STANDARD OPERATING PROCEDURE

SAFETY - LIFE SAVING RULES
MECHANICAL ISOLATION
CAT A-1 SOP #3

Verify isolations of hazardous energy before any work begins.

Date Issued:	**February 2011**
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Review Date:	**November 2015**

1.0 PURPOSE & SCOPE

This procedure is intended to establish the minimum requirements for isolating energy sources to ensure the safety and health of Suncor Personnel and Contractors where the unexpected start up or release of stored energy could cause injury.

This procedure is intended to ensure proper isolation of piping systems when such systems are to be opened to atmosphere during the course of maintenance or repair.

This procedure is also intended to prevent the inadvertent operation of valves associated with the piping system by ensuring that block valves, vents, bleed and/or drain valves used to isolate and de-pressure the process piping are appropriately tagged and locked out.

The following principles apply to energy isolation tasks to ensure safe work;

- Repairs on equipment must not begin until all associated energy sources are identified and the equipment is isolated from them
- Workers must personally verify that the equipment they are working on has been isolated.
- Workers signing the safe work permit are indicating that they have verified or are working under the protection of an authorized employee who has verified that isolation has been completed and the equipment is safe to work on.

This procedure does not apply to;

- Normal operation service and maintenance such as lubrication, cleaning, minor adjustment are not included in this procedure unless protective guards have been removed which expose sources of energy.

- Fire water hydrants and fire piping systems; As locking fire protections systems can cause delays in reactivating these systems. Tags should be used on these systems to prevent inadvertent opening while work is underway.
- An individual working without a permit on a process / piping system where he/she is a subject matter expert, the isolations are within line of sight of the individual involved, and the individual has control over the energy sources.

  For example;
  - Terminal Technicians working on draining / clearing a sight glass
  - Instrument adjustment,

  These exemptions DO NOT apply to the offloading / loading of trucks where the Drivers involved are in constant attendance and subject matter experts of the equipment.

2.0 REFERENCED DOCUMENTS:

- OEMS Element 9, Operational & Maintenance Controls
- PSM Standard, Operating & Safe Work Procedures, CO-S12A
- Distribution Standard Operating Procedure, Piping Initial Break, SOP Cat A-3, SOP #05
- Distribution Standard Operating Procedure, Electrical Isolation, SOP Cat A-2, SOP #09
- Distribution Standard Operating Procedure, Work Permitting, Cat A-1, SOP #06
- Distribution Standard Operating Procedure, Personal Protective Equipment, Cat A-1, SOP #10
- WorkSafe BC – Part 10
- Saskatchewan Occupational Health and Safety regulations, Part X
- Alberta Occupational Health and Safety Code, Part 19
- Quebec Occupational Health & Safety Code, Division XXXIII

3.0 PRECAUTIONARY STATEMENTS

3.1 Specific Hazards

Typical hazards that may be encountered while executing mechanical isolations may include;

Ergonomic Hazards

- Awkward Body Position
- Walk area not clear / level

Work Environment Hazards

- Exposure to electrical hazards
- Exposure to hydrocarbons or other chemcials
- Slips or trips
- Limited access / egress

Personal Limitations

- Distractions in work area
- Confusing instructions
- No / lack of training
- Fitness for duty

3.2 Training

Proper training and demonstrated competency are prerequisites to performing this Standard Operating Procedure. Training shall be provided by a competent person and records shall be maintained.

All employees who are required to utilize this procedure must review and successfully complete competency verification on an annual basis.

3.3 Personal Protective Equipment

Personal protective equipment as outlined in Distribution Standard Operating Procedure, Cat A-1, SOP #10 or as specified in the Safe Work Permit depending on the work to be completed as per the job scope requirements.

4.0 SPECIAL PRECAUTION

Exercise extreme caution when initially opening piping. Always assume that it is still under pressure. Stand at the side of the flange and using two combination wrenches, loosen furthest bolts away from you on the flange first. Refer to Distribution Standard Operating Procedure Cat A-2, SOP #05, Piping Initial Break.

5.0 RESPONSIBILITIES

Terminal Management;

- Responsible for ensuring full implementation and compliance of this standard operating procedure.
- Responsible for providing all lock-out hardware and tags that are required for compliance with this standard.
- Responsible to complete regular audits of mechanical isolation activities and document findings in Suncor reporting tool.
- Responsible to ensure all Terminal Employees who are required to issue mechanical isolation as part of their normal job function are verified for competency on an annual basis.

