AZERBAIJAN BUSINESS UNIT

(AzBU)

Procedure for:
Energy Isolation - Process

C2	09.09.04	Issued for use	G.Stacey	SSoW WG	N.McCleary	G. Campbell
Rev	Date	Reason for Issue	Prepared by	Checked by	Approved by	Endorsed by

Notes: C2:Complete rewrite taking into consideration SIRP requirements

HSE - SAFETY

Azerbaijan BU Document Reference

Asset Code	Dept Code	Document Type	Sequence No	Revision Code
UNIF	**HSE**	**PRO**	**107**	**C2**

TABLE OF CONTENTS

1 INTRODUCTION

1.1 PURPOSE

This purpose of this document is to ensure there is clarity to the detailed requirements that applies to the preparation for isolationand reinstatement of process, utility and drilling systems.

A glossary of the terms used in the document is given in Appendix A.

1.2 DEVIATIONS

The procedures are written in sufficient detail that they should be able to be applied consistently at all sites. There may still be the requirement for some local rules covering site-specific logistical/administrative arrangements and local variations in responsibilities to reflect differences in organisational arrangements. These local rules should not deviate from the core processes within this document. Any form of deviation from this procedure, including but not limited to local rules, shall be requested and authorised in accordance with the SSOW Deviations from Regulations and Procedures procedure (Doc. No. UNIF-HSE-PRO-101)

1.3 SCOPE

The scope covers defined activities of BP and Contractors at all BP AzBU sites and installations.

1.4 DOCUMENT REVIEW

This document will be reviewed on an annual basis when users from the sites will have an opportunity to propose changes to the existing processes and procedures. The document Technical Authority will be responsible for coordinating this review.

1.5 SSOW SPECIFIC CROSS REFERENCES

This SSOW procedure shall, where appropriate, be used in conjunction with this suite of BP AzBU SSOW Procedures referenced below.

Document Number	Title of Procedure
UNIF - HSE- PRO - 101	Deviations from Regulations and Procedures
UNIF - HSE- PRO - 102	Incident Investigation and Reporting
UNIF - HSE- PRO - 103	Permit To Work
UNIF - HSE- PRO - 104	Authorisation
UNIF - HSE- PRO - 105	Task Risk Assessment
UNIF - HSE- PRO - 106	Energy Isolations-Electrical
UNIF - HSE- PRO - 107	Energy Isolations-Process
UNIF - HSE- PRO - 108	Confined Space Entry
UNIF - HSE- PRO - 241	Leak Testing

1.6 BP GOLDEN RULES

Energy Isolation is one of BP's Golden Rules. It states that:

"Any isolation of energy systems: mechanical, electrical, process, hydraulic and others, cannot proceed unless:

- *The method of isolation and discharge of stored energy are agreed and executed by a competent person(s)*
- *Any Stored energy is discharged*
- *A system of locks and tags is utilised at isolation points*
- *A test is conducted to ensure the isolation is effective*
- *Isolation effectiveness is periodically monitored"*

1.7 LANGUAGE FACILITATION

Due to the various languages spoken at site, there is a necessity to assist all with "an ease of understanding". Therefore, the development and use of information tools are available.

2 ROLES AND RESPONSIBILITIES

2.1 PERFORMANCE UNIT LEADER

The Performance Unit Leader is responsible for operating in accordance with this document and for the self-regulation of compliance.

2.2 ASSET MANAGER

The Asset Managers are responsible for:

- Ensuring that the Processes applied at their sites are authorised by them prior to implementation
- Periodic internal review

2.3 OFFSHORE INSTALLATION MANAGER (OIM) / SITE CONTROLLER (SC) / ONSHORE SITE MANAGER (OSM)

The OIM/Site Controller/Site Manager is responsible for ensuring that those performing the roles of Area Authority, Isolating Authority and Performing Authority are competent to do so and have overall responsibility for the implementation of the Permit to Work and isolation procedures at their site. They are responsible for:

- Ensuring the operation and assurance of the isolation procedure at their site, acting upon all recommendations and proposing system improvements
- Authorising the Area Authority and Isolating Authority (in writing) as competent to carry out their responsibilities within the Permit To Work and isolations procedures
- Maintaining a control log of all authorised personnel. Details of this control log are included in *UNIF-HSE-PRO-104 Authorisation*.
- Communicating the responsibilities of key participants within the isolations procedures to those personnel under their direction
- Approving all Level 2 Risk Assessments undertaken for non-compliant isolations
- Ensuring the required competent personnel are available at the installation to carry out isolation activities.
- Ensuring that plant and equipment isolations are subjected to the appropriate level of self-regulation and audit.

