any work in the HRA unless physically supervised by the Turbo Gen Services Generator Supervisor.

Responsibilities include, but are not limited to:

- General housekeeping activities in the LRA and HRA work area's
- Cleaning and preparation of generator spare parts under supervision of the generator artisan.
- Provide hand assistance during strip down and re-assembly activities where and when required.

3.9 ESKOM ROTEK INDUSTRIESTRAINING DEPARTMENT MANAGER

- Develop and maintain a suitable Clean Conditions Training Program and ensure that Clean Conditions training is undertaken.
- Ensure that Generator Clean Conditions training courses are developed for each specific category of staff who will execute work in the clean conditions areas. This includes Generation, Turbo Gen Services, Risk and Resilience, Temporary Employment Services (TES) and OEM's.
- Determine and declare the course duration for each specific course category.
- Accreditation and re-accreditation of personnel will be the responsibility of the Training Department Manager.
- Develop and maintain a Clean Conditions accreditation data base and issue hard copy permits to accredited personnel. This will be required for Generation to be assured that only trained and accredited personnel are issued with a valid Clean Conditions access permit.
- Appoint ERI training practitioners within the ERI Training Department. Where ERI Training department identifies the need to accredit external training practitioners (e.g. TES or OEM personnel) to execute the ERI Clean Conditions training material, it is mandatory that the physical examination and accreditation of such workers will remain the responsibility of the ERI Training Manager.
- All examination papers shall be retained and archived for a minimum of 5 years by the ERI Training Department for audit purposes.
- Remote areas in Eskom such as Peaking, Renewable Energy and Nuclear possess a significant logistical training personal deployment issue, during unplanned emergency Clean Conditions training and accreditation. To mitigate this risk, it is required that the ERI Training Department Manager initiate and schedule "bulk training sessions" at pre-agreed Peaking, Renewable Energy and Nuclear venues. Follow-up smaller sessions should also be arranged for individuals that cannot attend this initial wave of training. Furthermore to deal with the exception and unplanned emergency training requirements, technology such as audio visual remote sessions should be trialled and if proven successful, implemented.

3.9.1 Training Practitioners

- Practitioners need to be appointed and accredited by the ERI Training Manager.
- Practitioners should have a technical power plant related background in order to effectively execute the training curriculum.
- Training Practitioners will be required to present planned and emergency Clean Conditions training at pre-designated venues.

3.9.2 Formal Clean Conditions Training and Accreditation:

The duration of the formal training program will be determined by the ERI Training Department Manager.

Where re-accreditation is required it will be the discretion of the ERI Training Department Manager to determine how that process will work in terms of course content, course duration and logistics.

The most important factor is that the examination and accreditation of the candidates be undertaken by an ERI Training Department in order to assure the organisation that an acceptable training standard and level is maintained throughout the organisation. The examination papers will be archived for at least 5 years by the ERI Training Department.

Induction and formal training apply but is not limited to:

3.9.2.1 Generation:

- ILR
- CCO
- Outage management Generator co-ordinator
- Generator Systems Engineer
- Training Department practitioner(s)*
- Maintenance Department personnel (Mechanical, Electrical, Operations, C&I, PTM, Condition Monitoring etc.)

*Applicable where the Power Station wishes to undertake the Induction training responsibility

3.9.2.2 Turbo Gen Services:

- Senior Project Manager
- Site Project Manager
- Site Manager
- Project Technician
- Project Quality Technician
- Project Quality Inspector
- Generator Supervisor
- Generator Small Component Inspector
- Generator Artisan

PUBLIC DOMAIN

- Crane Driver
- Asset Controller (Store man)
- Semi-Skilled Worker

3.9.2.3 Risk & Resilience:

- CC&FME Manager
- CC&FME Project Manager
- CC&FME Champion
- CC&FME Principle Official Access Controller
- CC&FME Official Access Controllers
- SHEQ System Auditors
- SHEQ Safety Officers
- SHEQ Safety Coaches

3.9.2.4 Peaking, Renewable Energy and Nuclear.:

- ILR
- CCO
- Outage management Generator co-ordinator
- Generator Systems Engineer
- Senior Project Manager
- Maintenance Group Manager
- Project Manager
- Site Manager
- Generator Engineer
- Project / Site Technician
- Quality Technician (QT)
- Quality Inspector (QI)
- Generator Supervisor(s) (GS)
- Generator Artisan(s) (GA)
- Maintenance Artisans
- Small Component inspector(s) (SCI)
- Generator Asset Controller (Tool Store man)
- Crane Driver
- Semi-skilled workers
- Riggers

PUBLIC DOMAIN

3.9.3 TRAINING VALIDITY

3.9.3.1 Generation

Accreditation validity is 3 years (or in line with the Clean Conditions Works Instruction for:

- ILR
- Outage management generator co-ordinator
- Generator Systems Engineer
- CCO
- Training Department practitioner(s)
- Maintenance Department personnel (Mechanical, Electrical, Operations C&I, PTM, Condition Monitoring etc.)

3.9.3.2 Risk & Resilience

Accreditation validity is 3 years for:

- Clean Conditions & FME Manager
- Clean Conditions Project Manager
- Clean Condition Champion
- Principle Official Access Controller (POAC)
- Official Access Controller(s) (OAC)
- Roaming Official Access Controller (ROAC)
- SHEQ System Auditors

3.9.3.3 Turbo Gen Services

Accreditation validity is 3 years for:

- Senior Project Manager
- Maintenance Group Manager
- Project Manager
- Site Manager
- Generator Engineer
- Project / Site Technician
- Quality Technician (QT)
- Quality Inspector (QI)
- Generator Supervisor(s) (GS)
- Generator Artisan(s) (GA)
- Small Component inspector(s) (SCI)
- Generator Asset Controller (Tool Store man)
- Crane Driver

PUBLIC DOMAIN

- Semi-skilled workers

Note:

- Semi-Skilled workers must be physically supervised by the Turbo Gen Services Generator Supervisor at all times when in the HRA.

3.9.3.4 Peaking, Renewable Energy and Nuclear:

Accreditation validity is 3 years (or in line with the Clean Conditions Works Instruction for:

- ILR
- CCO
- Outage management Generator co-ordinator
- Generator Systems Engineer
- Senior Project Manager
- Maintenance Group Manager
- Project Manager
- Site Manager
- Generator Engineer
- Project / Site Technician
- Quality Technician (QT)
- Quality Inspector (QI)
- Generator Supervisor(s) (GS)
- Generator Artisan(s) (GA)
- Maintenance Artisans
- Small Component inspector(s) (SCI)
- Generator Asset Controller (Tool Store man)
- Crane Driver
- Semi-skilled workers
- Riggers

3.9.4 Clean Conditions Induction DVD (site)**Note:**

The induction DVD shall be shown at every outage.

Induction DVD shall be available at:

- Main Access Container
- Turbo Gen Services Site Manager

PUBLIC DOMAIN

Induction DVD presenters:

- CC&FME Champion, or the Turbo Gen Services Project Manager, or CC&FME Principle Official Access Controller Access Controller
- Turbo Gen Services Project manager (If applicable)
- CC&FME Principle Official Access Controller
- CCO

It will be the responsibility of the on-site presenters to ensure that:

- That all related questions are adequately answered.
- That DVD Induction declaration forms are available and that each candidate signs off that he/she is fully aware of the risks and Work Instructions involved in working on generators. The candidate must also acknowledge that he/she understands the reporting structure of the Clean Conditions Area.
- Declaration form must be signed by the presenter as well as the permit applicant.
- The declaration forms should be filed as part of the Outage Clean Conditions documentation.

3.9.5 BYPASSING OF TRAINING / ACCREDITATION (Emergency only)

In the event of an unplanned emergency scope of work to be performed by a key critical resource that may result in an outage slip / delay the following process will apply.

- The ERI project manager / Generation outage manager will formally motivate to the ILR the requirement for a specific work activity to be performed by a key individual who does not have formal clean conditions training and accreditation.
- The ERI project manager / Generation outage manager will arrange / book a formal emergency clean conditions training session with ERI training department
- The ERI project manager will arrange for normal induction awareness training.
- The emergency training will be a reduced version of the full training curriculum with the intent to prove competence of the worker and the scope of work to be undertaken but with the requirement of being constantly supervised by the following clean conditions personnel. (CCO, CCC, POAC or ROAC).
- In the event that a language / communication barrier exists, it is required that the worker who cannot speak the English language be accompanied by a fellow worker that can translate and communicate with the clean conditions personnel.

3.10 SKILLS

Specific skills are required for the specific roles and responsibilities in the Clean Conditions Area.

It is therefore important that any Clean Conditions appointment or access permit being issued is done with the understanding that the individual is suitably qualified for the expected task at hand.

3.11 GENERATOR OUTAGE PLANNING

The requirement for the set-up and execution of generator Clean Conditions must form part of the site specific Clean Conditions Works Instruction for both planned and unplanned scope of work.

This should be reflected on the stations outage planning scope of work and must be in-line with the ENK 281 (Appendix 11 "Planning Timeframes")

3.12 QUALITY PROCESS AND WORK INSTRUCTIONS

An essential part of the Clean Conditions process is to have a well-defined quality control and assurance system in place comprising of detailed quality plans, work Instructions, best engineering practices and ad-hoc audits/review/assessments during the outage.

Quality plans shall include inspections with specific hold witness and other points to ensure that all precautions are taken to prevent ingress of debris, loose components or foreign components into the machine. The mandatory Clean Conditions Review stages should be contained in the quality plan and marked as hold points.

The quality plan shall show that agreed acceptance criteria have been met at appropriate stages of the work. An important part of the quality plan is the certification by means of signatures that work was done satisfactory. Assignment of responsibilities is thus made clear in a natural way. If used properly, this can help eliminate confusion over who is responsible for various items such as inspections, tests, physical work, supervision thereof, acceptance approvals, etc.

3.13 CLEAN CONDITIONS AREA PROCESS (ON-SITE)

3.13.1 Clean Conditions Area General Requirements

The Clean Conditions Area layout is designed with specific floor plan dimensions and constraints in mind. In principle the layout should achieve an access controlled; barricaded environment in which all access of personnel, tool, equipment, materials, spares, consumables etc. can be managed.

Typical minimum requirements to be detailed in the Work Instruction should be:

- Barricaded Low Risk Area
- Barricaded High risk Area
- Access Control cabin (with metal detectors and turnstiles)
- Dedicated Tools Container
- Dedicated Generator Spares Containers
- CCTV system
- Clean Conditions PPE
- Tent
- The Official Access Controller must sign all permit holders in and out of the clean condition area. (The only exception is where a computerised database is linked to the magnetic card system)
- Day visitors to the Clean Conditions area shall make use of a visitors permit system to gain once-off entry to the Clean Conditions area. The CCO will be the responsible person on-site to issue visitors permits and must take accountability for the visitors. Visitors that need to enter the work area will have to undergo Clean Conditions Induction Training, prior to being issued with a visitors permit. No visitor may be left without supervision in the HRA or LRA.
- No Cell phone cameras are allowed in Clean Conditions Areas. Only site approved cameras are allowed into the Clean Conditions Areas.
- Future electronic access control system technology for personnel, tools, materials etc. must be approved by the Group Technology Clean Condition Custodian prior to implementation. This should include a rollout program inclusive of training and Work Instruction updates as well as organisation Information Technology Architecture approval.