Operating Authority;

- Responsible to ensure all sources of energy are isolated and verify the equipment is at zero energy state.
- Visit work site with Performing Authority and review requirements of the safe work permit including the isolation points.
- Notify the Performing Authority of any changing conditions or potential impacts to the work area.

- Applying first locks and tags on associated equipment.
- Preparing and issuing the safe work permit.

Performing Authority;
- Responsible to review and accept the Safe Work Permit on behalf of themselves or on behalf of associated Workers who will be required to complete work under that permit.
- Responsible to verify that all sources of energy are isolated.
- Visit work site with Operating Authority and review requirements of the safe work permit including the isolation points.
- Notify the Operating Authority of any changing conditions or potential impacts to the work area.
- Install all the appropriate locks and tags.
- Abide by all conditions of the work permit.
- Perform task as outlined on the Safe Work Permit in a safe and responsible manner.

Worker;
- Abide by all conditions of the Safe Work Permit.
- Perform task as outlined on the Safe Work Permit in a safe and responsible manner.
- Notify the Operating Authority of any changing conditions or potential impacts to the work area.
- Install all the appropriate locks and tags.

6.0 DEFINITIONS

Terminal Management; highest level of authority on site, may be manager, supervisor or a delegated responsibility

Blank; means installing or removing an **ENGINEERED** and approved device at an open end of a line, between two flanges, or plugging/capping off the open end of a screwed fitting.

Control Device: Including, but not limited to, main disconnect switches, circuit breakers and valves.

Double Block & Bleed; refers to the engineered design and installation of 2 block valves with a bleed valve installed between the 2 block valve gates. When used in place of a blank, the 2 block valves will be secured in a closed position, while the bleed valve will be secured in the open position. The distance between the two block valves should not exceed 3 ft. (to ensure no possibility of sufficient build up of debris that could plug the bleed valve).

Departmental Systems Lock: The appropriate departmental / terminal lock applied to prevent unauthorized equipment use.

Energy Isolating Device; A mechanical device that physically prevents the release of energy, such as a manually operated circuit breaker, a valve, pump start / stop.

Hazardous Energy; Energy sources such as but not limited to, electric, mechanical, hydraulic, pneumatic, chemical, thermal, steam and compressed gas energy sources, energy stored in springs, potential energy from suspended parts (gravity) or any moving parts which may injure or endanger a worker if it were to come into contact with the worker

Individual Lock Out Method; A method of lock out in which each individual involved in the activity requiring energy isolation is knowledgeable about the hazards associated with the equipment to be isolated and the isolation required to ensure their protection. Individual lock out requires that each person has applied a Personal Lock to each lockable energy isolating device for their own protection.

Lockout is the use of locks to positively secure devices that control hazardous energy.

Lock Box Method; Situations will exist with large work crews and multiple isolation points, where it may be impractical for each worker to apply a personal lock to each isolation point. In this case, locks are used in the field to secure each lockout isolation. The keys are then secured in a “lock box”. Each Worker would then affix their personal lock on the lock box thus securing the keys locked in the box.

Lockout Devices; Padlocks, safety lockouts (scissors), circuit breaker switch devices, group lock boxes and valve lockouts.

Operating Authority: That individual who controls activities in his specific area; such as Terminal Technicians, Operators, Lab Technicians, Gaugers, Pumpers, Warehouse persons and Dockpersons.

Performing Authority: The individual who actually completes the maintenance tasks.

Personal protection lock: A unique lock installed by each individual for his protection.

Safety Blind/Cover Plate; refers to the installation of a **NON ENGINEERED** device at an open end of a line, between two flanges, plugging/capping off the open end of a screwed fitting or a cover installed over the open pump casing.

Secured or **secured device;** refers to the use of a lock, chain, car seal, ty-wrap or combination thereof plus a signed tag or other identifier where removal of such a device requires either a key wrench, or bolt cutters and accidental removal or opening is eliminated.

Zero Energy Plan: A document which lists indicating remedial measures required for all sources of energy as it pertains to a single piece of equipment. Zero Energy Plans must be prepared and approved by a person that is knowledgeable of the hazards and isolation requirements associate with the machine, equipment or process to be isolated.

Zero Energy Plans should contain;

- Identification of machine, equipment or process
- Listing all sources of energy isolating devices and their locations
- Procedural steps for isolating, securing, and draining of stored energy
- Procedural steps for placing and removing lock out devices, applying tags.
- Requirement for verifying isolation and de-energization have been accomplished

7.0 SUSTAINMENT AND CONTINUAL IMPROVEMENT

This document is classified in Process Safety terms as a Lifesaving Rule and as such must comply with the Lifesaving Rule Standard as outlined in Distribution Procedure Program, Cat B-3, SOP #14.

