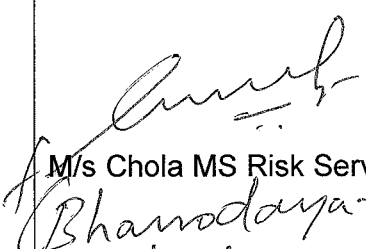
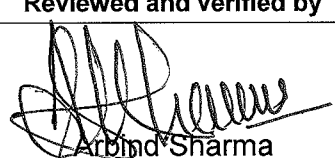
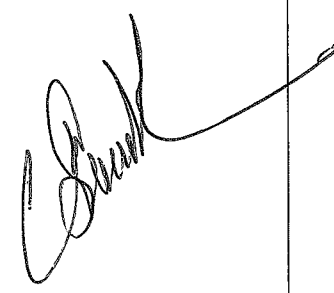




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TECHNICAL STANDARD (TS)

LOCK-OUT TAG-OUT TRY-OUT (LOTOTO)

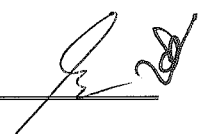
Prepared by	Reviewed and verified by	Authorized by
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20/2/2023

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Document Change Note

Rev. No	Rev. Date	Comments / Changes
00	15-01-2023	New Issue



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1 PURPOSE

The purpose of this procedure is to protect employees and others against hazardous energy/ substances being released from machines or equipment while carrying out non-routine activities.

2 SCOPE

This procedure shall apply to all AMNS project sites and related work areas including contractors to meet –

- Legal and regulatory requirements
- AMNS HSE requirements
- ISO 45001 and ISO 14001 standard requirements

3 DEFINITIONS

Hazardous Energy: Electrical, pneumatic, hydraulic, radiation, stored (springs and batteries), potential (by virtue of position), heat (hot water, steam, surfaces).

Hazardous Substance: Solids, gases, vapors, liquids, dust with the potential to cause injury or illness such as toxic, corrosive or flammable.

Electrical Work: Working on electrical power supply / distribution equipment like Power Distribution Boards, Transformers, Motor Control Panels, electrical supply cables, circuit breakers, etc comes under this category.

Affected Employee: An employee whose job requires him/her to operate or use a machine or equipment on which servicing or maintenance is being performed under lockout or tag out, or whose job requires him/her to work in an area in which such servicing or maintenance is being performed.

Authorised Employee: A person who applies LOTO on machinery/equipment to perform servicing or maintenance. Authorised personnel must consist of those personnel who are responsible for implementing the Energy Control Procedure.

Capable Of Being Locked Out: An energy isolating device is capable of being locked out if it has a means of attachment to which, or through which, a lock, cable, shield or other device can be affixed to prevent use. Note: Castell key holding devices do not replace the need for LOTO - key-holding devices must be capable of being locked out.

Energy Source: Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, gravity or other energy.

Energy Control Procedure (ECP): An individual step by step procedure which must be developed, documented, available and utilised for the control of potentially hazardous energy during the actual maintenance and servicing of that particular equipment or machine.

Energy Isolating Device: A mechanical device that can be physically isolated and prevents the transmission or release of energy, including but not limited to the following:

- A manually operated electrical circuit breaker, switch or disconnect
- A slip blind, a line valve, a block and any similar device used to block or isolate energy.
- Push buttons, selector switches, interlocks, Castell gate locking devices (if positive means of locking is not available) and other control circuit type devices are not energy isolating devices.

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Group LOTO: Group LOTO occurs when more than one individual or team is to perform Servicing and/or Maintenance. Group LOTO requires that each person of the team carrying out maintenance/ servicing have a means to positively lock out the energy source to ensure that each person is protected.

Lockout: The placement of a lockout device on an Energy Isolating Device, in accordance with an established procedure, ensuring that the equipment, machine, or process line being controlled at a zero state of energy and cannot be operated until the lockout device is removed. Lockout will utilize the ONE LOCK-ONE KEY-FOR EACH PERSON philosophy.