Note:

- Day visitors will not be permitted to perform any physical generator scope of work in the Clean Conditions Area. The visit will be of a temporary nature and the visitor must be accompanied by the CCO or formal delegate into the area.
- Access into the Clean Conditions area shall only be gained by passing through a metal detection system. The hand held metal detector should be used as an emergency back-up system should the walk through metal detectors be out of operation. The incorporation of turnstiles in the main access cabin is recommended since this will regulate high personnel traffic via this control point.
- Access over/through barricading is only allowed under special circumstances as described under the section dealing with barricading. A Roaming Official Access Controller must witness and record these types of activities.
- During an emergency where first aid or firefighting is to be applied inside the Clean Conditions Area, free entry under supervision of the Official Access Controller is allowed. A breach of Clean Conditions incident should be registered and suitable recovery actions be implemented.
- No eating, drinking or smoking will be allowed inside the HRA and or LRA.
- Access during non-working time will not be allowed. The external perimeter of the Clean Conditions area should be patrolled by the site security during non-working time. An Access Cabin key control system during non-working hours must also be in place and the arrangement details properly indicated by signage on the Access Cabin.
- No personnel, tools, equipment, materials or anything else shall pass into or out of the High Risk Area without being registered by the Official Access Controller.
- The use of sticky carpets at various strategic locations in the Clean Conditions Area (as defined on the floor lay-out plan will also aid in ensuring that foreign material be removed from the underside of the overshoes.

3.13.1.1 Documents and Information to be Displayed/Available in Main Access Cabin

- An emergency evacuation plan. (It is the responsibility of the CCC and or the POAC to ensure that all permit holders are aware of the evacuation plan).
- Clean Conditions Work Instruction: 240-56178527
- Clean Conditions Policy: 240-47859177
- The site specific Clean Conditions Work Instruction
- All Clean Conditions roles appointment forms
- The Clean Conditions filing system
- The Clean Conditions floor plan
- All chemical material safety data sheets (MSDS)
- Daily log book
- Clean Conditions responsibility organization chart with contact numbers
- Official Access Controller accreditation certificates
- Permit holder Access List
- The Power Station emergency contact telephone number.
- Clean Conditions Induction DVD

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- Clean Conditions induction declaration forms.
- Certificate of Compliance (CoC) for the electrical installation of the containers.
- All relevant safety and emergency notices.

3.13.1.2 Clean Conditions Access Permit Requirements (Low and High Risk)

The CCO is responsible to issue and control the generator photo permit system. A photo access permit system must be used. Permits must comply with at least the following requirements:

- All persons that need to perform work in the Clean Conditions area must apply in writing on a permit application form for a permit.
- Permits may not be issued unless it can be verified that the applicant has undergone Clean Conditions Induction Training. This training should be valid for the entire duration of the outage.
- The permit must be unique to each Clean Conditions outage, and should be identified with the specific unit number and must have a start date and a planned end date. The permit will be valid for the entire duration of the outage (Scope of work content for example may change and therefore exceeding the planned outage end date will have no impact on the permit validity).
- The permit should clearly indicate which Clean Condition Areas the permit holder is allowed to enter (i.e. Low and/or High Risk Area etc.)
- The permit must incorporate a recent photo of the permit holder.
- The permit must contain the individual's initial(s), nick name and surname.
- The permit must have a unique reference number that is linked to an Access List.
- The Access Permit List must be updated by the CCO and be re-issued every time changes take place. The Access List must have a revision number and date.
- The permits may not be removed from the main Access Cabin. The only exception is where the site security magnetic card access system is used and it is linked to the Clean Conditions area access control system by means of a dedicated control system. Where a magnetic card system is used, the card should also contain a photo of the card holder. This may be a separate photo but must have a positive link to the card unique number.
- The permits must be displayed on a permit display board ("IN" / "OUT") and will be used for roll call purposes in the event of an emergency.
- Visitors will not be issued with photo permits. Instead a Visitors Permit will be issued and the visitor will be accompanied into the Clean Conditions Area by the CCO or formal delegate.

3.13.1.3 Clean Condition Area Dress Code

Persons entering the Clean Conditions area shall take precautions against leaving foreign objects in the machine inadvertently. In this regard, the wearing of appropriate clothing shall be insisted on by those controlling access to the machine.

The area dress code will comply with the minimum Work Instructions as detailed below:

- PPE, i.e. hard hats, hearing protection etc. (excluding conventional overalls and safety shoes) that is required for the specific task.
- Dedicated two piece Clean Conditions overalls made of 100% cotton and be white in colour. These overalls may not have any pockets, belt loops or metallic fasteners. Where specific work activities necessitate the use of one piece overalls, it must be approved for use by the CCC and CCO.

- Where a specific need arise to utilise disposable overalls for specific work activities, it must be approved by the Clean Conditions Officer. The minimum requirement of such disposable overalls is that they should be on a one piece construction, have no pockets, metallic attachments and only have Velcro fasteners. These disposable overalls are allowed to be worn over normal Clean Conditions overalls but must be put on and be removed in clear sight of the CC&FME Access controller who in turn must ensure that the requirements of this WI is clearly met. The preferred colour of these disposable overalls is white.
- No clothing other than a pocket-less cotton T-shirt or underwear may be worn underneath the overall. There is no specific colour requirement for the T-shirt although white is preferred. Should there be an issue w.r.t. the colour of the T-shirt it will be resolved by the CCC & CCO. Undergarments must not contain any metal parts.
- Safety shoes shall be worn at all times.
- The safety shoes shall comply with the following:
 - No shoe laces
 - No shoe lace clips or any other loose fastening device
 - The shoes should be undetectable by a metal detector
 - Have shoe soles with a grip pattern that will minimise the entrapment of small foreign debris
 - Uppers preferably to be made of leather

Note:

During unforeseen circumstances where the above type of shoe is unavailable for whatever reason, it is required that the matter be referred to the ILR for the necessary risk mitigation and approvals.

- Overshoes shall be worn when entering the Clean Conditions High Risk Area. This is necessary to avoid contaminating the machine with swarf or similar magnetic and non-magnetic particles that may become embedded in the soles of safety shoes.
- Overshoes must comply with the following:
 - Be of cotton material with a rubber sole for proper grip and have an elasticised shoe opening.
 - Overshoes must conform to SABS SANS 20345:2008 sections 5.3.5 (5.3.5.2 minimum spec), tested in accordance with ISO 20344; section 5.11 and the coefficient of friction determined in accordance with ISO 13287.
 - Overshoes must have a unique number.
- Overshoes may under no circumstance be worn outside the High Risk Area.
- Overshoes will be issued inside the main Access Container.
- Overshoes may be washed and re-issued.
- Safety shoe soles must be checked and cleaned (if necessary) prior to putting on the overshoes.
- No jewellery or any other metallic/non-metallic personal effects will be allowed inside the High Risk Area. Suitable storage for personal effects shall be provided at the entry point. Storage of personal affects shall be at the individuals own risk. Where this requirement cannot be met fully, such in the case of medical alert tags, the CCC and or POAC should ensure that sufficient control measures are in place (and documented) to mitigate associated risks.

- The wearing of prescription spectacles (or safety glasses) is allowed inside the High Risk Area and should be logged in the register. The frame screws must be controlled on entering and exiting the area.
- In the case of extreme cold working conditions the use of thermal underwear is allowed. Where this underwear does not provide adequate protection against the cold the use of an approved Clean Conditions jacket made of 100% cotton without pockets or metallic fasteners is allowed.

3.13.1.4 CCTV Surveillance

CCTV surveillance equipment in the Clean Conditions Area is obligatory. This additional measure will assist the Clean Conditions personnel in providing an effective means of controlling the area.

It will be the responsibility of the CCC and ILR to determine the exact number of cameras and their placement. As a minimum the Clean Conditions area should be covered in the following areas or zones:

- The Main Access Container (inside).
- The Tool Container (inside).
- The spares holding area (i.e. Low Risk Area).
- The High Risk Area.
- The generator belly/terminal chamber area.

The minimum CCTV specification shall be:

- Real time recording on hard disk drive(s).
- Playback/viewing recordings while maintaining real time recording.
- Sufficient data storage space to ensure no information gets lost during outage duration.
- Colour display screen in access cabin.
- Data transfer capability (i.e. DVD recorder, USB interface etc.) with universal video codec's.
- Low light cameras to be used underneath the generator where lighting is normally poor

3.13.1.5 Clean Conditions Area Enforcement and De-Establishment

The Clean Conditions Area enforcement and de-establishment must adhere to the following criteria:

3.13.1.5.1 For Level 3 - Outages

For Clean Conditions enforcement:

- The CCO must be satisfied that the work risk is well defined and documented before dismantling and repair SOW can be executed
- All PQP's are in place, signed off and accepted by the Generator Outage Co-ordinator or the system engineer.

For Clean Conditions De-establishment:

- The CCO must be satisfied that the work scope has been successfully completed and that all control, inspections and quality control measures were adhered to.
- The System Engineer must provide quality assurance.

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3.13.1.5.2 For Level 2 - Outages

For Clean Conditions enforcement:

- The work area should be barricaded.
- All relevant registers to be available.
- Access to the work area should be manned by a CCC and or POAC and Risk & Resilience Official Access Controllers
- The CCO should review the setup and give the go-ahead for work to proceed.
- All PQP's are in place, signed off and accepted by the Generator Outage Co-ordinator or the system engineer.

For Clean Conditions De-Establishment:

- All work should be complete
- All registers should be consolidated
- Final inspections to be conducted prior to closing up
- Closing up complete
- The CCO should review the setup and give the go-ahead for Clean Conditions to be de-established.
- Reviews 8 & 9 to be signed off
- The System Engineer must provide quality assurance.

3.13.1.5.3 For Level 1 - Outages

For Clean Conditions enforcement:

- All PQP's are in place, signed off and accepted by the Generator Outage Co-ordinator or the system engineer.
- Review #1 and #2 should be signed off
- For Clean Conditions De-establishment:
 - Review #7 to be signed off

3.13.1.5.4 Clean Conditions LOCK-UP and GO during outages

It may be required to abandon the Clean Conditions Area under special circumstances. These circumstances are difficult to define but may include safety or security reasons or it may have to do with waiting time of spares, equipment and/or materials as an example.

Should any such special circumstance arise, it will be the responsibility of the Clean Conditions Project Manager and the ILR to discuss and agree on the terms of Clean Conditions area abandonment.

The minimum area requirements will be as follows:

- An approved risk assessment of the situation should be compiled on the latest Gx template and the Clean Conditions risk properly addressed.
- The area barricading should be intact and inspected at least once a shift by on-site security.
- The Access point should be locked and key control arrangement should be in place. These arrangements must be clearly indicated via adequate signage on the main access point.