Nanaimo Terminal Management is to initiate document review process.

To ensure this Standard Operating Procedure documents meets all applicable OEMS / PSM standards, this document is to be reviewed at a frequency not to exceed 3 years or when conditions change to warrant a review

8.0 PROCEDURE REQUIREMENTS

1. Zero Energy Plans or equivalent shall accompany permits. Where a double block valve and bleed is used as an equivalent to a blank for isolation, then the valves will be so identified as part of the energy plan.

2. All equipment will be blanked at the most convenient flange closest to the location of the work. In the case of blanking for the purpose of entry, the blank will be located as close as possible to the vessel. When the closest flange is inaccessible blanks may be installed at an alternate flange if **BOTH** of the following conditions are met:

    a. there are no traps, pockets, or connecting lines between the flanges
    b. the line is tested and verified to be free from hazard between the work and the blank.

3. All blanks/safety blinds must be installed as outlined on the approved "Zero Energy Plan or equivalent ", any changes to the approved plan MUST be signed off by Terminal Management. Any and all changes to the plan should result in the Master controlled copy being updated. A dual tagging system may be considered for use in place of initialling the Zero Energy Plans.

4. Blanks used for hydro-static Testing of lines and equipment **MUST** be engineered, inspected and approved for the load they will be exposed to prior to installation.

5. No work may be initiated on any piece of equipment until a Zero Energy plan is readily available, completed and verified as accurate.

6. **Lockout tags will:**

*a. be clearly marked "**DANGER - DO NOT OPERATE**"*
b. be securely fastened to the lockout device
c. show the reason for the equipment being inoperative
d. show the date the tag was attached
e. be signed (legible) by the Operating Authority

7. An installed blank is an energy isolation device that is not lockable. A lockout tag should be attached where blanks are installed.

8. All Contractors working on the equipment **PLUS** all applicable Terminal personnel must install a lock or securing device and identifier on the lock-out device during the time that the equipment and is being worked on.

9. In all cases, the first lock applied and the last lock removed is to be that of the Operating Authority.

10. If piping needs to be purged of hydrocarbons as part of the isolation procedure, always use nitrogen or other inert gas**. DO NOT USE AIR**

11. Blanks located nearest to the hazard are always installed first and removed last.

12. Blanks should be installed on the "out of service" side of the isolation valves.

13. All individual Performing Authority and Worker locks **MUST** be removed when work is completed, or at the end of the work day

14. For Confined Space Entry when piping is disconnected or a piping spool is removed, in lieu of a blank, the flange or coupling on the vessel side will be tagged "Confined Space Entry, Do Not Connect".

15. Removal of Performing Authority personal locks:

a. can be done by the person who installed them
b. by the Operating Authority or Terminal Management provided:
    i. it is an emergency
    ii. every effort is made to contact the worker
    iii. the equipment is verified safe to operate.

In all cases, lock removal should be communicated to the affected worker prior to commencement of his / her next shift.

16. A Group Lock Box may be used when the number of isolation points (4+) and or the number of workers applying locks makes it impractical to apply all the locks in the field. Group lock box is used to secure the master key of a group of lockbox locks installed on isolating devices. The lock box is then in turn secured by an Operations Lock, Departmental / Terminal Lock and Performing Authority personal lock(s).

17. Single Isolation

Single isolation is the term used when work on equipment is isolated by a single means of isolation, ie closed suction or discharge valves.

Single isolation is authorized for use ONLY in instances such as:

- Installing or removing a blank or orifice plates;
- When the risks of performing work are the same as or less than the risk involved in installing blanks;
- Control valve, PSV removals and installations;
- Water and condensate systems that are less than 120 oF;
- Utilities, air, nitrogen;
- Low hazard inline strainers.

18. Hazard Assessment

Should instances occur whereby single isolation falls outside of the boundaries listed above, then a detailed hazard assessment must be completed.

For example:

a. Positive isolation cannot be achieved and a significant hazard exists
b. When it is not reasonably practical to provide blinds or double block and bleeds and single isolation provides adequate worker protection.
c. For work under double block and bleed with plugged bleed or passing bleed.

The hazard assessment form (Appendix A) is to be used to authorize single isolation. Participants in the assessment MUST include Terminal Management, Operating Authority, Workers Involved, Professional Engineer, Contractor Supervisor and any other expertise.

Single isolation is never to be used for applications involving confined spaces.