Servicing and/or Maintenance: Workplace tasks or activities such as constructing, installing, setting up, adjusting, inspecting, modifying, repairing, trouble shooting, and maintaining and/or servicing machines or equipment. These activities include any related work where the employee may be exposed to the unexpected energisation or start-up of the equipment, machine, or process line or release of hazardous energy.

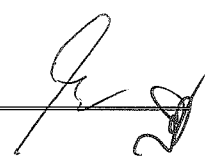
Try Out: Following the deactivation of all hazardous energy through locking and tagging, all personnel participating in the Servicing and/or Maintenance activity must "test and try" to activate control panels or switches to ensure that the energy source(s) has been disconnected.

Tagout: The placement of a prominent warning device (RED Tag) on an Energy Isolating Device, in accordance with an established ECP, to indicate that the Energy Isolating Device and the equipment, machine, process line being controlled must not be operated until the tag-out device is removed.

4 RESPONSIBILITIES

On Site Electrical Supervisor will be responsible for the overall implementation of the LOTO Standard at the Plant.

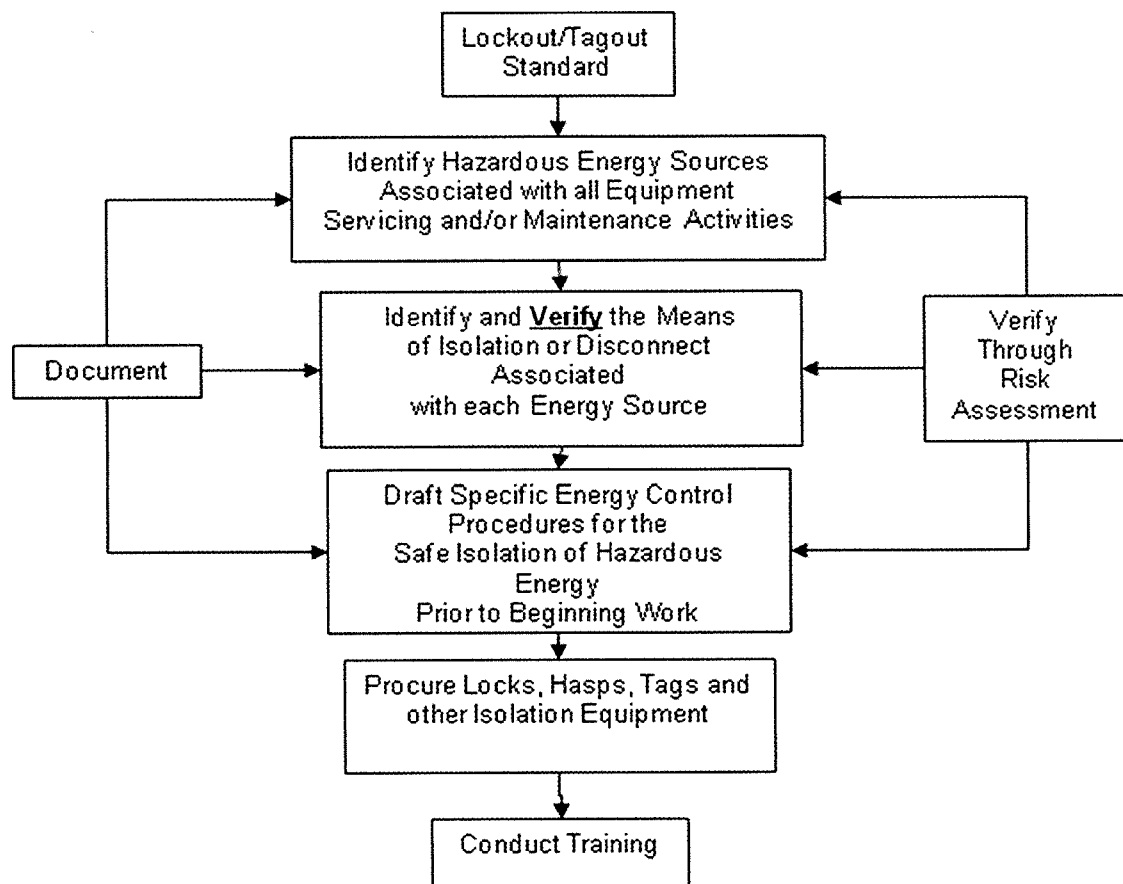
Equipment-Specific Procedures :	Department Supervisors
LOTO Equipment :	Department Supervisors
Training :	HSE Department
Standard Assessment :	HSE Department
Recordkeeping :	HSE & Department Supervisors