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- The CCTV camera system must remain active and should record any motion detected in the area.
- The generator openings must be covered in such a manner that no accidental foreign material ingress or contamination will take place.
- A full reconciliation of personnel, tools and equipment must be performed. This reconciliation should be audited and agreed to by the Risk & Resilience CCC and the Generation CCO. This must be documented and signed off in the relevant registers and any deviations should be documented in the findings register.
- If the Generator Rotor is in-situ, the recommendation is that the inner baffles should be in place to aid in protection of any FME ingress.

Note: Before Generator Clean Conditions can be reinstated the following must take place:

- Risk & Resilience as well as Generation to review the CCTV footage and agree that there was no breach in Clean Conditions.
- A full audit of personnel, tools and equipment. This audit should be reconciled and agreed to by both Risk & Resilience as well as Generation.
- A full inspection of the Generator Clean Condition area's by the CCC, CCO and the Generator contractor (if applicable) to establish the integrity of the Generator Clean Condition areas before work can resume. This agreement should be in writing before resumption of any Generator Clean Condition activities.

3.13.2 Clean Conditions High Risk Area Logistical Requirements

- This is the area of the highest risk. This includes the generator stator, exciter and generator rotor work areas.
- Under predefined conditions (eg. stator rewinds) the entire area or parts of it could be covered with a Clean Conditions tent and canopy.
- Access to this area will be controlled and only persons with a valid permit are allowed into this area.
- Clean Conditions PPE should be worn in this area.
- No maintenance or refurbishment of spare parts will be allowed in this area.
- No storage of tools is allowed in this area. Only special tools that cannot be removed will be allowed to stay for extended periods in this area. These items must be recorded in the relevant registers.
- No storage of spare parts will be allowed in this area.
- Work is limited to stator, rotor and exciter maintenance only.
- Entrance to the area will be via a metal detector system and tacky/sticky carpets.
- Floor area to be covered by an appropriate covering such as Novilon to aid in the detection of fallen spares or tools.
- Under normal circumstances no purpose built machining, consumable and tool containers will be allowed into the HRA. Should there be a very specific need, for example a stator rewind. The Risk & Resilience CC&FME Project Manager, the Turbo Gen Services Project Manager and the Generation ILR must assess the risk and ensure that appropriate risk mitigation measures and processes are in place. Following mutual agreement between Turbo Gen Services and Risk & Resilience as well as the Eskom site, a concession must be applied for and approved by the Turbo Gen Services Engineering Manager as well as the Eskom Group Technology Custodian of this Work Instruction. (The concession process later described in this Work Instruction should be utilized).

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- At the entrance of the High Risk Area the Official Access Controller must ensure that personnel, tools, spare parts and any other ad-hoc items are recorded in the relevant registers.
- When the generator terminal box / bushing chamber is opened for inspection and/or maintenance, this area will also be regarded as a High Risk Area. It is imperative that sufficient control measures for personnel, equipment, tools and material be employed at the natural access of the terminal box. (Emergency SOW inspections are dealt with under 3.3; Table 2: Internal Inspection - Boundary Considerations)

3.13.3 Clean Conditions Low Risk Area Logistical Requirements

- This work area will have a lower risk associated with it since it is a work area that is clearly separated from the High risk Area.
- Refurbishment work of spare parts is allowed in this area.
- Storage of spare parts, tools and material allowed in this area.
- The generator tools container must be manned by a dedicated Generator Tool Controller.
- All generator small spare parts must be kept in a Small Component container and must be regulated by the Small Component Inspector.
- Packing and unpacking of crates is allowed in this area.
- Area must have a separate controlled entrance.
- Area may have a large component access gate. Entrance and exit to be controlled by the Official Access Controller.
- Access to this area is via the Access Control Cabin.
- Normal PPE (i.e. blue overalls) is also allowed in this area.

3.13.4 Clean Conditions Area Miscellaneous Requirements

3.13.4.1 Clean Conditions Tent

Under special circumstances such as stator maintenance, stator rewinds or on-site rotor storage the use of a tent is recommended to avoid any unwanted debris to enter the machine, being airborne or accidentally flung into the machine. The reference to “tent” may imply a purpose designed and constructed covering or may comprise of a temporary construction such a scaffolding wrapped with plastic or tarpaulin. Structures such as exciter canopies may also be deployed to form part of the “tent” layout.

The tent should:

- Be constructed in such a way to minimize the number of detachable items.
- Be thoroughly inspected by the Clean Conditions personnel before entering the Clean Conditions Area.
- Be- pre-approved inventory list of all the tent components be in place.
- Be erected under the supervision of the Generator Supervisor, CCC and or the POAC.
- It is strongly recommended to have a positive pressure ventilation system with filtered and dehumidified air. Due to varying site environmental conditions, outage duration, SOW etc., it will be the responsibility of the Generator Systems Engineer in consultation with the CC&FME Project manager to determine and execute the requirements for such a ventilation system.

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- Should scaffolding be used, then the process described in 3.13.4.2 below under “scaffolding” also applies.

3.13.4.2 Scaffolding

It is recommended to minimize the use for scaffolding as far as possible. (Rather use purpose made special platforms). Platforms must be designed with minimum small components that can become detached.

Further requirements:

- Scaffold control register to must be a separate register detailing all items and components that enter and exit the area.
- Daily inspections need to be performed according to register 240-102104412.
- Steel wire or Ductape shall not be used during scaffolding construction.

If scaffolding needs to be erected during Clean Conditions control, the following applies:

- Erection must be witnessed by the CCO, CCC or POAC.
- Any work in progress needs to be stopped temporarily and the generator closed up with appropriate covers to prevent ingress of foreign material.
- Scaffold builders must adhere to clean condition processes in terms of dress code and PPE.
- Scaffold builders must undergo Clean Conditions induction and be issued with visitors permits. Under NO circumstances should the scaffold contractor personnel be allowed to work in the Clean Conditions Area unaccompanied by either the CCC or the POAC.

3.13.4.3 Barricading Requirements

The barricading should comply with the following minimum requirements:

- Enclose the entire work area (Low and High Risk zones).
- Be at least 1,8m high.
- Have no openings between the barricading and the floor.
- Be of such a design to discourage the free passing through of items.
- External boundary barricading shall be of a solid construction.
- Barricading constructed with expanded metal and covered with Perspex will be allowed as a boundary between the HRA and LRA.
- Sections should interlock by means of interlocking brackets and should preferably not be fastened with bolts and nuts (bolts and nuts poses an additional risk in the Clean Conditions area).
- The barricading structure should have an inventory indicating all items to be used during the construction.

Note:

Barricading of expanded metal construction has the added advantage of increased supervisory visibility at the boundary between the LRA and HRA.

For reference only...

Applicable Turbo Gen Services Barricading Drawing Numbers:

- 13.59/2123 (Clean Conditions Barricading)
- 13.59/2124 (Clean Conditions Access Cabin)
- 13.59/2125 (Generator Tool Container / Tool Store)
- 13.59/2126 (Spare Hold Container – 3 door)

3.13.4.4 Blanking Plate System

- Turbo Gen Services Site maintenance are the controllers and custodians of the blanking plates
- A dedicated blank plate control register must be used and maintained by the Access/Tool Controller.
- Only approved blanks as per 240-56356616 must be used for the blanking of pipes and openings. If no permanent blank available, then a solid temporary blanking plate should be used and controlled in the register. A permanent blanking plate should be manufactured and fitted within 48 hours.
- All items including the bolts, nuts, washers, gaskets and the physical blanks must be controlled in the blank plate register.
- Every site shall have a line diagram to indicate the exact location of blank plate/spade. This diagram must form part of the Work Instruction Clean Conditions check sheets.

3.13.4.5 Exciter Bed Plate Removal

At some Eskom power stations such as the “GEC” stations there is a floor space limitation in the HRA and therefore the bedplate cannot be removed from the foundation and placed elsewhere in the HRA for dismantling. This in turn has a direct impact on outage duration because the generator rotor removal is dependent on the exciter being removed completely.

In order to accommodate outage duration optimisation it is recommended to facilitate time saving initiatives w.r.t. exciter maintenance.

The complete exciter bedplate (and where applicable the exciter gearbox) can be removed from the HRA under the following conditions:

- A satellite Clean Conditions Controlled Area (High and Low Risk) is established according to a pre-approved floor plan.
- All control measures in this satellite area is a duplicate of the main area.
- All strip down and removal activities are controlled.
- If required, the exciter bed plate can be removed from the main generator HRA and placed in the satellite HRA.

Note: The only exception is where no work will be performed on the exciter and therefore it will be placed in the LRA.

- The exciter bed plate can be brought back into the generator HRA as a complete unit or in components as long as the register balances and all components are accounted for.

For removal of the exciter bed plate from the generator HRA to a satellite HRA, the following requirements shall be adhered to:

- Work can only commence following acceptance of Review 2.
- The ROAC and the Generator Supervisor shall control and maintain the predefined Inventory list

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- The exciter shall have a separate but dedicated register which will accompany the exciter. This register shall have records of all the components relating to exciter bed plate removal as well as the strip down that will follow in the satellite HRA.
- All removed components shall be placed in a lockable storage/transportation unit in the main HRA prior to transportation to the satellite LRA and the Small Component Inspector.

3.13.4.6 Generator Auxiliary Systems control

Generator auxiliary systems pose a major Clean Conditions risk and therefore appropriate quality control and inspection mechanisms shall be put in place to avert induced risks on the machines as the result of foreign material being left inside these systems. Formal Clean Conditions Control (Level 1, 2 or 3) is not normally required for Generator Auxiliary System outage maintenance, only higher appropriate levels of quality control.

These systems typically include:

- Stator coolant water system.
- Secondary Cooling Water systems
- Gas system (H₂, Air and CO₂)
- Lubrication and jacking oil system
- Seal oil system

The areas of concern for the above systems are the pipe work sections leading to the generator casing between the filters and or strainers. The defined risks associated with these sections of pipes are foreign material being overlooked during final assembly and re-commissioning. These can cause blockages that will result in loss of coolant and or lubrication flow that will lead to overheating, seizure etc. To mitigate the risk it is highly recommended that system bypass flushing be undertaken after maintenance.

The minimum mitigation compliance requirements are:

- Inspections must be included in the quality control plan (PQP) as hold, witness points or other points. (It is important to do these final inspections prior to coupling the relevant auxiliary system pipe work flange and or fitting to the generator. These final inspection points must be designated as hold and witness points).
- Visual inspections inside the pipe work with the aid of an endoscope.
- Approved Clean Conditions check sheets specifically designed for each area of concern and linked to hold, witness points or other points in the relevant PQP.
- Pipe work flushing and or air blow through – where applicable.
- Re-commissioning flow tests and pressure checks, where applicable
- Proper blank flange control systems. (Including gaskets and fasteners).