2.4 AREA AUTHORITY (AA)

The Area Authority is responsible for approving the isolation design, providing assurance that the design achieves the highest quality of isolation reasonably practicable. He/She can delegate the detailed isolation design to an Isolating Authority. The Area Authority is then responsible for authorising the work to proceed under the appropriate controls. They are responsible for:

- Ensuring only authorized personnel perform isolations
- Advising the OIM/Site Controller on Isolating Authority (IA) competence
- Ensuring isolation specification, application, removal, certification and security are

accomplished in accordance with this procedure

- Facilitating the Risk Assessment process in accordance with *UNIF-HSE-PRO-103 Task Risk Assessment*
- Approving all Energy Isolations
- The weekly review and quarterly audit of long-term isolations
- The control of all lock-off devices and tags involved with isolations.

2.5 ISOLATING AUTHORITY (IA)

The Isolating Authority is responsible for:

- The specification, application, removal and recording of Energy Isolations in support of a Permit to Work
- The design of process isolation when requested by the Area Authority. When designing the isolation the Isolating Authority must agree the scope and content of isolation with appropriate personnel e.g. the Performing Authority.
- Isolating specific sections of plant or items of equipment to the highest quality and security of isolation, which is reasonably practicable.
- Demonstrating to the Performing Authority the integrity of the Energy Isolations
- Monitoring of isolations in-place

2.6 PERFORMING AUTHORITY

The Performing Authority is the person charged with the responsibility of carrying out the work and has the right to request demonstration of the integrity of any isolation. They are responsible for checking that Energy Isolations `have been implemented in accordance with the isolation specification before starting work.

2.7 MAINTENANCE PERSONNEL

Maintenance personnel work under the direction of the Isolating Authority and are responsible for installing the means of isolation (e.g., spades) and removing equipment / pipe work (e.g., spool pieces) taking into consideration the equipment rating and service.

2.8 THE ONSHORE SUPPORT ENGINEER

The Onshore Support Engineer is responsible for providing engineering advice and guidance to the Area Authority.

2.9 CUSTODIAN

The custodian of this document is the Technical Authority for Energy Isolations Process. The TA is responsible for ensuring that an annual review of this document is carried out.

3 MONITORING AND AUDITING OF ISOLATIONS

3.1 MONITORING

The integrity of each isolation point shall be monitored at suitable intervals to detect any actual leakage or deterioration in condition caused, for example, by vibration or disturbance (or changing pressure upstream). This monitoring may involve partial testing of valve isolations as suggested in Appendix D. The minimum recommended frequency of monitoring is once per shift and immediately prior to breaking containment. The results of any monitoring of isolation integrity shall be recorded and will form part of the shift handover.

3.2 SELF-REGULATION AND AUDIT

Each Business Asset shall:

- Undertake internal audits of the operation of Energy Isolations at each site.
- Maintain an Audit Register.
- Have in place a system for tracking recommendations through to closeout.
- Periodically review isolation-related activities including review of individual isolations and the overall isolation process. Such reviews may also include.
    - General compliance with this document and any local procedures
    - The Level 2 Risk Assessment of non-compliant isolation and the extent of any approved deviations
    - A register of competent Isolating Authorities.

The use of a standard audit checklist is recommended, to allow comparison with externals audit results. Audits, which are independent of the location, shall be carried out and will form part of the Site Safety Adviser's audit programme and the HSE compliance assurance programme. The recommended frequency of audit is as follows:

Installation /Site personnel	1 permit and isolation confirmation (ICC) certificate per day
Site Safety Adviser	1 permit and isolation confirmation (ICC) certificate per week
Site Manager/Controller	1 permit and isolation confirmation (ICC) certificate per month

Note: Audits should be a cross section of activities ongoing i.e. hot work, cold work, and spark potential. Installation / Site personnel should carry out audits of individual tasks covering both the PTW and the Isolation Confirmation Certificate (ICC) on a regular basis.

Site Managers shall carry out regular internal reviews of the findings of Energy Isolation Certificates, to ensure that any critical failings in the system, or its manner of implementation, have been identified and appropriate actions have been or will be taken.

The BU HSE Department as part of their audit schedule shall carry out Energy Isolation audits. Such audits shall examine a cross section of at least 20 Energised Isolations together with compliance to this procedure and any deviations in place.

The results of the audit shall be discussed with Management and issued for information and action as appropriate.

4 COMPETENCY, TRAINING AND AWARENESS

4.1 GENERAL

All personnel involved in Energy Isolations-Process shall be trained and deemed competent.

The competency of all relevant personnel shall be determined during the planning process for any particular risk assessment. The Area Authority and/or Line Supervisor shall ensure that the personnel involved in the activity have the correct competencies by examining records, or requesting individuals to produce relevant certification.