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5 ENERGY ISOLATION & LOTOTO – PROCESS DESCRIPTION

Before an employee performs any inspection, repair, maintenance or cleaning on plant / machinery / equipment where unexpected energizing, start-up or release of stored energy could occur, the equipment must be made safe through isolation. The plant / machinery / equipment must be isolated from the energy source(s), rendered inoperative, locked and tagged to prevent inadvertent start-up during the work. When a tag-out system / device is used on an energy isolating device which is not capable of being locked out, the tag-out device shall be attached at the same location that the lockout device would have been attached.



5.1 EQUIPMENT/ MACHINERY EVALUATION AND ENERGY CONTROL PROCEDURE (ECP) DEVELOPMENT

The following must be conducted as the first step in implementing this Standard:

- Servicing and/or Maintenance / Electrical Person(s) shall make a survey of the Project's equipment and machinery to identify all Servicing and/or Maintenance activities that can unexpectedly release potentially hazardous sources of energy that can harm personnel.
- Servicing and/or Maintenance activities in Project may include, working on electrical distribution box, cleaning out concrete mixers (batching plant), repairing conveyors, dust collector maintenance, removing or servicing pumps/motors and also commissioning activities.
- Unexpected release of hazardous energy can include any unintended motion, energization, start-up or release of stored energy that can directly impact personnel.

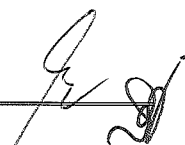
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- Once all sources of potentially hazardous energy have been identified, the means by which safe isolation can occur must be determined. This includes determining whether equipment, machinery or process lines are Capable of Being Locked out and what Energy Isolating Devices are required.
- An ECP must be developed for each piece of equipment/ machinery, all pipe lines that has the potentially hazardous energy and the means of safe isolation. The ECP shall address:
 - specific procedural steps for shutting down, isolating, blocking and securing plant, machines or equipment to control hazardous energy;
 - specific procedural steps for the placement, removal and transfer of lock-out devices or tag-out devices and the responsibility for them;
 - specific requirements for testing a machine or equipment to determine and verify the effectiveness of lock-out devices, tag-out devices, and other energy control measures;
 - how and when multiple lock out / tag out devices are to be utilized due to multiple tasks being undertaken or more than one work team is involved; and
 - specific requirements for removing lock-out or tag-out devices and restoring machines and equipment to normal operation.
- ECP's shall also ensure that Energy Isolating Devices are clearly labeled or marked and that they are located or arranged so that their purpose is clearly evident.
- Energy Isolation points should be labeled with an identification number or other ECP reference number to ensure that it is clear which devices must be deactivated when conducting Servicing and/or Maintenance
- No maintenance or service activity is allowed to be initiated without the implementation of the appropriate energy control procedure and subsequent isolation of all hazardous energy.
- If an energy source is required to properly perform the planned Servicing and/or Maintenance or it is not possible to isolate all potential forms of hazardous energy associated with machinery/equipment, the ECP must be drafted to account for this need and all measures must be taken to tag out activation points. A risk assessment of the Servicing and/or Maintenance activity shall be performed to ensure the ECP is drafted in the safest manner possible.
- Completed, ECP's must be posted in a central location and be readily available to all personnel when needed.