3.13.4.7 Rotor Threading Equipment

All items relating to the rotor threading tools and equipment must be inspected, signed and recorded into appropriate registers when taken into and removed from the High Risk Area.

These items typically include but are not limited to:

- The threading device structure

- The structure bolting
- The drive mechanism
- The modular extension elements
- The skid/sliding plate.

3.13.4.8 Rigging Equipment

During the maintenance/inspection phase of the generator, numerous rigging/lifting activities take place. Special attention must be given to register all items of the rigging equipment when equipment and/or spares are taken into and out of the High Risk Area.

Note: All rigging and lifting equipment must comply with the relevant statutory requirements. It is the responsibility of the Turbo Gen Services Project manager to ensure compliance.

These items include, but are not limited to:

- Slings
- Eyebolts
- Shackles
- Chain blocks
- Special contractor lifting brackets/beams
- Trestles

3.13.4.9 Generator Shim Plate Control

- All shim plate positions shall be recorded/mapped and bundled prior to booking them out of the High Risk Area.
- No shim plates shall be stored inside the High Risk Area, even during reassembly. The shims shall be booked into the High Risk Area on an as and when needed basis. The shims position map shall be used to determine which ones will be required inside the High Risk Area at any given moment.
- No cutting of shims to suit the alignment criteria is allowed inside the High Risk Area whilst the generator internal gas path (exciter stator/rotor) is still exposed.

3.13.4.10 Trolleys Entering the Clean Conditions Area

The following minimum requirements are expected:

- Only essential trolleys which are an integral part of the equipment to be used
- Trollies shall be controlled in the same manner as tools and equipment, all parts that can become detached to be listed. (E.g. bolted parts, split pin attached parts, washers, wheels, etc.).
- Wheels shall be inspected for cleanliness.

3.13.4.11 Other Items in the Clean Conditions Area

All items used in the construction of the Clean Conditions Area must be recorded in the relevant registers when establishing the area.

These items are often overlooked and may pose a substantial risk to the generator.

These items include, but are not limited to:

- Barricading sections (inspections must be made to ensure that each section is fit for service)
- Barricading interlocking brackets
- Containers
- Metal detectors
- Floor covering (e.g. Novilon or rubber sheeting)
- Display signs/notices
- Fire extinguishers/firefighting equipment
- First aid equipment
- Air hose manifolds (special attention must be given to the air connectors and their seals).

Note:

No quick connectors with the ball bearing locking design may be used in the area

- Tables
- Chairs
- Waste bins
- Clean Conditions area control stationary
- Plastic sheeting
- Tarpaulins (special attention to be given to condition and rope eyes)

3.13.5 Regulation of Special Activities in the Clean Conditions Area**3.13.5.1 Transfer by Crane over Barricading**

All tools, materials and equipment transferred by crane into and out of the Clean Conditions area must be witnessed and recorded by the ROAC.

Items small enough to be carried by hand shall not be transferred by crane and the normal control point at the Access Cabin shall be used to register such items.

3.13.5.2 Work Activities with Elevated Risk implications to the generator health.

Examples of such activities are (but are not limited to):

- Machining,
- Cutting,
- Welding,
- Brazing,
- Area layout changes,
- Clean Conditions Classification Level Transitions etc.

This section covers any activities that may result in the release of uncontrolled foreign material or add additional safety and plant risks in the Clean Conditions High Risk Area

Each Power Stations Generator Systems Engineer shall have in place an approved site Works Instruction for these types of standard / planned scope of work that is also supported by the ERI and Group Technology Clean Conditions Custodians.

This Work Instruction will not only highlight the work activity but also clearly identify the associated Clean Conditions risks. It should also clearly reference the mitigation and control measures.

In the unlikely event of a unique requirement for which an approved site works instruction does not exist the request for a concession should be supported by the ERI and Group Technology Clean Conditions Custodians and approved by the PSM.

3.13.6 The Control of Tools, Materials, PPE and Other Consumables

3.13.6.1 General Tool Use and Control Requirements

- A dedicated generator tools container must be used for all outage requirements. Avoid the introduction of unnecessary and duplicate tools.
- Only special tools and tools other than those in the dedicated tools container are allowed in the Clean Conditions area and must be registered by the Official Access Controller.
- All tools used in the work area shall have unique identification numbers and must be reflected on a register. Tools or equipment too small to be marked (e.g. small drill bits) must be marked using a colour coding system. A clear description (including the colouring code) of the item should be entered into the register as the colouring of the item on its own is not sufficient. This colouring will then serve as visible identification, differentiating the item from unmarked items.
- The unique numbering/identification of each tool shall be applied in such a manner that when used for normal work it will not fade away or lose its identification too quickly. Tools need to be monitored for signs of wear and must be rectified as soon as problems are detected. The “Dot Peen” system is recommended for the marking of tools.
- The equipment, material and tool register must be consolidated on a daily basis under the control of the CCC and or the POAC. All materials, tools or equipment that cannot be booked back into the tool container must be transferred into a long term register. The long term register shall be audited on a daily basis as well.
- The dedicated Turbo Gen Services Generator Tool Container inventory shall be maintained as per responsibilities assigned in the Work Instruction.
- Equipment (e.g. ELCID test set or Endoscope) that is accompanied by a pre-approved inventory list may be presented to the Clean Conditions personnel to facilitate the registering of such items into the Area. The owner of the equipment is responsible to draft the inventory list and certified to be correct by a Clean Conditions Champion. The format of the inventory list must be approved by a Clean Conditions Project Manager.
- The Turbo Gen Services Generator Tool Container shall be manned by a Turbo Gen Services Generator Asset Controller.
- The person being issued a tool from the tool container will sign in both the “in” and “out” fields of the register. The responsibility of confirming the condition of the tool resides with both parties (the person to whom the tool has been issued and the person issuing the tool).
- The use of the dedicated generator tools is prohibited on any other power station plant area. No exceptions shall be made.
- Tools with detachable components must to be described and the number of detachable items recorded. Wherever possible removable fasteners shall be glued in place.

PUBLIC DOMAIN

3.13.6.2 Consumables Control

- The generator contractor shall provide a list of all chemicals to be used for approval by the site environmental officer.
- All chemicals shall be accompanied by a MSDS.
- A separate consumable control register with description, date and time in, date and time out, quantity in, quantity out shall be maintained.
- The description must be detailed in terms of the consumable container information and the container itself. The container components such as lids and caps must be recorded.

3.13.6.3 Rag (Cloth) Control

- Use only rags with seamed hems.
- Rags shall be made of a lint free unbleached material.
- All the rags used in the Clean Conditions Area must be uniquely numbered and controlled in a dedicated register.
- Numbering should preferably be of a permanent nature such as embroidery since the chemicals used at the generator can wash off numbers applied using permanent marking pens.

3.13.6.4 Overshoes and Glove Control

- Use only overshoes and gloves with seamed hems.
- Overshoes and gloves shall be made of unbleached lint free material and must be unprinted.
- Overshoes shall have non-slip rubber soles. The rubber sole must not have a grip pattern to allow foreign debris to be trapped in.
- All the overshoes and gloves must be numbered and controlled in an appropriate register.
- Numbering should preferably be of a permanent nature such as embroidery since the chemicals used at the generator can wash off numbers applied using permanent marking pens.
- Dirty overshoes may be washed during the outages and reused.

3.13.6.5 PPE Control

All PPE (excluding the overall) to be used in the Clean Conditions Area shall be controlled via appropriate registers. These PPE includes but are not limited to:

- Hard Hats
- Eye protection
- Hearing protection
- Safety gloves.
- Dust/Chemical masks
- Face shields

3.13.6.6 General Spares Control within the Clean Conditions Area

To ensure control of all generator spares, sufficient control mechanisms shall be implemented to ensure that all spares can be accounted for during the following stages such as:

PUBLIC DOMAIN

The Generator Systems Engineer shall ensure that there is a predefined inventory list according to the OEM design quantities of the mechanical strip down parts and components on the generator. (This shall form part of the Quality Control system).

The list should include:

- Item number
- Design quantity
- Item description

This list should also make provision for the ROAC and GS to record:

- Pre-dismantled quantity
- Dismantled quantity
- Pre-assembled quantity
- Assembled quantity
- Component locked, torqued and or secured by whatever mechanism or process

By having such records, the probability of losing control over spares during repeated handling operations is greatly reduced. Accurate spares records will also aid in the search effort should it be suspected that spares are missing.

This record system shall have a clear generator spare part lists and must have sufficient signing off space after each operational stage.

The Generator Systems Engineer must ensure that there is a record list in place for control of the maintenance process of all small parts (i.e. bolts, nuts etc.). This record system shall at least include:

- Item number
- Item description
- Design quantity
- Quantity booked in for maintenance
- Quantity returned acceptable for assembly
- Quantity rejected (with reasons why)
- Quantity replaced/refurbished
- Quantity booked out for assembly

All small parts shall be heat sealed in a plastic bag and labelled to indicate that they are ready for installation. The plastic bags must not be allowed past the Official Access Controller during the booking into the High Risk Area. When the bag is opened all parts shall be verified and signed in on the relevant spare part control sheet.

All discarded small parts shall be bagged, tagged and stored (for audit purposes) in a designated lockable area in the Low Risk Area until the Clean Conditions Area has been revoked at the end of the outage.

All stripped generator small parts shall be stored in the Low Risk Area. A suitable secure storage system will be implemented for all small components such as the generator bolts and nuts.

PUBLIC DOMAIN

Small parts shall be stored in bins with clear identification labels applied. These labels should include the origin of the parts, the type of parts as well as the quantities of each individual part/component.

For the storage of large parts such as end shields, bearings, seal houses etc. the following shall apply:

- All parts must be stored in the Low Risk Area.
- The Low Risk Area floor plan lay-out may incorporate the storage position of these parts
- Parts bolting faces or butt joints are adequately protected from collision damage.
- All parts shall be clearly labelled that they are fit for reassembly following their respective maintenance routines.

All lubrication ports shall be inspected and covered during the maintenance process and thoroughly inspected before reassembly occurs to ensure that no rags, debris or foreign material cause a blockage that will result in loss of flow conditions.

In the event that generator spares have to leave the Low Risk Area for workshop maintenance this event shall be recorded in a dedicated register for this purpose.

Note:

As part of the generator spares control check sheets, the rotor balance weight and all other components locking must be controlled as per relevant check sheet.

3.13.6.7 Clean Conditions Area “Hand-Over” process

During generator outages it is often required that the responsibility for the Clean Conditions work area may be shared between different parties (e.g. Turbo Gen Services or Contractor)

Therefore a proper handover process must be in place to ensure that roles and responsibilities are clearly outlined. These roles and responsibilities must be clearly documented.

During the hand-over process the both parties need to ensure that the working area is tidy, tools and equipment registers are up to date and that any Clean Conditions risks at the time of handover are suitably recorded, risks assessed and mitigated. All the required appointments for the new responsible party (e.g. generator supervisor) shall be in place.

The dedicated hand over certificate shall be signed and filed in the Clean Conditions filing system.