4.2 LEVELS OF TRAINING

A training programme providing initial and refresher training and trainee assessment on the contents of this document shall be carried out involving all personnel responsible for the specification, approval, application and recording of process isolations.

The competency requirements for energy isolations - process for the key positions within this document are as follows:

Area Authority, OIM/Site Controller/Onshore Site Manager, Department Heads	
Initial training	Theory in Energy Isolations-Process :1 day classroom, followed by 1 day Workplace Assessment Practical.
Refresher training	Practical or CBT (2 yearly), or if away from site/installation for more than 12 months
Isolating Authorities	
Initial training	Practical in Energy Isolations-Process - 1 day classroom, 1 day Workplace Assessment **Practical Workplace Assessment:** Before being deemed competent to carry out process isolating duties, the Isolating Authority must have been assessed at the workplace by a competent Assessor. The Isolating Authority shall demonstrate by practical example that he is competent ito design and implement process isolations. The process for carrying out workplace assessments is described in the workplace Assessment Plan (see Appendix F)
Refresher training	Practical or CBT (2 yearly), or if away from site/installation for more than 12 months

In special circumstances such as drilling operations, individuals can be assessed as competent isolators for specific items of equipment providing that they have completed the formal training and have been assessed as competent on the specific tasks. Site management is responsible for ensuring that this is recorded so that it is clear which tasks these individuals are competent to undertake.

5 THE ISOLATION CONFIRMATION CERTIFICATION (ICC) PROCESS

5.1 GENERAL

Where isolations are required an Isolation Confirmation Certificate (ICC) must be completed as detailed in the Permit To Work (PTW) procedure.

The Isolation Confirmation Certificate supports the Permit to Work by providing the means of:

- Recording the isolations which are required before the task detailed on the associated Permit to Work can proceed
- Confirming that the isolations have been made for the task to proceed (subject to authorisation of other certificates e.g., Confined Space Entry)
- Authorisation and recording of de-isolations and isolations which may be required to test equipment under a Sanction To Test (STT)
- Authorisation and recording of de-isolation on completion of the task detailed on the associated Permit to Work.

Note: The Isolation Confirmation Certificate (ICC) must be completed before the relevant Permit to Work can be issued

The Area Authority, IA and Authorised Electrical Persons involved must be fully informed of the plant, equipment or system to be worked upon and the scope of work to be carried out under each permit where isolations are required. Marked-up Process & Instrument Diagrams and site checks must be utilised to ensure that the plant, equipment or system is clearly identified for isolation.

When each isolation is complete, the Isolating Authority/Authorised Electrical Person enters the isolation details onto the Isolation Confirmation Certificate. The certificate must be cross-referenced to the initial permit and any subsequent permits that utilise the same isolations.

Note: The Isolation Confirmation Certificate is raised before the permit is issued, and remains in force (as a minimum) until the permit is cancelled.

The Isolation Certificate shall only be cancelled when “WORK is COMPLETE”. The Area Authority can then sign the “CANCELLATION” section.

A single individual may not define and approve the design of energy isolations. The Isolating Authorities are responsible for designing the isolation but must liase with the Area Authority, Support Engineer (where applicable) and Performing Authority on the scope, content and application method of proposed isolations.

6 ISOLATION REVIEW AND LEVEL 2 RISK ASSESSMENT PROCESS

6.1 REVIEW AND RISK ASSESSMENT PROCESS

Where an isolation cannot achieve the standard detailed in Energy Isolations Process the Area Authority or Support Engineer is responsible for commencing the Isolation Review and Risk Assessment:

As a minimum, the Area Authority or Support Engineer together with the Isolating Authority, and the Performing Authority complete a Risk Assessment. There must be three members minimum for a Level 2 Risk Assessment.

The completed Risk Assessment shall be submitted to the OIM/Site Controller/Site Manager who will, if necessary, discuss and clarify the isolation design with the team. If accepted, the OIM/Site Controller/Site Manager shall approve the Risk Assessment.

When a satisfactory method of achieving isolation is agreed, isolations are planned, carried out and documented in accordance with the methodology described in the Permit To Work procedure, Energy Isolations Process procedure and the Task Risk Assessment procedure.

6.2 REJECTION OF ISOLATION DESIGN

Under no circumstances where the Isolation Review procedure is used, shall any proposed isolation design be carried out without the agreement of the team involved in the Risk Assessment.

Where the proposed isolation design is reviewed by the OIM/Site Controller/Site Manager and rejected, new proposals in accordance with the Process Isolation Selection Chart shall be proposed, or a new Risk Assessment Record sheet submitted.