5.2 REQUIRED LOTO EQUIPMENT

Locks must be used (as defined by the ECP) to isolate all sources of hazardous energy. Locks must consist of the following:

- Locks must be easily distinguishable from all other site locks by size, shape or color;
- Locks must never be used for any other purpose other than LOTO;
- Locks must be individually keyed - one key per lock, one lock per person;
- Locks must be issued to specific individuals but should be issued to as few people as is necessary to conduct maintenance or service work;



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- Locks must be numbered and a roster maintained to ensure that all locks can be identified by the person who applied it.
- Tags must be used at all locations where a lock has been used to isolate an energy source. Tags must be used as follows:
 - Tags must be constructed to withstand the environment in which they are used and not easily torn;
 - Tags must be affixed to the isolated device by strong means such that easy removal is not possible;
 - Tags must be accompanied with the name/ employee number of the person carrying out the work.

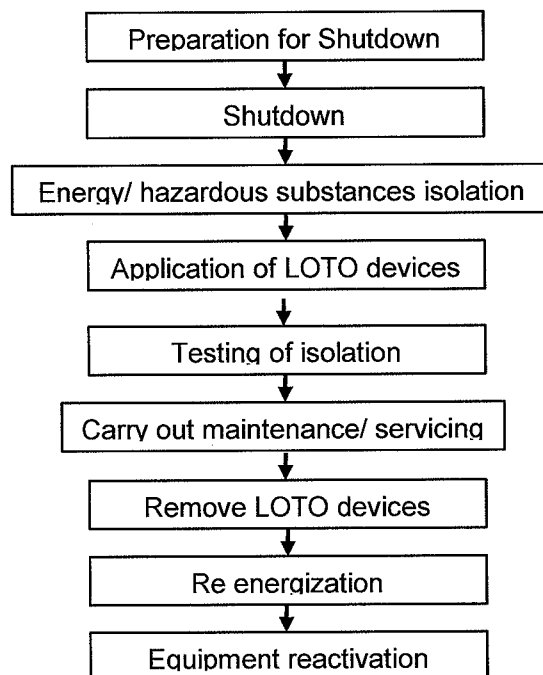
NOTE: Tags are warning devices only and are not an acceptable means of providing a physical restraint for isolating hazardous energy. Locks must be used whenever possible.

- In addition to locks and tags, other isolation devices must be procured as determined by the ECP and could include multi-lock hasps for group LOTO, gate valve isolation brackets, ball valve isolation brackets, cables, etc.

5.3 WITHDRAWAL OF LOCKS/TAGS

If a lock is inadvertently left on an isolating device after all Servicing and/or Maintenance is complete, the Project Head must attempt to contact the person who applied the lock. If this individual is not available, the team that carried out the task, HSE Manager and the Project Head shall verify that all work is complete and all must agree the equipment is ready to be re-energized. HSE Manager shall also involve in verifying that it is safe to re-energize the equipment and the lock may be removed by the Project Head. Such incidents shall be documented and records shall be maintained by HSE department.

5.4 LOTOTO SEQUENCE



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5.4.1 Preparation for shutdown

- Before work is started on any equipment, machine, the maintenance in-charge or electrical in-charge shall be responsible for preparation for Lockout / Tag out.
- It shall be ensured that all hazardous energy sources are identified (Chemical, Electrical, Mechanical or other) to determine which switches, valves or other energy-isolating devices apply to machinery or equipment to be locked and tagged out.
- Where stored or residual energy (such as that in capacitors, springs, elevated machine members, rotating flywheels, hydraulic systems, and air, gas, steam, or water pressure, etc.) may be encountered, identification of such type(s) of stored or residual energy shall be ensured. Appropriate methods of dissipating or restraining such energy (by methods such as, but not necessarily limited to, grounding, repositioning, blocking, bleeding down, etc.) shall be ensured.
- Each case shall be carefully considered by the maintenance / electrical personnel, taking into account the hazardous properties of the materials involved and the details of machine/equipment.
- The responsible person notifies all individuals affected by isolation procedure. This can be done via radio or other suitable communication methods. The person must:
 - Notify that equipment will be isolated
 - Advise workers to stay clear
 - Instruct workers not to turn on the equipment

5.4.2 Shutdown

Using the manufacturer guidelines, the authorised person methodically shuts down and de-energizes the equipment. This must be done in an orderly manner to avoid additional hazards.