Note: In cases where Turbo Gen Services and the Contractor need to work simultaneously in the Clean Conditions Area it is seen as perfectly acceptable as long as mutual agreement is in place as to which party will resume overall Clean Conditions responsibility. It is required that both parties sign the handover certificate to indicate such agreement.

3.14 ENVIRONMENTAL CONTROL OF THE GENERATOR

Airborne debris and moisture pose a major risk to the opened generator and stator, generator rotor and its major spare components.

Whenever the generator is opened all entry points for debris shall be suitably protected and or covered.

Fully exposed rotors:

Rotors that are not wrapped in any way shall be stored on trestles in a tent in the HRA that is adequately filtered, pressurized and dehumidified (below the atmospheric dew point temperature) for the duration of storage. This will prevent airborne debris and condensation to negatively affect the rotor. CRR's shall additionally be fitted with CRR heater blankets.

Covered (cocooned) rotor:

Rotors that are covered (cocooned) shall be stored on trestles in HRA for the duration of storage.

The covering must include as a minimum requirement the following:

- Exposed couplings, slip rings, journals and other rotor shaft sections to be protected against rust. Normally DENZO™ type tape is acceptable. Any other products need to be approved by the Generator Systems Engineer.
- Desiccant bags to be fitted underneath coil retaining rings to absorb moisture.
- The entire rotor which includes the shafts, CRR's and rotor body (winding and cooling ports) must be covers with heavy duty plastic wrapping.

Where rotors are removed from the stator for a very short duration (<24hrs) it is allowed that the rotor be stored on trestles and be properly wrapped by clean plastic sheets.

The exposed stator shall also be pressurized and dehumidified. Wherever OEM guidance is available it should be considered. An exposed stator implies a dismantled stator where the rotor and or end shields are removed. For these types of scenarios the stator shall be covered with a suitable tent structure in order to disallow airborne debris to enter the stator. A filtered, pressurised and dehumidified environment is recommended.

Site Engineering will advise on method of protection.

Stator windings should not be allowed to stand for longer than 14 days without applying preservation techniques such as a vacuum dry out. The OEM maintenance manuals should provide details in this regard. In the case of a vacuum dry out a stator heater / dehumidifier needs to be connected in order to raise the internal stator temperature. Where practical these stator heaters / dehumidifiers can be connected on the stator bushing chamber and the air exhaust can be either a top manhole cover or a removed H2 cooler. In either case the exposed entrance into the stator must be adequately protected by a shield of some form. Under no circumstances can it be allowed that foreign bodies fall into the stator. Site Engineering will advise on method of protection.

Note: The Systems Engineer must ensure that this is catered for during outage planning.

3.15 FINAL INSPECTIONS IN THE CLEAN CONDITIONS AREA

Detailed site specific Clean Conditions inspection sheets shall be drawn up by the Generator Systems Engineer to cover all areas of the generator (e.g. generator rotor, magnetic core, stator end windings, terminal box, work area, overhead cranes, cooler compartments, stator core back-end etc.). In areas of limited accessibility, an endoscope shall be used.

Inspection hold and other points must be defined in the PQP and will depend on the scope of work.

These inspection sheets shall be signed off by the relevant staff and should provide assurance that no foreign objects were left inside the machine prior to boxing up. These inspection sheets must also be used during critical maintenance phases and should be aligned with the Clean Conditions Review Process.

3.16 AUDITS AND REVIEWS

3.16.1 Audits

Formal audits may be performed on the generator Clean Conditions Process as and when deemed necessary by the organisation

On-site internal audits must be executed and shall include a delegation comprising of the Internal Review Members and the on-site audit team.

Further to this, official corporate audits may also be executed as per the corporate schedule and will be announced to each site in a timely manner.

PUBLIC DOMAIN

Note:

The Risk & Resilience SHEQ 1st, 2nd & 3rd Generator Clean Conditions audits will be considered external and independent. The audit members consist of the Risk & Resilience CCC, Turbo Gen Services and the CCO.

3.16.2 Clean Conditions Reviews

Because the Clean Conditions process is a document intensive and the success of it greatly depend on accurate control and record keeping, critical and ad hoc reviews must be conducted at various stages of the process.

Note:

- ***PQP sign off responsibilities are indicated in Table 4 (Table of Reviews Required and Responsibilities)***
- ***The Seven (7) Clean Conditions outage reviews are only applicable for Level 1 outages.***
- ***Review 8 and 9 are only applicable for Level 2 outages.***

The reviews are:

3.16.2.1 Review 1

(Planning and documentation confirmed to be in order)

The purpose of this review is to confirm that all items of Clean Conditions relating to the **Required Documentation and Work Area set-up** have been complied with. This can be done a few days before the dismantling.

3.16.2.2 Review 2

(Pre - dismantling)

The purpose of this review is to confirm that all items of Clean Conditions relating to the **Pre-dismantling** phase have been complied with. This review is done on the same day the dismantling work is scheduled to start. No dismantling work with the exception of the additional Level 3 outage time saving actions as per level 3 outages may proceed until the CCO is satisfied with the requirements of this review. This review must be a quality control hold point on the work and will be signed off by the CCO.

3.16.2.3 Review 3

(Post-dismantling)

The purpose of this review is to confirm that all items of Clean Conditions relating to the **Dismantling** phase have been complied with. This review is done directly after all dismantling has been completed. No repairs, inspections or reassembly may proceed until the CCO is satisfied with the requirements of this review. This review must be a quality control hold point on the work and will be signed off by the CCO.

3.16.2.4 Review 4

(Daily reviews during repair or inspection phase)

The purpose of this review is to confirm that all items of Clean Conditions relating to the **Repair or Inspection** phase have been complied with. This review is made daily and will be signed off by the CCO.

3.16.2.5 Review 5

(Pre-Assembly)

The purpose of this review is to confirm that all items of Clean Conditions relating to the **Pre-Assembly** phase have been complied with. No re-assembly may proceed until the CCO is satisfied with the requirements of this review. This review must be a quality control hold point on the work and will be signed off by the CCO.

3.16.2.6 Review 6

(Post-Assembly)

The purpose of this review is to confirm that all items of Clean Conditions relating to the **Assembly** phase have been complied with. No final boxing up (closing of manholes or inspection doors) may proceed until the CCO is satisfied with the requirements of this review. This review must be a quality control hold point on the work and will be signed off by the CCO.

3.16.2.7 Review 7

(Confirm that reviews 1-6 are in order before going on barring)

The purpose of this review is to confirm that all items of Clean Conditions relating to the **Post-Assembly and Reviews 1 to 6** have been complied with. The final boxing up and suspension of the Clean Conditions area may proceed if the ILR is satisfied with the requirements of this review. This review must be a quality control hold point on the process quality plan and will be signed off by the ILR. Where the ILR may be for any reason be unavailable (e.g. Peaking remote sites) a substitute ILR appointed by the PSM. The substitute ILR shall be trained and competent to perform the critical Review 7 responsibilities.

Note:

The machine may NOT go on barring prior to the requirements of Review 7 have been met.

3.16.2.8 Review 8 (FOR LEVEL 2 OUTAGES ONLY)

(Planning and documentation confirmed to be in order prior to dismantling)

The purpose of this review is to confirm that all items of Clean Conditions relating to the **Required Documentation and Work Area set-up** have been complied with. This shall be done before any dismantling can commence. This review must be a quality control hold point on the work and will be signed off by the CCO.

3.16.2.9 Review 9 (FOR LEVEL 2 OUTAGES ONLY)

(Confirm that work done is satisfactory in order for the machine to go onto barring)

The purpose of this review is to confirm that all items of Clean Conditions relating to the level 2 control measures have been complied with. The final boxing up and suspension of the Clean Conditions area may proceed if the ILR is satisfied with the requirements of this review. This review must be a quality control hold point on the work and will be signed off by the ILR.

Note:

The machine may NOT go on barring prior to the requirements of Review 9 have been met.

The next table indicates the quality plan requirements with regards to the seven/nine reviews.

Table 4: Table of Reviews Required and Responsibilities

Review #	Description	Responsibility	Where in PQP? (All Hold points)
1	Planning and documentation confirmed to be in order	ILR	Very first entry in PQP.
2	Pre – Dismantling requirements in order.	CCO	Directly following Review 1. (This is done directly before the first actions of dismantling.)
3	Requirements after the dismantling phase in order.	CCO	Directly after dismantling but before any inspections/repairs
4	Requirements during repair or inspection process in order. (daily)	CCO	At the end of the repair phase.
5	Pre- Assembly requirements in order.	CCO	After inspections but before reassembly.
6	Requirements after Assembled phase in order.	CCO	After reassembly (but before air pressure test for hydrogen filled generators).
7	Post Assembly and Reviews 1-6 in order before going on barring	ILR	Just before machine go on barring. Clean Conditions may now be revoked
8	LEVEL 2 OUTAGE ONLY Planning and documentation confirmed to be in order before dismantling	CCO	Very first entry in PQP.
9	LEVEL 2 OUTAGE ONLY Confirm that work done is satisfactory in order for the machine to go onto barring	ILR	Just before machine go on barring. Clean Conditions may now be revoked

3.17 CLEAN CONDITIONS RISK ASSESSMENT

During the course of maintenance or inspection activities on the generator, it is conceivable that violations or incidents may occur that could place the generator's safe operation at risk.

PUBLIC DOMAIN

Incidents:

(Incidents are normally associated with non-deliberate events)

Example:

- The reporting of a broken knife blade
- A missing rag.

Violations:

(Violations are normally associated with deliberate events)

Example:

- Not declaring a tool at the entrance of the HRA
- Breaching the barricading.

In either case (incident or violation) if there are unresolved Clean Conditions related risks, then the Generation Risk Assessment process shall be followed.

In all cases, input and support to the Generation Risk Assessment process, a separate Clean Conditions Incident Investigation shall be conducted by the Main Contractor. If any uncertainty exists on accountability, the ILR will formally decide who will conduct the Clean Conditions Incident Investigation.

The Generation Risk Assessment shall be reviewed and signed by the Turbo Gen Services Clean Conditions Custodian as well as the Group Technology Clean Conditions Custodian before being finally approved.

The Clean Conditions Incident Investigation will be conducted according to the Turbo Gen Services Clean Conditions Search and Incident Investigation Work Instruction 240-94027445

The Clean Conditions Incident Investigation template will be supplemented with but not limited to:

- Detailed and signed off mapping search check sheets.
- Interviews and statements taken from the staff who directly involved in the incident or violation. This statement must have a very detailed description of where and how the incident or violation occurred.
- Turbo Gen Services or Main Contractor generator specialist report, containing detailed conclusions and recommendations.
- Clean Conditions CCTV footage review report.
- Review report of the Clean Conditions registers / documentation.

The machine may not be returned to service prior to the acceptance of the Generation Risk Assessment.

PUBLIC DOMAIN

3.18 RETURN TO SERVICE MONITORING

RTS monitoring is the final barrier which can prevent catastrophic damage to a machine if correctly set up and operated. It is strongly recommended that RTS monitoring be part of planning and scope of work in line with the return to service monitoring guideline.