Note: **No amendments or additions** to the Risk Assessment Record sheet shall be made.

6.3 RISK ASSESSMENT OF NON-COMPLIANT ISOLATIONS

In the event that the minimum recommended isolation standard cannot be achieved, a Level 2 Risk Assessment shall be carried out according to the following guidelines:

- The assessment team shall specify appropriate safeguards, which may replace or be in addition to those listed in Table 1 (Appendix B). The team shall be satisfied that these safeguards shall reduce the risks to an acceptable level before the Level 2 Risk Assessment is submitted to the OIM/SC/SM for the task requiring isolation is permitted to proceed
- When risk assessing non-compliant isolations, consideration shall be given to the risks associated with swinging large spades compared with the risk associated with the lower level of isolation
- Consideration shall be given to: extended monitoring periods, prior to breaking containment, reducing the duration of the tasks, provision of a permanent standby man, development of a contingency plan for isolation failure.

- Full consideration shall be given to the alternatives including partial or full production shutdown or deferral of the work
- The recommendations from the Level 2 Risk Assessment shall be approved by the OIM/Site Controller who may also recommend further review by technical specialists or management before taking the decision on whether to proceed with the work

6.4 RISK ASSESSMENT RECORDS

The Risk Assessment shall be attached to the appropriate Permit(s).

6.5 HAZARDOUS WORK

Where hazardous or potentially hazardous work such as spading, removing a section of pipeline, or electrical disconnection is required, a permit must be raised to carry out the isolation.

7 TYPES OF ISOLATIONS

There are varying types of isolations, which are described within this section. These include:

- Boundary Isolations
- Long Term Isolation
- Personal Isolations
- Additional Isolations
- Isolation for Confined Space Entry

7.1 BOUNDARY ISOLATIONS

Where an area of plant is isolated such that several activities can safely take place within this common set of strategically placed isolation points then this can be termed as a 'Boundary Isolation'. It must be clearly identified that the isolation is appropriate for all the individual tasks to be carried out against the Boundary Isolation. An Isolation Certificate is raised and identified, as Boundary Isolation and all individual PTW are cross-referenced to this Boundary Isolation.

If any of the proposed tasks requires a level of isolation or implementation of control measures greater than that covered by the Boundary then a separate Isolation Certificate should be raised for this task.

Once work is in progress and subsequent PTW is applied for within the recognised framework of the Boundary Isolation, they can be added providing it is clearly established that the existing isolation is appropriate for the task. However, this should be avoided if possible and it is preferable to identify all activities when the Boundary Isolation is being planned.

Entry to a confined space within a boundary requires separate Isolation and a Confined Space Entry Certificate to be raised.

No isolations within Boundary isolation shall be removed until all applicable PTW having been cancelled.

If for any reason work on a particular piece of plant within the Boundary needs to be suspended (e.g. whilst awaiting spares) then a separate isolation shall be implemented and an ICC raised before the Boundary Isolation can be cancelled.

Where the de-isolation of boundary isolations is proposed, an isolation review team that

includes an Area Authority shall ensure that all associated PTW have been cancelled. They should also ensure that equipment within the boundary is in a safe condition.

7.2 LONG-TERM ISOLATIONS

Long-term isolations are defined as those that no longer have work performed against them. Each site should maintain a detailed register of long-term isolations.

Long-term isolations shall be subject to two levels of review:

- A weekly review of the register to check the status of the isolations in place and whether they should be removed or replaced by a plant modification
- A quarterly audit to physically check all the isolation points to confirm their security and integrity

Before any work is recommenced against a long-term isolation, a full integrity check of the valved isolation shall be carried out.

7.3 PERSONAL ISOLATIONS

Personal isolations are intended for short duration tasks of relatively low risk; for example replacing pressure gauges, filters or small valves, or other such tasks where the completion of an ICC is considered to add no significant value in terms of risk reduction. The rules for approval of a personal isolation are as follows:

- The task and isolation are performed by one person within one shift; the person may receive assistance from others but he shall be present at all times when work is in progress
- Before approval, the Area Authority must be satisfied with the competence of the Performing Authority to both carry out the isolation and execute the work. Personal isolations shall only be carried out by those deemed to be a competent Isolating Authority. Where an isolation involves competency in more than one discipline eg electrical, mechanical, instrument or process, personal isolation is only permissible if the Performing Authority has all the appropriate isolating competencies
- The same isolation standards apply to personal isolations other than the completion of the ICC
- The isolation points shall be labelled with a personal isolation label and locked
- If the worksite is left unattended, the plant shall be left safe, including capping or plugging of any open ends

An ICC shall be raised whenever these conditions are not adhered to.

