

**Astron Energy South Africa (Pty) Ltd
Cape Town Refinery**

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Leak Response Protocol

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1. Purpose

The purpose of this *Leak Response Protocol* is to guide responses to loss or potential loss of containment (LOC). The instruction provides discussion questions for consideration by Operations and Emergency Responders¹ as they determine a response plan.

This instruction offers guidance for use during an LOC event and in situations where no active leak is present but the protocol should be considered. It does not establish a procedure that must be strictly followed in every instance. Each LOC and potential LOC is unique, and the protocols outlined herein are not a substitute for the experience and technical judgement of response personnel.

2. Scope

The Leak Response Protocol is for any leak within the Refinery, all Astron Energy Off site pipelines and associated facilities in Cape Town Port and in Saldanha.

2.1 High-Consequence Service

The Leak Response Protocol (LRP) should always be used when a leak is present in a high-consequence service, which includes process streams that are subject to rapid vaporization, operating at auto-ignition temperature or with toxic substances.

Examples of leaks may include:

- Pipe leaks
- Exchanger leaks
- Control valve leaks
- Flange leaks
- Mechanical seal leaks
- Instrumentation leaks
- Valve leaks

2.2 Scenarios Where No Leak Is Present

The following scenarios, in which no active leak is present, may require consideration of the LRP:

- Vibration in rotating or reciprocating equipment. Unusual vibration may be an indication of imminent failure.
- Storage tank abnormal conditions. High-level alarms, submerged floating roofs and roof drain problems are serious and could lead to LOC.
- High consequence services where a leak has not yet occurred but which have the potential for LOC if conditions are not addressed, including:

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- Piping or vessel cracks that are not through-wall.
- Internal tube leaks in a heat exchanger.

3. Definitions

Table 1 presents terms, abbreviations and definitions that are important in understanding the content of this Instruction.

Table 1: Terms and Definitions

Term	Definition
Auto-ignition	The process whereby a material that will ignite in the presence of air but without a spark or flame being present.
ERT	Emergency Response Team
High-Consequence Service or Material	A process or a substance that is subject to rapid vaporization, toxic materials, or process streams in auto ignition service.
LOC	Loss of containment
LRP	Leak Response Protocol
OE	Operational Excellence
Rapid Vaporization	A fluid with a boiling point below 10°C or where the boiling point is below the operating temperature at atmospheric conditions.
Toxic Substance	Any substance that can cause injury or illness or that is suspected of being able to cause injury or illness under some conditions (e.g., hydrogen sulfide, hydrofluoric acid, and anhydrous ammonia).
V&V	Verification and validation

4. Linkage to Operational Excellence

Table 2 describes how this instruction is linked to Operational Excellence (OE) Elements and Expectations.

Table 2: Linkage to OE

OE Element	Relationship
Element 3: Safe Operations	Supports: Expectation 3.4 A process is in place to develop and maintain operating and maintenance procedures and process safety information. The process shall help ensure that documents, procedures, records and other information are accurate, reflective of current operating practices and accessible to appropriate members of the workforce. Procedures for document control, including confidentiality and retention, shall also be included.

5. Responsibilities

Table 3 summarizes the responsibilities of individuals and entities involved in fulfilling the requirements of this instruction.

Table 3: Roles and Responsibilities

Role	Responsibility
Local Learning & Development Manager	- Provides affected employees initial and refresher training (every 3 years) on use of the Leak Response Protocol (LRP). - Updates LRP training materials when changes occur that necessitate adjusting content or adding new content.
Operations Management	Participate in initial and refresher training on use of the LRP.
Operations Personnel	Use the LRP in the event of a leak in high-consequence service to determine if the leak can be safely mitigated, isolated, or bypassed.
Refinery Fire Department	Review all checklists completed on a monthly basis and report back on any areas of improvement. Review the Leak Response Protocol on a yearly basis.
Operations Supervisors	Responsible for ensuring that the Leak Response Protocol is initiated immediately upon the discovery of a leak as per the Response timeline. Ensure that all parties are informed and that the checklist is brought to the area of the leak. Facilitate the completion of the checklist.
RSC	Responsible for keeping a record/copy of the completed checklist and decisions made in the Leak Response File on "O" Drive under Operations South side / North side.. Verify decisions

6. Procedural Requirements

For a printable summary of the procedural requirements outlined in steps 6.1 – 6.5 including associated timelines you may refer to "**The Leak Response Timeline and Protocol Checklist**" in [Appendices](#):

6.1 Immediate Actions

1. Clear the site of nonessential personnel.
2. Notify the Astron Energy Fire department (AEFD) for leak response or standby coverage.
3. Gather on-site personnel (Operations, AEFD, ERT, Management, Inspection, Engineering, Materials Engineering, Maintenance, and Safety) and establish a safe location to meet.

4. Decide whether to immediately shut down the unit.
5. Notify internal and external parties as appropriate.

6.2 If Mitigation (Operations in control)

1. Gather on-site personnel to go over the leak response protocol checklist and evaluate the risks.
1. Review isolation options and emergency shutdown procedures.
 2. Verify that approaching the leak is safe.
 3. Implement the action plan.

6.3 If Emergency Shutdown (AEFD in control of Response)

1. Implement emergency shutdown procedures coordinated by operations.
2. Deploy the refinery Incident Command System (ICS).
3. Activate evacuation notifications.
4. AEFD to Request mutual aid if needed.
5. Conduct notifications as needed or required.

6.4 Leak Response Steps

1. Limit site access around the leak to essential personnel only.
2. Identify the leaking material information:
 - Steam, water, hydrocarbon, or toxic or hazardous chemical
 - Size, location, and accessibility
 - Temperature

WARNING: Do not remove insulation if the source of the leak or the failure mechanism is not well understood.

3. Use the criteria in Table 4 to determine whether to shut down the unit.

Table 4: Criteria for Unit Shutdown

Shut down the unit if the answer to either of the following questions is YES:

1. Does the leak pose an immediate danger to safety, health, or the environment? Consider acute toxicity, vapor cloud formation, potential exits, above auto ignition temperature, and personnel exposure.
2. Are you in doubt that we can safely continue to operate the unit or safely secure the leak?

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Shut down the unit if the answer to any of the following questions is NO:

3. Can the leak be safely isolated or safely mitigated? Remote isolation valves or equipment is available to secure the leak without exposing personnel to unacceptable risk, even if the leak gets worse.
4. Can the unit continue to operate with the leak (or system) isolated? Consider if bypasses or alternative routings are available.
5. Is the worst case failure mechanism understood (pinhole vs. generalized thinning)?

6.5 Completion of the Leak Response Protocol Checklist

Use “*The Leak Response Timeline and Protocol Checklist*” in [Appendices](#):

7. Training

Refresher training for affected employees is required every three years and shall be administered by the local Learning & Development group. Affected employees are Operations Management, Operations Personnel, and Emergency Response Personnel.

New affected employees shall receive training in the use of the LRP by the local Learning & Development group.

8. Verification and Validation

Use the V&V protocol in [Appendices](#) to verify and validate the design and effectiveness of this instruction against expectations.

9. Appendices

Document Title	File
<i>The Leak Response Timeline and Protocol Checklist</i>	 Leak response protocol checkistt.do

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Document Title	File
<i>Leadership Verification and Validation for Leak Response Protocol</i>	 LRP V&V Protocol