Appropriate return to service monitoring activities should be in place by the Generator Systems Engineer. (The Manual 240-56227872 (Level 0 to Level 3 Return to Service Outages) shall be used).

The Clean Conditions Outage Level Classification may also dictate what RTS monitoring level should be used.

3.19 RECORDS

All Clean Conditions files and CCTV footage shall be archived for at least five consecutive outages of the machine. This will allow an audit trail to be established in the event that historical data is being required.

It is the responsibility of the Outage Manager to ensure that the Clean Conditions files and CCTV footage are stored in a safe environment. This will normally be, but not limited to the sites documentation centre files and the LAN for the CCTV footage.

A formal Clean Conditions file hand-over process is in place between CC&FME and the CCO at the end of the outage. The file movement must be traceable and auditable.

3.20 CLEAN CONDITIONS CONCESSION APPLICATION

During any generator maintenance or inspection activity, the possibility exists that a unique requirement or work activity that is not covered in this Work Instruction could result in a Clean Conditions related risk. This in turn may result in undue generator downtime or worst, catastrophic generator failure.

The Clean Conditions Concession Application process must therefore be followed as a priority in order to avoid any unnecessary outage delays.

The concession will be compiled by the:

Generator Systems Engineer

Reviewed (Input and support given) by the:

- CCO
- Turbo Gen Services Project Engineer or Main Contractor Project Engineer.
- CC&FME Champion

The concession will be accepted by:

- The ILR
- Turbo Gen Services Project Manager or Main Contractor Project Manager
- CC&FME Project manager

All parties must sign on the concession application prior to escalating it to the next level.

The concession will then be supported by:

- The Turbo Gen Services Clean Conditions Custodian.

The concession will then be approved by:

- The Eskom Group Technology Clean Conditions Custodian.

PUBLIC DOMAIN

The concession application should comply with the following:

- Be on the Work Instruction template (240-49617483)
- Give clear indication on the risk and or which procedural requirements cannot be met with.
- Give clear indication what benefit the concession will yield
- Provide a risk statement and risk mitigation strategy
- Provide clear roles and responsibilities for execution of risk mitigation measures.
- All parties need to be in agreement.

Note:

The Clean Conditions concession application is a process developed to provide reasonable risk mitigation to prevent a potential catastrophic failure incident.

The power station therefore must feel comfortable in accepting this process however this does not relieve itself from the accountability of consequential plant damage.

Therefore is important that the Power Station management ensure that responsible persons are deployed to perform and review the above process.

The Power Station should regard this concession as a minimum requirement for appropriate risk mitigation but may consider additional measures.

3.21 CLEAN CONDITIONS PRACTICE NOTES

With continual operational experience gained during the execution of Clean Conditions Control measures it is inevitable that changes or additions to the Work Instruction may be required. The custodian of this Work Instruction will periodically review new requirements and proposals and if necessary will issue the necessary approved practice notes to that effect. The practice notes will be documented and also distributed in the organisation. It is therefore required that this Work Instruction be read in conjunction with practice notes if applicable. All practice notes shall be linked to the Work Instruction on SharePoint.

4. AUTHORISATION

This document has been seen and accepted by:

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5. REVISIONS

Date	Rev.	Compiler	Remarks
November 2013	0.5	LG Stevens	New Template and update of GGS 0393 final draft for review
October 2014	0.6	LG Stevens	Final Draft for formal Comments Review Process
January 2015	0.7	LG Stevens	Updated Draft After formal Comments Review
March 2015	0.8	LG Stevens	Final Updated Draft after Comments Review
March 2015	1	LG Stevens	Final Document for Authorisation and Publication
August 2019	1.2	LG Stevens	Final Draft Document after Review Process
August 2019	2	LG Stevens	Final Rev 2 Document for Authorisation and Publication

6. DEVELOPMENT TEAM

The following people were involved in the development of this document:

- Lance Stevens
- Robbie Taylor (ERI CC&FME Team)

7. ACKNOWLEDGEMENTS

- Vic Hall (ERI Training Team)
- ERI CC&FME Team

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APPENDIX A: CLEAN CONDITIONS REVIEW SHEETS

The following Table is a list of the Review Sheets to be used. Only use as required by obtaining the correct form template from the Eskom Document Management System.

Review #	Description	Document Number
1	Planning and documentation confirmed to be in order	240-49617357
2	Pre – Dismantling requirements in order.	240-49617363
3	Requirements after the dismantling phase in order.	240-49617366
4	Requirements during repair or inspection process in order. (daily)	240-49617367
5	Pre- Assembly requirements in order.	240-49617372
6	Requirements after Assembled phase in order.	240-49617380
7	Post Assembly and Reviews 1-6 in order before going on barring	240-49617413
8	LEVEL 2 OUTAGE ONLY Planning and documentation confirmed to be in order before dismantling	240-49617432
9	LEVEL 2 OUTAGE ONLY Confirm that work done is satisfactory in order for the machine to go onto barring	240-49617436

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APPENDIX B CLEAN CONDITIONS FORMS

The following Table is a list of the Clean Conditions Forms to be used. Only use as required by obtaining the correct form template from the Eskom Document Management System.

Form Description	Document Number
Attendance Register	240-49617460
Clean Conditions Awareness Training (DVD)	
Generator Clean Conditions Outage Level Classification Application Form	240-49617475
Generator Clean Conditions Concession Application Form	240-49617483
Generator Clean Conditions Induction Training Declaration Form	240-49617489
Generator Clean Conditions Control Tools Register	240-102104394
Generator Clean Conditions Control Personnel Entry & Exit Register	240-102104408
Generator Clean Conditions Control Blanking Plate Control Register	240-102104418
Generator Clean Conditions Components Control Register(High Risk Area)	240-102104384
Generator Clean Conditions Control Findings Register	240-102104388
Generator Clean Conditions Control Spares Register During Refurbishment (SCI Container)	240-112104406
Generator Clean Conditions Control Consumables Long Term Register	240-102104416
Generator Clean Conditions Control Tools Long Term Register	240-102104396
Generator Clean Conditions Control Gloves and Overshoes Register	240-141726216
Generator Clean Conditions Control Rags Register	240-102104398
Generator Clean Conditions Control Keys Register	240-102104390
Generator Clean Conditions Control Waste Register	240-102104404
Generator Clean Conditions Components Control Register(Low Risk Area)	240-102104386
Generator Clean Conditions Control Scaffolding Daily Inspection Register	240-102104412
Generator Clean Conditions Control Rags Inspection Register	240-102104410
Generator Clean Conditions Control Barricading Daily Inspection Register	240-102104400
Generator Clean Conditions Control Blanking Plate Register (Access Cabin)	240-141726266
Generator Clean Conditions Components Control Register (Cabin)	240-102104402
Generator Clean Conditions Control Consumables Register	240-102104392
Generator Clean Conditions Control Special Tools Register	240-102104422
Generator Clean Conditions Control Special Tools Long Term Register	240-102104420

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APPENDIX C WORK INSTRUCTION FOR ACTIVITIES WITH ELEVATED RISK IMPLICATIONS TO THE HEALTH OF THE GENERATOR

This section covers any high risk work activities that may result in the release of uncontrolled foreign material or add additional safety and plant risks to the Generator and / or Clean Conditions Areas

Examples of such activities are (but are not limited to):

- Machining
- Cutting
- Brazing
- Welding,
- Area layout changes
- Classification Level Transitions

This Work Instruction highlights the work activities and also identifies the historical associated Clean Conditions risks and also references the minimum mitigations and/or control measures to be implemented.

1	Grinding	Grinding of the metallic surfaces and holes using electric and pneumatic angle grinders as well as small pencil grinders. (This includes activities such as Slip Ring Grinding)	<ul style="list-style-type: none">• Fine steel dust entering the Generator stator, Generator rotor, and Exciter stator and exciter rotor will result in electrical failure of the Generator.	<ul style="list-style-type: none">• Hot work permit must be in place.• Fire extinguishers to be in place. A minimum of two fire extinguishers to be in place.• Area to where grinding will take place shall be protected with a plastic bag. The plastic bag should be taped below the area to be ground by using duct tape.• Welding blanket to protect the stator and/ or floor area directly below.• Vacuuming of the area being worked on throughout the operation.• Ensuring there is adequate lighting.• Magnetic sweep of the area that is affected by the grinding work.• All work to be carried out under constant supervision of the Roaming Access Generator Supervisor and / or Controller (RAC)• The Generator shaft (close to slip ring) including the slip ring cooling fan will be covered with plastic to protect it from any hot work negative effects that can arise out of this activity. (if applicable)
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				<ul style="list-style-type: none"> • Lay Plastic below the work area to collect all sparks remnant that will result from the work. • Collect the grinding debris in the plastic bag. This debris should be bagged and tagged. • The work area surrounding will be thoroughly inspected when the work is completed by visual inspection. • Consolidation of the tools, components and equipment to be done at the beginning and end of this activity. • Debris created in this process must be bagged and tagged and to be recorded and removed immediately from the Clean Condition area and stored for the duration of the outage.
2	Sawing (Hacksawing & Jig sawing Included).	Sawing of material.	<ul style="list-style-type: none"> • Debris removed by sawing can enter high risk electrical components. 	<ul style="list-style-type: none"> • Taping up of the area directly surrounding the area to be worked on to prevent foreign matter from contaminating inaccessible areas. • Ensuring there is adequate lighting. • Inspection of the cutting blades before and after activities, any missing pieces must be reported to the CCO and CCC or POAC. • Continual Vacuuming of the area being worked on. • Debris created in this process must be bagged and tagged and to be recorded and removed immediately from the Clean Condition area and stored for the duration of the outage. • Magnetic sweep of the area that is affected by the sawing work. • All work to be carried out under constant supervision of the Roaming Access Generator Supervisor and / or Controller (RAC)
3	Cutting (open flame)	Cutting of metal using open flame	<ul style="list-style-type: none"> • Open flames can ignite combustible material causing fire to the Generator 	<ul style="list-style-type: none"> • Hot work permit must be in place. • Fire extinguishers to be in place. A minimum of two fire extinguishers to be in place. • Welding blanket to protect the

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			and its components.	<p>stator and/ or floor area directly below.</p> <ul style="list-style-type: none"> • Vacuuming of the area being worked on throughout the operation. • Ensuring there is adequate lighting. • Magnetic sweep of the area that is affected by the grinding work. • All work to be carried out under constant supervision of the Roaming Access Generator Supervisor and / or Controller (RAC) • The Generator shaft (close to slip ring) including the slip ring cooling fan will be covered with plastic to protect it from any hot work negative effects that can arise out of this activity. (if applicable) • Collect the grinding debris in the plastic bag. This debris should be bagged and tagged. • The work area surrounding will be thoroughly inspected when the work is completed by visual inspection. • Consolidation of the tools, components and equipment to be done at the beginning and end of this activity. • Debris created in this process must be bagged and tagged and to be recorded and removed immediately from the Clean Condition area and stored for the duration of the outage.
4	Pinch Cutting	Cutting by using a tool (like a bolt cutter, side cutters)	<ul style="list-style-type: none"> • Tools dropping • Parts of cutting faces breaking off • Cutting debris creation 	<ul style="list-style-type: none"> • Ensure Clean Conditions covers / blanking plates / tarpaulins / plastic sheeting are in place to cover generator stator openings as well as loose standing components such as rotors. • Inspect the cutting edges of the tools to be used. • Inspect the tool fixtures for looseness. • Ensure that the part to be cut is secured prior to cutting • Affix a plastic bag underneath the part that is to be cut. If