7.4 ADDITIONAL ISOLATIONS

An individual Isolation Confirmation Certificate must be completed for each Permit to Work requiring isolations; unless isolations are controlled by a Boundary Isolation Certificate. Where working within a defined boundary, further isolations may not be required. However, where additional isolations are identified, an Isolation Confirmation Certificate will be required.

7.5 ISOLATION FOR CONFINED SPACE ENTRY

Positive isolation shall be effected on all live lines for any task requiring entry to a vessel or confined space. Spool removal is to be preferred, although spade isolation may be used where it is not reasonably practicable to remove pipework sections. It should be noted that in some cases it may not be reasonably practicable to comply with this requirement in making entry to mud tanks, pump pits, ballast tanks, or other utility systems. Here, a Level 2 Risk Assessment shall be undertaken and approval obtained from the OIM or Site Controller before entry can be permitted under work control.

Vessel nozzles should normally be left open to assist with free ventilation. Air movers or ducted fans may also be used to create a flow of clean air through the vessel. If there is any likelihood of fumes, water or other contaminant entering the vessel from sources other than the isolated pipework while persons are inside, the need to blank off any affected nozzles shall be considered. Blanks used for this purpose do not need to be pressure-rated. However non-pressure rated blanks shall be clearly identified by either a tag, painted circumference or other marking. In the case of tanks with ‘swan necks’, mechanical plugs may be an option, to prevent ingress of fumes, etc.

The manway doors on a vessel being prepared for entry shall be removed last and reinstalled first to reduce the risk of unauthorised entry.

Further details on confined space entry are given in UNIF-HSE-PRO-108

7.6 PROVISION FOR ISOLATIONS DURING MODIFICATION OF DESIGN AND NEW FACILITIES

In relation to existing Installations and Sites:

- The design of all modifications and new facilities shall include a review of the provision of means of isolation for maintenance to ensure compliance with this document
- Such reviews shall address both isolations within the modified/new facilities and any opportunities to upgrade existing isolation facilities where these are inadequate
- New valves supplied as part of a modification or as a replacement shall be provided with a facility to lock off in the open or closed position

7.7 ISOLATION OF HIGH PRESSURE SMALL BORE PIPING

When isolating small bore piping consideration shall be given to the pipe connection to the isolating valve to ensure that there is no possibility of the security of the fitting being dislodged during disconnection or reconnection of any pipe work used for invasive maintenance. In addition to the isolation type consideration needs to be given to the integrity of the system fittings/connections (i.e. Swagelocks).

8 REGISTERS

All Isolation Confirmation Certificates (ICCs) shall be registered on the Isolation Confirmation Certificate Register, which is maintained by the Area Authority(s). Where a site has more than one Area Authority, the nominated responsible Site Isolating Authority (IA) Co-ordinator shall assume overall control of the Register.

9 RECORDS

When all the isolations have been implemented, the Area Authority signs and dates the Isolation Confirmation Certificate. He then records the Isolation Confirmation Certificate number on the permit. The Control Room Operator and/or the Permit Coordinator may also perform this where they are appointed.

Isolation Confirmation Certificates shall be accessible to each Area Authority and are held in the vicinity of the Control Room for ease of monitoring each area.

APPENDIX A - DEFINITIONS & ABBREVIATIONS

Auto Ignition	The temperature at which a flammable substance would auto ignite without an external ignition source
Competent Person	A person who, by reason of his or her training, knowledge, experience and judgment is considered by management to be capable of planning and supervising the safe isolation of plant.
Confined Space	A "confined space" is any enclosed space or partially enclosed space which is large enough that an employee can bodily enter it and perform assigned work, has limited or restricted means of entry or exit, unfavourable natural ventilation and is not designed for continuous occupancy. The general definition of "confined space" shows that many types of spaces may be considered confined and therefore hazardous - large pipelines, tanks, vessels, separators, ducts, sewers, mud, pits, flues, manholes and voids between modules and in legs on offshore installations. The definition also includes any space in which dangerous levels of contaminants can accumulate and ventilation is restricted, e.g. excavations (normally deeper than 1.2m), the space above floating roofs on floating roof tanks, open topped tanks, closed or unventilated rooms, sumps and culverts and any other poorly ventilated areas.
Hazardous Utility	Corrosive, toxic or irritant chemical fluid, e.g., nitrogen, steam or hot water, drilling mud, diesel oil, Aviation Turbine Kerosene, and other fluids that could have an environmental impact.
Isolation	A method of preventing the passage of fluids through connecting pipe work and the disconnection of all forms of motive power in order to allow safe access to allow intrusive equipment maintenance.
Isolation Confirmation Certificate	This combines in one document a record of all isolations required for a task to be carried out safely.
Long Term Isolation	An isolation that remains in place after permit to work cancellation, and recorded as "Long Term". A register is maintained of all Long Term Isolations
Mothballed	Equipment that has been taken out of service, and will not be used in the near future. The equipment is disconnected from all energy sources. No isolation is required.