9.0 PROCEDURE: EQUIPMENT ISOLATION

OPERATING AUTHORITY

1. Obtain Zero Energy Plan document
2. Complete Field Level Risk Assessment.
3. Block in all necessary valves to isolate the piping system as per the Zero Energy Plan.
4. De-pressure and or drain the piping system by opening appropriate bleeds, vents and or drains.
    - *If equipment has a bleed to flare, open the bleed and listen for flow.*
    - *Consider the temperature, pressure and nature of fluid when opening drains.*
    - *Consideration for containment of drained fluids*
5. Determine if the isolation is holding pressure and is adequate to control the energy.

6. If flow does not stop or pressure does not drop to zero in a reasonable period of time, CLOSE bleed(s) and or drains(s) and RESEAT the isolation valves.
7. Repeat steps 3-6
8. If flow cannot be totally stopped, determine if any other valves further upstream or downstream can be used for isolation.

    - *Identify new isolation points and review these with all personnel involved.*
    - *Initiate work order to replace faulty valve.*

9. If positive isolation is achieved, CHAIN LOCK and TAG each isolation valve and TAG all drains, vents and or drains.

    - *Ensure chain is placed in a position to prevent any turning of the hand wheel.*
    - *Tag to read "DANGER - DO NOT OPERATE" and be signed / dated by Operating Authority*
    - *If isolation valves are motor controlled, Electrical Lockout procedure (CAT A-2, SOP#9) must be followed. In addition, the hand wheel must be chain locked to prevent manual operation.*
    - *If isolation valves are equipped with nitrogen or air actuators, the valves must be handjacked closed / locked/ tagged and the energy source must be blocked in or otherwise de-energized.*
    - *Ensure that any flare connections are blocked in, chain locked and tagged.*
    - *It is best to use scissor type lockout devices to accommodate multiple locks.*

9. Install tags at all locations where plugs have been removed.
10. Initial on the Zero Energy Plan, the isolation at each location.
11. To ensure Worker's safety, if positive isolation cannot be achieved, a hazard assessment must be completed.
12. Work with the Performing Authority in identifying hazards, precautions or other specific requirements that may be necessary to safely complete the documented job scope. Prepare Safe Work Permit
13. Visit work site with Performing Authority and review requirements of the safe work permit including the isolation points.

14. Once isolation has been completed by the Operating and Performing Authorities, both the Operating and Performing Authorities MUST verify together that the equipment is de-energized and cannot be started.

    - *Should repairs extend beyond the time specified, this step MUST be repeated with each subsequent work permit.*

PERFORMING AUTHORITY PROCEDURE

1. Obtain Zero Energy Plan and inspect work site. Identify isolation locations with Operating Authority
2. Work with the Operating Authority in identifying hazards, precautions or other specific requirements that may be necessary to safely complete the documented job scope.
3. Accept and sign work permit. Ensure that all workers understand the requirements of the Safe Work Permit.
4. Complete Field Level Risk Assessment.
5. Ensure all information pertaining to the job is checked off on the permit, including but not limited to:
    a. Equipment is drained and de-pressured.
    b. PPE required is on hand
    c. Isolation valves are chained and locked
    d. Additional lockouts such as vents, drains and electrical have been identified.
6. The Performing Authority applies his/her personal lock and tag at each isolation point including those that are not lockable such as blanks. Performing Authority initials Zero Energy Control Plan
7. Each Worker places his/her lock at each isolation point. Each Worker initials Zero Energy Control Plan
8. Once isolation has been completed by the Operating and Performing Authorities, both the Operating and Performing Authorities MUST verify together that the equipment is de-energized and cannot be started.

    - *Should repairs extend beyond the time specified, this step MUST be repeated with each subsequent work permit.*

9. Complete isolation at designated locations and in the order as specified on the Zero Energy Plan.
    - *Caution, gasket materials may contain asbestos*

TERMINAL MANAGEMENT

1. Conduct assessment of mechanical isolation using provided checklist.

10.0 ISOLATION REMOVAL AND PREPARATION FOR SERVICE

1. Operating and Performing Authorities visit work site and review Zero Energy Control plan and identify isolations to be removed.
2. Operating and Performing Authorities work to identify hazards, precautions or other specific requirements that may be necessary to safely complete the documented job scope.
3. Safe Work Permit is prepared by the Operating Authority.
4. Performing Authority accepts and signs work permit. Ensures that all workers covered under the permit understand all of the requirements.
5. Performing Authority completes Field Level Risk Assessment.
6. Once isolations are removed, locks may be removed in reverse order of installation beginning with the Workers and next Performing Authority.
7. Operating Authority works to prepare the equipment for service;

    i. Verify all blanks have been removed
    ii. Verify all Performing Authority chains and locks have been removed
    iii. Remove all chains, locks and tags
    iv. Close all drains, vents and install caps
    v. Verify valve lockouts and electrical lockouts are in the required position.
    vi. Re-commission the equipment.
    vii. Inspect equipment while in service to verify integrity of all vents, drains, and isolation points.
    viii. Initial on the Zero Energy Plan, the isolation removal at each location.

ix. Submit completed Zero Energy Plan to Terminal Management. Any changes to the plan must be captured to ensure the information remains accurate.