5.4.3 Energy / hazardous substance isolation

Mechanical Machinery

- Isolate hydraulic, pneumatic and process powered machinery by closing the appropriate isolation valves. Prevent any possibility of machinery movement by disconnecting the power fluid supply and return pipes, or otherwise making safe.
- Isolate engine-driven machinery by shutting off the engine fuel supply and then isolating all the starting systems.
- For electrically driven machinery, switch off the power supply to the motor and ensure that the equipment is securely disconnected and separated from all sources of electrical energy.
- Any residual mechanical, electrical or pressure energy which may be locked within any part of the machinery mechanism should be safely released as follows:
 - Mechanical –rotating elements need to be run down and springs released;
 - Electrical – capacitors should be discharged and batteries disconnected and/or removed;
 - Hydraulic – accumulators and pressurised pipework should be depressurised;
 - Pneumatic – the system should be depressurised. If valves could be operated by residual trapped air, the line should also be disconnected;
 - Services– steam, gas or fuel may need to be depressurised, vented, purged or drained.

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Even after disconnection of machinery power systems, or prevention of engines/motors from starting, there may still be a risk for people working on the machinery if it were to move (e.g. due to gravity). If so, device such as a properly engineered chock or a scotch should be fitted to lock the machinery in a safe position.

Electrical Equipment

Hazards to workers include electric shock, electrical burns, and electrical arcing resulting in the ignition of flammable gas, vapours or materials.

The main power circuit of the electrical equipment, plus any associated auxiliary circuits which constitute a hazard, should be electrically isolated. Disconnect and separate the electrical equipment from every source of electrical energy. Discharge any stored energy in the electrical circuits, taking particular care with batteries and capacitors.

Devices suitable for isolation include:

- circuit breakers with the required contact separation and locking facilities;
- disconnectors (commonly referred to as isolators) with locking facilities;
- switch disconnectors with locking facilities;
- plug and socket outlets;
- fuse links; and
- removable links.

Personnel should verify that all switching devices used for electrical isolation provide adequate contact separation, as some older devices do not provide proper separation.

When the equipment is isolated, the means of electrical isolation should be secured by locking in the 'off' position. If fuses or links have been removed they must be held secure (e.g. in a lock-out box). Some designs of fuse carrier allow for the use of an insulated insert, which may be lockable, to prevent unauthorised replacement of the fuse.

Water / process pipeline isolation

AMNS facilities are characterised by long lengths of continuously welded pipework and pipelines connecting process vessels, plant and installations. The contents may be hazardous substances, which may be flammable and/or toxic and are often at high temperatures and/or pressures.

Release of hazardous substances due to inadequate process isolation may lead to:

- local immediate effects to people (death or injury) and to the environment
- long-term effects to people and the environment may be equally serious; and/or
- escalation of the initial release, causing wider damage to plant and other systems (e.g. damage resulting in further releases of inventory).

Any intrusive activity could allow the escape of hazardous substances. The implementation of adequate isolation practices is critical to avoiding loss of containment. Wherever practicable, isolation requirements will be minimised by planning intrusive maintenance for shutdown periods.

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5.4.4 Application of LOTO devices

Apply lockout devices to all energy isolation devices and make sure they are tagged. Use the appropriate lockout device along with a tagout device – can be used on the energy control as a secure lockout device

Inspect the system thoroughly to ensure all moving parts have stopped and take steps to guard against residual energy. Releasing tension in springs, bracing parts which could fall and blocking moving parts in hydraulic systems are all examples of how to control stored energy at this stage.

5.4.5 Testing of isolation

Once you have disconnected primary and secondary sources of energy, attempt to start the equipment to verify that the lockout has been successful. Inspect the system to ensure it does not re-start. If the lockout has been successful, return all switches to their off positions.

5.4.6 Carry out maintenance / servicing

At this stage you can complete the required maintenance or cleaning work on the equipment/machinery safely. Ensure to stay alert to any potential hazards or areas of equipment which could re-start

5.4.7 Remove LOTO devices

Once the work is finished, Lockout/Tagout devices and tags have to be removed. First, ask the authorized employee who applied the LOTO to remove their device. Then, have a second authorized employee remove their LOTO device. This helps ensure that everyone is following proper procedures.