Non-hazardous Utility	Cold water, air, etc.
Performing Authority, Area Authority and Isolating Authority	These terms shall have the meanings assigned to them in *UNIF-HSE-PRO-104 Authorisation.*
Positive Isolation	Isolation by means of a fixed barrier, such as a blank flange (following spool removal), blind plate or spectacle plate, bolted or clamped in place and conforming to the pipe work specification, which provides an equivalent standard of containment to the pipe work in which it is installed.
Process Fluid	Well fluids, live crude, stabilised crude, gas, NGL or any other produced fluid containing hydrocarbon gas or liquid. H_2S, Naturally Occurring Radio-active Material or hydrates may also be present.
Reasonably Practicable	This term implies that an evaluation of costs versus benefits must be made. Where the cost or difficulty of a precaution is grossly out of proportion to the reduction in risk likely to be achieved by implementing the precaution, the precaution can be considered not reasonably practicable. Any additional risks that may arise while installing or removing the precaution must also be taken into consideration in determining what is reasonably practicable.
Secondary means of isolation	A method of isolation normally used only to support process isolation involving valves, with the objective being process isolation, e.g., isolation of an actuator before isolating the appropriate valve, or isolation of an emergency shutdown panel, providing a closed signal to a valve, disconnecting the actuator air supply and then isolating the appropriate valve.
Spade	A physical obstruction to flow whose design characteristics are the same as the plant, equipment and / or systems into which the obstruction is inserted, e.g., a spade, spectacle blind or line blind.
Toxic Material	Material, which can cause harm by means of inhalation, ingestion or absorption.

APPENDIX B - ISOLATION STANDARDS

General

Experience has shown that for most types of fluid hazard, isolation by valves alone can be adequate if used in conjunction with certain additional mandatory safeguards, appropriate to the level of risk, to ensure effectiveness and security.

Minimum recommended isolation standards have been developed and should be referred to when designing process isolation where it is not reasonably practicable to achieve positive isolation (refer to Table 1). The minimum standard also identifies mandatory safeguards, which the Area Authority is responsible for putting in place to reduce the risk level to as low as reasonably practicable.

For short-term operational tasks such as corrosion coupon retrieval or filter replacements, where no positive isolation is practicable or where the job duration is shorter than the time to install positive isolation, then the 'V' value from Table 1 can be considered as the minimum recommended isolation standard. These tasks shall be conducted using a Permit and a local operating procedure.

Note 1: Any proposed isolation, which deviates from those shown in Table 1 (Appendix B), must be subject to an Isolation Review and a Level 2 Risk Assessment.

Note 2: Isolation against a tested single valve is permissible while swinging a spectacle blind, inserting a spade or fitting a blank flange to achieve a positive isolation.

Positive isolation is regarded as the most secure method and shall be considered when planning maintenance work. **It is mandatory for entry into confined spaces**

Positive Isolation is also recommended in the following situations, in view of the additional security it offers:

- Long duration isolations, eg more than one week
- Where equipment is to be removed from service, and all energy sources disconnected
- Where naked flame hot work is to be undertaken
- For process fluids at or above auto-ignition temperature

When breaking containment in systems likely to contain toxic material

Table 1 Minimum Recommended Isolation Standards for Predetermined Risk Levels

Fluid Type	**Operating Pressure**		
	<10barg	**>10barg <55barg**	**>55barg**
Process fluids and hazardous utilities	V = SVI I = SVI+A	V = SVI+B I = DBB+B	V = DBB+A I = DBB+B
Non-hazardous utilities	V = SVI I = SVI	V = SVI+A I = SVI+B	V = SVI+B I = DBB+B

V	Valve configuration required to permit the installation of blank flanges and spades (positive isolation)
I	Valve configuration required to permit carrying out intrusive maintenance without positive isolation
A	Use mandatory safeguards as on List A
B	Use mandatory safeguards as on List B
SVI	Single Valve Isolation
DBB	Double Block and Bleed

Mandatory Safeguards	**Category A (Low Risk)**	**Category B (High Risk)**
Continuous gas monitoring (for hydrocarbon systems only)	y	y
Pressure build-up to test valve integrity	y	y
Regular monitoring of isolation integrity	y	y
Control and prevent nearby work	y	y
Operations Technician in attendance	y	y
Radio link to control room when breaking containment		y
Develop contingency plan against leakage		y
Identify backup isolation valves, shutdown systems etc		y
Minimise task time		y
Portable fire-fighting equipment available (for hydrocarbon systems only)		y
Minimise possibility of plant disturbance		y

APPENDIX C - GUIDANCE NOTES

C1 ISOLATION PLANNING

C1.1 Isolation Planning

Isolation of any piece of equipment shall be planned such that the risk of removing it from service and then reinstating it on completion of the work is minimised. The Flowchart (Appendix E) should be referred to when planning any isolation. All isolations shall be designed according to the standards set out in Appendix B (including Table 1).