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				<p>possible, ensure the cutting occurs inside the plastic bag.</p> <ul style="list-style-type: none"> Seal the plastic bag soon as the cut assembly drops into it. In the event that the fixtures are loose parts, duct tape must be used to hold the parts together prior to cutting. *NB* never attempt to do this activity alone.
5	Drilling	Drilling of holes using electric, pneumatic and / or battery operated drills	<ul style="list-style-type: none"> Debris from drilling can cause damage to the Generator. Drilling sparks can ignite combustible consumables. 	<ul style="list-style-type: none"> Ensure the hot work permit requirements are followed. Fire extinguishers to be in place. A minimum of two fire extinguishers to be in place. Fire blankets if required to be put in place around area where drilling will be performed in order to protect the adjacent components. Taping up of the area directly surrounding the area to be worked on. Should cutting fluid be used, ensure it is approved. In the case of Koeberg it must be CRACK approved. Vacuuming of the area being worked on throughout the operation. All shavings recovered from the vacuum machine and from the area cleaning process must be bagged and tagged. Ensuring there is adequate lighting. Magnetic sweep of the area that is affected by the grinding work. All work to be carried out under constant supervision of the Roaming Access Generator Supervisor and / or Controller (RAC)
6	Filing and scrapping	Hand filing and or scrapping of components	<ul style="list-style-type: none"> Filing debris entering the Generator stator, Generator rotor, and Exciter stator and exciter rotor will result 	<ul style="list-style-type: none"> Taping up of the area directly surrounding the area to be worked on to prevent foreign matter from contaminating inaccessible areas. Vacuuming of the area being worked on throughout the operation. Debris created in this process

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			in electrical failure of the Generator.	<p>must be bagged and tagged and to be recorded and removed immediately from the Clean Condition area and stored for the duration of the outage.</p> <ul style="list-style-type: none"> • Ensure there is adequate lighting. • Magnetic sweep of the area that is affected by the work. • All work to be carried out under constant supervision of the Roaming Access Generator Supervisor and / or Controller (RAC)
7	Hammering, Peening and Chiselling.	Hammering, Peening and chiselling of components	<ul style="list-style-type: none"> • Filing debris entering the Generator stator, Generator rotor, and Exciter stator and exciter rotor will result in electrical failure of the Generator. 	<ul style="list-style-type: none"> • Taping up of the area directly surrounding the area to be worked on to prevent foreign matter from contaminating inaccessible areas. • Vacuuming of the area being worked on throughout the operation. • Debris created in this process must be bagged and tagged and to be recorded and removed immediately from the Clean Condition area and stored for the duration of the outage. • Ensuring there is adequate lighting. • Magnetic sweep of the area that is affected by the work. • All work to be carried out under constant supervision of the Roaming Access Generator Supervisor and / or Controller (RAC)
8	Hammering using a dead blow hammer (orange)	Utilization of dead blow hammers in Clean Conditions area	<ul style="list-style-type: none"> • Rupture of the hammer head which will allow the balls / pebbles contained inside it to scatter over the whole surroundings and cause contamination of the Generator and pipe lines. 	<ul style="list-style-type: none"> • Apply adequate protection material in which: the drain holes will be covered by means of duct tape, openings leading to the centre of the Generator will be covered with specially cut out gaskets and duct taped. This will ensure in the event of the hammer head rupture, the balls will be contained in the overhang area and that can be cleaned easily with the vacuum cleaner. • The bearings will be covered tightly with the plastic • The hammer will be visually

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				<p>inspected on an ongoing basis to determine if is still safe for use.</p> <ul style="list-style-type: none"> • Ensure that hitting sharp edges are avoided and the hammer will only be applied on flat surfaces.
9	Sanding	Removal of material by using flapper discs and/or sanding paper	<ul style="list-style-type: none"> • Sanding debris entering the Generator stator, Generator rotor, and Exciter stator and exciter rotor will result in electrical failure of the Generator. • Pieces of the flapper disc scattering in the area. <p>1.</p>	<p>Using a high speed flapper wheel:</p> <ul style="list-style-type: none"> • Taping up of the area directly surrounding the area to be worked on to prevent foreign material from contaminating inaccessible areas. • Vacuuming of the area being worked on throughout the operation. • Debris created in this process must be bagged and tagged and to be recorded and removed immediately from the Clean Condition area and stored for the duration of the outage. • Ensuring there is adequate lighting. • Magnetic sweep of the area that is affected by the work. • All work to be carried out under constant supervision of the Roaming Access Generator Supervisor and / or Controller (RAC) <p>Using Sand Paper:</p> <ul style="list-style-type: none"> • Constant vacuuming of the area being worked on. If metallic dust is being created, the area must be enclosed using transparent plastic sheeting with continuous dust extraction from the enclosed area. • Thorough vacuuming of the area surrounding the work area on completion of sanding work. • Debris created in this process must be bagged and tagged and to be recorded and removed immediately from the Clean Condition area and stored for the duration of the outage. • Magnetic sweep of the area that is affected by the sanding work. • Ensuring there is adequate

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				lighting. <ul style="list-style-type: none"> • All work to be carried out under constant supervision of the Roaming Access Generator Supervisor and / or Controller (RAC)
10	Tapping, and reaming.	Tapping to re-instate threads. Reaming to resurface/ dress holes.	<ul style="list-style-type: none"> • Metallic debris from tapping and / or reaming can cause damage to the Generator Stator, Generator Rotor, Exciter. 	<ul style="list-style-type: none"> • Vacuuming of the holes being tapped as well as the surrounding area throughout the operation. • Taping up of the area directly surrounding the area to be worked on to prevent foreign material from contaminating inaccessible areas. • Debris created in this process must be bagged and tagged and to be recorded and removed immediately from the Clean Condition area and stored for the duration of the outage. • Magnetic sweep of the area. • All work to be carried out under constant supervision of the Roaming Access Generator Supervisor and / or Controller (RAC)
11	Welding	Arc welding	<ul style="list-style-type: none"> • All welding methods result in the release of welding sparks. 	<ul style="list-style-type: none"> • A Hot work permit must be in place. • Fire extinguishers to be in place. A minimum of two fire extinguishers to be in place. • The area must be well ventilated. • Ensure there is adequate lighting. • Any fire risk to be managed by the use of fire blankets and cooling patches to control the spread of heat. The availability of the correct type of fire extinguishers, trained fire fighters and first aiders must be ensured. • Welding screens need to be placed strategically around areas to be welded. • Heating blankets must be wrapped around areas that can be affected by welding sparks – wrapped around stator windings, PTFE hoses, etc. • Welding slag to be carefully

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				<p>removed and kept in a bag. Welding slag must not be removed by using excessive force or impact that can result on welding flux being propelled uncontrollably.</p> <ul style="list-style-type: none"> • Continual vacuuming of the area where welding was performed. • Debris created in this process must be bagged and tagged and to be recorded and removed immediately from the Clean Condition area and stored for the duration of the outage. • Magnetic sweep of the area that is affected by the welding work. • All work to be carried out under constant supervision of the Roaming Access Generator Supervisor and / or Controller (RAC)
12	Brazing and or Soldering	<p>Brazing of copper and brass components using gas, open flames.</p> <p>Soldering of probe wires</p>	<ul style="list-style-type: none"> • Brazing using open flames from gas supply. • Soldering could cause damage to existing and adjacent cables. 	<ul style="list-style-type: none"> • A Hot work permit must be in place. • Fire extinguishers to be in place. A minimum of two fire extinguishers to be in place. • The area must be well ventilated. • Ensure there is adequate lighting. • Any fire risk to be managed by the use of fire blankets and cooling patches to control the spread of heat. The availability of the correct type of fire extinguishers, trained fire fighters and first aiders must be ensured. • Welding screens need to be placed strategically around areas to be welded. • Heating blankets must be wrapped around areas that can be affected by brazing or soldering process – wrapped around stator windings, PTFE hoses, etc. • Continual vacuuming of the area where welding was performed. • Debris created in this process must be bagged and tagged and to be recorded and removed immediately from the Clean

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				<p>Condition area and stored for the duration of the outage.</p> <ul style="list-style-type: none"> • Magnetic sweep of the area that is affected by the brazing and soldering work. • All work to be carried out under constant supervision of the Roaming Access Generator Supervisor and / or Controller (RAC)
13	Machining and honing (including oil stoning)	Machining and honing using abrasive /cutting methods	<ul style="list-style-type: none"> • Metal debris from machining and honing . 	<ul style="list-style-type: none"> • Vacuuming of the holes being tapped as well as the surrounding area throughout the operation. • Taping up of the area directly surrounding the area to be worked on to prevent foreign material from contaminating inaccessible areas. • Debris created in this process must be bagged and tagged and to be recorded and removed immediately from the Clean Condition area and stored for the duration of the outage. • Magnetic sweep of the area. • All work to be carried out under constant supervision of the Roaming Access Generator Supervisor and / or Controller (RAC) • Only an approved oil medium will be used inside the CC HRA. In the case of Koeberg CRACK (Control of Chemical Restricted Products at Koeberg) are approved.
14	Heating (Induction)	Heating on any generator component	<ul style="list-style-type: none"> • Heat generated may result in thermal damages. 	<ul style="list-style-type: none"> • Use of induction heating only by authorized personnel only. • A Hot work permit must be in place. • Fire extinguishers to be in place. A minimum of two fire extinguishers to be in place. • The area must be well ventilated. • Ensure there is adequate lighting. • Any fire risk to be managed by the use of fire blankets and cooling patches to control the spread of heat. The availability of the correct type of fire