11.0 TERMINAL MANAGEMENT

1. Update Zero Energy Plan if changes are required.

12.0 PROCEDURE DEVIATION

Deviations from this standard operating procedure must be authorized using the Management of Change procedure. Deviations must be documented and documentation must include the relevant facts supporting the deviation decision.

DATE	AUTHOR	DESCRIPTION	REVISION
Feb 2011	R. Rattray	New document issue.	Initial Issue
August 2012	R. Rattray	Re-formatted to comply with PSM	2012-01

APPENDIX “A” AGREEMENT FOR WORK UNDER SINGLE ISOLATION

1. Equipment Name _____ Equipment Number _____

Location of Work _____

Job Description _____

_____

_____

_____

Estimated Duration _____

Trades Involved _____

2. Describe alternatives to and justification for working under single isolation

_____

_____

_____

3. Complete and attach Zero Energy Isolation / Lock-Out List

i

4. Valve Characteristics

Type of Valve _____ Size of Valve _____

Valve Orientation _____

Identify any Sealing / Seating or Stem Leakage Issues (deposits etc)

_____

_____

APPENDIX “A” AGREEMENT FOR WORK UNDER SINGLE ISOLATION

5. Methods to be used to verify / test integrity of single isolation

_____

_____

_____

6. Fluid Properties to be isolated by Single Isolation

Name _____ Pressure _____

Temperature _____ Flash Point _____

Auto Ignition Temp _____ Toxicity _____

Corrosivity _____ Solids / Deposits _____

Liquid / Vapour / Slurry _____

7. If valve passes, describe mitigation steps

_____

_____

_____

_____

_____

APPENDIX “A” AGREEMENT FOR WORK UNDER SINGLE ISOLATION

8. Precautions for Initial Opening and Ongoing Work

Chemical Protection _____

Respiratory Protection _____

Eye Protection _____

Line of Fire _____

Egress _____

Safety Shower / Eyewash Location _____

Fire Equipment (Stand By Personnel / Extinguisher / Hose Line / SCBA)

_____

_____

Hot Work Controls _____

Barricades _____

Use of Non Spark Equipment _____

9. Acceptable Risk – ***The undersigned agree that work under the single isolation described provides adequate protection to the workers and the job can proceed safely*****.**

Print Sign

Operating Authority
_____

Performing Authority _____

Contractor Supervisor _____

Terminal Management _____

Professional Engineer _____

DESCRIPTION	
Service:	
Pump Name:	
Pump Number:	
Equipment Number	
Motor Number:	
Location:	
Blanking Required:	

Special Instructions:

- Verify that area has been cleared of all Workers prior to commissioning
- Ensure pump and piping are drained
- Ensure all plugs and caps are installed on drains and bleeds prior to commissioning
- Ensure that drains/ bleeds are clear and pump is drained / depressured.

SPECIAL INSTRUCTIONS / LOCK-OUTS		DE-ENERGIZED				ENERGIZED			
Sequence	Description / Lock-Out	**DATE**	**INITIAL**			**DATE**	**INITIAL**		
			Technician	**Contractor**	**Management**		**Technician**	**Contractor**	**Management**
#1									
#2									
#3									
#4									
#5									
#6									
#7									
#8									
#9									
#10									
#11									
#12									
#13									
#14									
#15									
#16									

SPECIAL INSTRUCTIONS / BLANKS:										
		Flange Size Rating / Type	INSTALLED				REMOVED			
Sequence	SERVICE & LOCATION		DATE	INITIAL			DATE	INITIAL		
				Tech	Cont	Mgr		Tech	Cont	Mgr
#1										
#2										
#3										
#4										
#5										
#6										
#7										
#8										
#9										
#10										

SPECIAL INSTRUCTIONS / ELECTRICAL ISOLATION											
SEQ	DESCRIPTION / SERVICE	Sub Station	MCC	DATE	INITIAL			DATE	INITIAL		
					Tech	Cont	Mgr		Tech	Cont	Mgr
#1											
#2											
#3											
#4											
#5											

SCHEMATIC (IF AVAILABLE)