The following key points should also be considered:

- Plant and equipment isolation requirements should be identified early in the work planning cycle for the Installation or site so that adequate time can be made available for formal risk assessment, should it become necessary. Where necessary, reference shall be made to the Installation or site Operations Safety Manual (OSM) and the identification of high-risk areas
- A boundary isolation may be put in place to cover several planned activities in an area of plant. The Isolation Certificate shall describe the scope of work planned and the Permits for these jobs shall be cross-referred to the same Isolation Certificate
- The need for good access and egress to allow isolations to be effected
- Isolations should be as close to the vessel or worksite as possible, to assist in security and ease of monitoring
- Preparation for isolation involving draining, flushing, purging and venting of process pipe-work shall be conducted under the Safe System of Work (SSOW) according to the appropriate procedures for the task and including the appropriate isolation
- Amendments shall not normally be made to isolations in place other than to allow testing of equipment prior to return to service. Amendments may be made to improve the integrity of the isolation with the approval of the Area Authority. The reason for the amendment shall be recorded and the Performing Authority advised of the change
- Pressure relief valves shall only be isolated following the provision of an alternative means of pressure relief

C1.2 Isolation Methods

The highest quality of isolation which is reasonably practicable shall be applied to every individual isolation point. The methods of isolation normally available are detailed below, listed in decreasing order of security and effectiveness.

C1.2.1 Positive Isolation

Positive isolation may be affected by either of the following:

- Spool removal – removal of pipework section and bolting/clamping blank flanges rated for full line design pressure onto live ends
- Spade isolation – witnessed insertion between bolted or clamped flanges of a blind plate; swinging of a spectacle plate. Any such insertion must be rated to the pipe design specification. The insertion of spades shall be witnessed by the competent Isolating Authority

C1.2.2 Double Block and Bleed

Double Block and Bleed (DBB) consists of the closure of two block valves in series with an intermediate bleed valve. The integrity of both valves shall be tested separately and the bleed valve will then be left in the closed position, with periodic integrity checks. The Area Authority shall specify how frequently this bleed valve is opened to check for pressure buildup. As a minimum this shall include:

- Prior to the issue and/or revision of a PTW
- At the start of every work period (this includes after any form of work break between normal periods of work).
- Continuous monitoring during any breaking of containment activity (including but not limited to, the removal of spools, pumps, valves; the insertion of spades)

Emergency Shutdown (ESD) valves may be used as part of a DBB isolation, providing they can be reliably immobilised.

Single valves of a type which provide a double seal in a single body and with a bleed between the seals are also acceptable. Examples of such valves are suitably specified double wedge gate, parallel expanding gate, double seating ball valves, etc, but not double piston seal ball valves where the cavity pressure provides the downstream positive seal.

Where double-seal single valves are used, additional identification of the isolation on the valve SHALL BE INCLUDED, as full loss of isolation will occur on inadvertant valve operation. Additional means of identification for this type of valve shall be two (2) appropriate locking devices. Each shall be individually labelled and identified appropriately as “Upstream Isolation” and “Downstream Isolation”. Both shall be recorded on the ICC and be sequentially numbered.

It should be noted that ‘standard’ ball valves **do not** provide a double seal. In such cases it is important to note that the integrity of the isolation is critically dependent upon the security of a single valve operating stem. Also, it is not normally possible to perform a full integrity test as the two seals cannot be applied independently.

C1.2.3 Single Valve Isolation

Single Valve Isolation (SVI) consists of the closure of a single block valve. A measure of additional security can be achieved by closing several valves in series but the absence of a bleed or vent in the intervening volume means that this method must be classified as SVI. The hazard of trapped pressure due to thermal expansion may be created in this case.

Any valve used for SVI must provide a reliable seal. Non-return valves, flow control valves and other valves which may not provide tight shut-off must not be used.

C1.2.4 Other Isolation Devices

Devices such as mechanically expanded plugs, stopple bags or frozen plugs shall not be used as primary forms of isolation, except where the application has been properly engineered, risk assessed and approved by the appropriate Technical Authority.

Conventional mechanical plugs or stopple bags may be used as a vapour or liquid seal to contain and direct to vent any small amounts of vapour. Flammable vapour monitors shall be used where the presence of vapour could create a hazard.