Care must be taken when removing a positive isolation. Hazardous substances can build up behind the blank or spade if a valve leaks. Vents or drains should always be checked before the spade or blank is removed. If a leak is detected behind the isolation, re-secure the vent or drain and stop work until a safe system for the removal is in place.

Finally, remove the tags from the machine. Be sure to include the date and time that the tags were removed, as well as the signature of the authorized employee who removed them.

Now that the machine is unlocked and tagged, it can be turned back on and used normally.

5.4.8 Energization

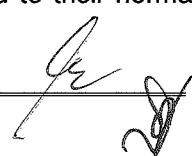
Once the work has been complete the final stage of lockout tagout can take place, whereby the equipment is restarted. Once the final lockout device has been removed, the equipment can be re-energised and started up again according to manufacturers instructions.

5.4.9 Equipment reactivation

Re-commissioning requires equivalent controls to those used during installation of isolation. Where work has been controlled under multiple permits, dependent on common isolation points, it is critical to define the sequence of plant reinstatement.

Controls should include a check of all cross-referenced permits in force and their related isolations (including instrumentation isolations), to confirm the safety of other work following plant reinstatement. The team should ensure that any plant control and protection systems functions that were overridden for the purposes of the isolations are restored to their normal condition.

Reinstatement and re-commissioning of plant shall include:



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- confirmation of plant integrity before removing isolations
- full visual system check by maintenance personnel against the system P&ID and check that no isolation tags remain on the plant;
- additional monitoring after re-commissioning.

6 CHECKING, CORRECTIVE AND PREVENTIVE ACTION

Periodic inspections shall be carried out to assess compliance to this procedure.

Any deviations shall be reported to Project Head & Corrective and preventive action shall be taken.

7 TRAINING

Personnel who are involved in maintenance/ servicing will be provided with advanced training on the LOTO program, including:

- General LOTO procedures.
- Equipment or process specific energy control procedures.
- Test and Try procedures.
- LOTO Permit system.
- Manufacturer recommendations.

Training must be repeated whenever there is a change in job assignment, a change in equipment which presents new hazards, ECP's change or when inspection reveals that these minimum standards are not being followed. Refresher training shall be provided annually.

All authorized personnel must successfully demonstrate their understanding of the LOTO process and ECP's to the satisfaction of the Project Head before being authorized to execute LOTO.

8 RECORDS

S. No.	Title	Location	Retention period
01	LOTO application record book	HSE Department	Completion of Project
02	Training	HSE Department	Completion of Project

9 REFERENCE DOCUMENTS

AMNS/Project/SS/HSEM/08	Hazard identification, risk assessment and control
AMNS/Project/SS/HSEM/12	Emergency Response Management
AMNS/Project/SS/HSEM/10	Permit To Work Procedure
AMNS/Project/TS/HSEM/06	Electrical Safety standard

10 ANNEXURES

AMNS/Project/TS/HSEM/20-F01 – Equipment Specific Energy control procedure

AM/NS INDIA	LOCK-OUT TAG-OUT TRY-OUT EQUIPMENT-SPECIFIC ENERGY CONTROL PROCEDURE	AMNS/Project/TS/HSEM/20/F01
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Department/ Zone:

Equipment Identification:

SCOPE: This procedure applies when any work is to be conducted on the _____ in _____. This includes, but is not limited to General Maintenance, Parts Replacement, Cleaning, Inspections and Adjustments. ALWAYS shutdown the equipment using the normal stopping method prior to LOTOTO.

Hazardous Energy Source		Isolation Device			STEP No. & Method of Lockout & Verification
Type & magnitude	Function	Type	Location	I.D. No.	

This Energy Control Procedure identifies specific Energy Sources (Active & Stored types) for the stated Plant, Equipment & Specified Scope of Work. This Procedure MUST be used in conjunction with the PTW Procedure.