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				<p>extinguishers, trained fire fighters and first aiders must be ensured.</p> <ul style="list-style-type: none"> • Welding screens need to be placed strategically around areas to be welded. • Heating blankets must be wrapped around areas that can be affected by welding sparks – wrapped around stator windings, PTFE hoses, etc. • Welding slag to be carefully removed and kept in a bag. Welding slag must not be removed by using excessive force or impact that can result on welding flux being propelled uncontrollably. • Continual vacuuming of the area where welding was performed. • Debris created in this process must be bagged and tagged and to be recorded and removed immediately from the Clean Condition area and stored for the duration of the outage. • Magnetic sweep of the area that is affected by the welding work. • All work to be carried out under constant supervision of the Roaming Access Generator Supervisor and / or Controller (RAC)
15	<p>Moving and removal of barricading</p> <p>Extending Level 1 Clean Condition barricades towards the LP rear.</p>	<p>Partial removal of barricading</p> <p>Extend TE barricade towards LP rear to allow for more space in the Generator Front.</p>	<ul style="list-style-type: none"> • Foreign material introduction into Area • Un-authorized personnel entering the Area • Tools and equipment can be carried into or out of the Generator HRA through without being booked through the Clean Condition 	<ul style="list-style-type: none"> • The CCC and/or POAC, and CCO shall be present during the operation • Check the operability of the surveillance cameras prior to altering the barricade. • Ensure there is adequate lighting. • All workers involved with the alteration have to book into the area via the Clean Condition Access Cabin. • All work to stop and unnecessary personnel to vacate the Area prior to the alteration. • The fast-lane Access Cabin and tools Access Cabin doors will be closed during the alteration. • No overhead cranes will move

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			Access control cabin.	<p>over the area while the alteration is in progress.</p> <ul style="list-style-type: none"> Once all alterations are completed the functioning of the CCTV equipment must be confirmed by the CCC and/or POAC and the CCO and/or ILR
16	Lock up and GO	Work is suspended	<p>Short term Lock up and Go</p> <ul style="list-style-type: none"> Unauthorized entry to the Clean Condition Area. Foreign material into the Generator. <p>Long term Lock up and Go</p>	<ul style="list-style-type: none"> The area barricading should be intact and should be inspected once per shift by the Station Risk & Assurance Department. The findings from the visual inspections will be reported to the ILR and / or CCO. The main access cabin should be locked and key control arrangement should be clearly indicated via adequate signage displayed on the doors. The CCTV camera system should remain active and should record any motion detected in the area and reviewed daily by the ILR and / or CCO. A full audit of personnel, tools and equipment registers should be completed before the lock up and go is established. This audit should be done by the CCO and CCC and/or POAC. If Munters driers are installed they should be running at all times and regularly inspected and maintained as per the OEM requirements. This process should be monitored and controlled by the ILR and / or CCO. Registers and logbooks should be locked in provided lockers for safe keeping during idle time. An approved access register will be available at EOD indicating the authorised personnel that may sign out the keys to enter the Cc control area Access and control registers must be used and audited Weekly access to the Clean Conditions HRA & LRA for cleaning and inspections.

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			(Longer than 30 days) <ul style="list-style-type: none"> Unauthorized entry to the Clean Condition Area. Foreign material into the Generator. 	<ul style="list-style-type: none"> ----- Additional to the above short term process: CC&FME will monthly audit the control process with the CCO and or ILR.
17	Stator Vacuum Dry out (fitment of vacuum pump)	Stripping and reassemble of stator coolant pipework for fitment of the vacuum dry out pump.	<ul style="list-style-type: none"> Lost Components Ingress of foreign materials into the stator coolant pipework 	<ul style="list-style-type: none"> Blanking plate control to be enforced
18	Dehumidifier / Munters Drier	Fit and connect dehumidifier to stator	<ul style="list-style-type: none"> Ingress of foreign objects, tools into the stator core. 	<ul style="list-style-type: none"> Fasten tools to lanyard to prevent accidental falling of tools into generator openings. All work to be carried out under constant supervision of the Roaming Access Generator Supervisor and / or Controller (RAC)
19	Fitting of the Stray Flux Probe (air gap mounted probe)	Drilling of the 4 dowel pins on the Stray Flux Probe in order to fit new ones.	<ul style="list-style-type: none"> Loss of Components Ingress of foreign materials into the Generator Stator core slots and other parts. 	<ul style="list-style-type: none"> The area must be well ventilated. Ensure there is adequate lighting. Continual vacuuming of the area Debris created in this process must be bagged and tagged and to be recorded and removed immediately from the Clean Condition area and stored for the duration of the outage. All work to be carried out under constant supervision of the Roaming Access Generator Supervisor and / or Controller (RAC) Visual inspections to be done before, during and after activities. Perform Endoscope inspection on all stator core hydrogen slots. The stator core hydrogen slots should be covered, preferably with marked red tape, in order to prevent any debris from entering

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				<p>the slots.</p> <ul style="list-style-type: none"> • The bottom half of the Generator Stator, (between 3 O'clock and 9 O'clock position) should be totally covered with Novilon or plastic in order to prevent any debris from contaminating the Generator Stator. • The camera view into the Stator should remain unobstructed in order to ensure that any lost tools or components may be traced by video playback.
20	NDT (dye penetrant).	Performing Non-Destructive Testing (NDT).	<ul style="list-style-type: none"> • If the chemicals are left on the surfaces may react with the generator components. 	<ul style="list-style-type: none"> • For Koeberg only CRACK (Control of Chemical Restricted Products at Koeberg) is permitted. • The area must be well ventilated. • Ensure there is adequate lighting. • All work to be carried out under constant supervision of the Roaming Access Generator Supervisor and / or Controller (RAC) • All surfaces must be thoroughly cleaned after the work is performed.
21	NDT (MPI)	Performing Magnetic Particle Testing MPI	<ul style="list-style-type: none"> • Magnet can fail and fragment. • Magnetic shavings could remain on metal surfaces and impede with the flux. 	<ul style="list-style-type: none"> • The area must be well ventilated. • Ensure there is adequate lighting. • Only approved magnetic particle penetrant chemicals will be used inside the CC HRA. The Access Controllers will ensure compliance. For Koeberg only CRACK (Control of Chemical Restricted Products at Koeberg) is permitted. • All surfaces must be thoroughly cleaned after the work is performed. Magnet must be secured to workers wrist. • Magnetic sweep of the area affected by the MPI test afterwards. • All work to be carried out under constant supervision of the Roaming Access Generator Supervisor and / or Controller (RAC)

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22	Exclusion of a dedicated generator tool store and the three door cabin.	Min SOW of unavailability of Generator tool tore and three door cabin	Loss of tools, spare parts, equipment and components	<ul style="list-style-type: none"> All hand tools to be used inside the HRA to be inspected by the access controllers in conjunction with the tool user for any visible, physical defects. Tools to be uniquely marked. The SCI will manage and control the limited small components inside the erected CC control areas. The SCI will maintain his/her register to control components throughout the strip, refurbishment and re-assembly phases. A locker will be provided to the SCI to lock the bagged and tagged components into and key control will be via the main CC Access Cabin
23	Removal of asbestos material (gasket and all its pieces). Airborne asbestos fibres containment, cleaning/vacuuming of the affected areas. Then testing and certifying the area to be asbestos free.	Remove asbestos gasket, contain airborne asbestos fibres and vacuum the affected areas, then rest and certify the area to be asbestos free	<ul style="list-style-type: none"> Unauthorized entry Unidentified Tools / Equipment Gasket pieces or other foreign material ingress into the Generator during vacuuming and removal of asbestos material. 	<ul style="list-style-type: none"> Clean Condition Champion and CCO to ensure that the access door to the bushing chamber is locked after the task activity. Access Controllers to ensure that all tools or equipment are signed in before the activity commences and sign out after the activity is completed. All work to be carried out under constant supervision of the Roaming Access Controller. All debris /gasket pieces/foreign material to be collected in bags and placed in the Clean Condition Waste bin. Vacuuming of the area being worked on throughout the operation.
24	Stator rewind	Activities include brazing and cutting.	<ul style="list-style-type: none"> Ingress of foreign materials into the Generator stator bars. Loss of Components, Tools, Materials and equipment 	<ul style="list-style-type: none"> Rewind of the stator to be done under Level 1 Clean Conditions Stator bars will be the only items stacked in the Clean Condition area. Special racks will be used for this purpose. The stator bars will come in crates, the crates will then be immediately removed from the Clean Condition area once unpacked. Scissors to be used for cutting.

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			stored in the HRA and surrounding areas	<ul style="list-style-type: none"> • Sticky mats or carpets to be used. • All visitors to follow normal process of gaining access to the Clean Condition area. • Special Tools to remain inside the Clean Condition area in special trolley tool boxes. • Consolidation of the special tools to be done at the beginning and end of each shift. • All tools will have an asset number or unique identification number • Long term registers to be used for recording the special tools and scaffolding required. • Roaming Access Controller to witness the movement of the crates at all times and record the inspected crates. • Debris created in this process to be recorded and removed immediately from the HRA and stored for the duration of the outage. • Full Clean Condition PPE to be worn • Pre Clean Condition registers to be used. • All visitors to follow normal process of gaining access to the Clean Condition area • Photo permit system as per the Eskom Standard 240-5618527 rev 0.4 will be used. Photo permits in the access cabin will be used as emergency roll call. • Rotek search for lost components Search Procedure 240-94027445 will be used if required. • Small components inspector to be available. • Contractor risk assessment to be in place and approved by the Station.
25	Generator Clean Condition revoking. Unwinding of	Due to the complexities of the SOW (being destructive) the	<ul style="list-style-type: none"> • Loss of components and equipment that have 	<ul style="list-style-type: none"> • All Level 1 registers to be balanced / reconciled and notes made on the Finding Register and log book on the status of the registers.

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the stator core under Level 3 Clean Conditions Cleaning of the area in preparation of rewinding the stator core	<p>normal preventative methods will not be practical to apply.</p> <p>Activities include but are not limited to:</p> <ul style="list-style-type: none"> • Grinding • Machining • Welding • Brazing • Cutting. 	<p>been removed.</p> <ul style="list-style-type: none"> • Ingress of foreign materials into the generator compartment and pipe work. • Damage to the surrounding generator equipment and pipe work. • Damage to equipment due to fire hazard. 	<ul style="list-style-type: none"> • ERI Turbo Generator Services Mechanical to hand over the plant to ERI Generator Services as per Clean Condition instruction. • All the small Components removed under Level 1 will remain inside the LRA and the 3 door cabin unless signed out via the components register for refurbishment purposes. • All components and equipment removed under Level 3 to be stored in a dedicated LRA / Stator components storage area. • CCTV to continue to monitor the LRA & HRA. • All visitors to follow normal process of gaining access to the Clean Condition area. • The CCC, CCO and ILR to ensure via an audit that all the components and equipment removed under Clean Condition control Level 1 are accounted for before declaring Level 3. • Special equipment /tool Containers may be included inside the Clean Condition High Risk Area after being fully inspected and audited to verify content • Floor plan will indicate the respective positioning of all the containers allowed in the Clean Condition area. • Only the tools container will be manned by a storeman. Tool container will contain tools inventory list. All tools will have a unique asset number. At the end of the outage / project an audit verification will take place • Clean Condition PPE will be used. • Access control as per the requirements of Level 3 Outages will be in force. • Magnetic sweeps will be required in the HRA and the area is to be thoroughly cleaned and vacuumed after the stator has
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				<p>been dismantled before the installation of the new core.</p> <ul style="list-style-type: none">• Level 1 area classification will be established prior to rewinding the stator.• The OEM / main contractor is responsible to remove all redundant spares/components from the HRA to the designated scrap bins.
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