In all cases, contingency measures against injury or damage caused by sudden ejection of the isolation device shall be put in place.

C1.3 Precautions when Breaking Containment

The key safeguards for both low-risk and high-risk isolations (refer to Appendix B Table1 Categories A and B respectively) are the pressure buildup tests on the integrity of each valve immediately prior to breaking containment, together with the appropriate level of regular monitoring of the isolation integrity. The Area Authority shall control and prevent nearby work and ensure continuous gas monitoring at the worksite. An Operations Technician shall be present during breaking containment and any other critical phases of the task.

Isolations with Category B safeguards require additional control and contingency measures. The key additional safeguards are to minimise the task duration, ensure plant stability and to develop a contingency plan against leakage.

The contingency plan shall consider the following:

- How to respond to a leakage
- Identifying additional isolation valves and the expected action if the isolation fails
- Knowing the position of the local ESD facilities

Firefighting equipment shall be readily available and the work party shall be in radio contact with the control room.

Other precautions that should be considered when breaking containment are as follows:

- Consideration should be given to hot bolting flanges prior to the operation and all materials for the job shall be available at the job site
- Bolts are to be slackened off in the correct sequence. No bolts shall be removed until they have all been slackened and the joint cracked, and until it has been confirmed that the line contents will not be released in an uncontrolled manner and any appropriate gas testing has been carried out
- Particular care shall be taken with clamp lock type fittings. With nuts slackened, the fitting should be physically dislodged to confirm there is no residual pressure, before final disassembly
- The person who opens the flange shall do so in such a way as to minimise the possibility of contact with the contained fluids and of sudden escape of large quantities. Suitable Personal Protection Equipment (PPE) shall be worn
- Where there is a danger of H_2S being present, full H_2S procedures covered in the BP Hydrogen Sulphide Procedures shall be followed
- The Area Classification procedure used for the selection of electrical equipment in hazardous areas does not consider abnormal operations when breaking containment. Consideration shall be given to restricting the use of electrical (and other) equipment during breaking containment due to the risk of releasing flammable gas

C2 ISOLATION IMPLEMENTATION AND CONTROL

C2.1 Security

Any isolation must achieve and maintain effective containment of the relevant fluid for as long as required. Valves shall be locked or otherwise immobilised to prevent unauthorised operation. It may be necessary to apply additional immobilising devices under certain circumstances.

Where valves are required to be locked (open or closed) as part of an isolation, only the following methods are acceptable:

- The use of wire locking loops fitted through the valve handle, requiring considerable effort to force the valve from the locked position
- Padlock and chains which likewise would take considerable effort to force the valve from the locked position. Where this method is used, padlock keys shall be held by the Area Authority
- The use of specifically designed tamper-proof valve interlocks. The activation of the interlock shall be controlled by the Area Authority utilising the master key held at the site

When isolating any valve that cannot be locked and may inadvertently be opened by accidental contact, the valve handle shall be removed where practicable.

Electrically operated valves shall have the power supply positively isolated and any handjack shall be manually locked. If the valve cannot be physically immobilised it should not normally be used for isolation purposes.

Pneumatically and hydraulically operated valves which fail closed shall have their control lines isolated and physically disconnected.

Pneumatically and hydraulically operated valves which fail open should not normally be used for isolation purposes. If no other alternative is reasonably practicable, the valve shall be prevented from moving. Under this situation the isolation shall be considered as non-compliant with Energy Isolations-Process and a Level 2 Isolation Risk Assessment carried out.

It is not necessary to lock bleed valves in a DBB arrangement as they are required to be opened periodically to check the integrity of the isolation.

Personal isolations (refer to section 7.3) shall be secured to the same standard to prevent unauthorised operation of the valves.

C2.2 Identification Methods

All valves, spades and blank flanges used for isolation purposes shall be identified by means of tag-labels. The following information shall be identified on the tags:

- The Isolation Confirmation Certificate (ICC) Number
- The Equipment Tag No
- The IA's Name (clearly printed) and their Signature
- The date of Isolation

Bleed points shall also be labelled with the same format.

Where padlocks are used, the individual key number shall be listed on the ICC and a means of referencing the correct key to the isolation point included. Keys should be held centrally in a secure fashion and controlled by the Area Authority either by using a master key cabinet or individual key safes.

Where there are overlapping isolations where some of the isolation points are common to more than one isolation then these points shall have a separate locking device and tag from each isolation. Each isolation shall be registered and controlled by its own individual ICC.

C2.2.1 Flange Tagging for Breaking Containment

Flanges used in breaking containment should be identified as an aid to ensuring that they are reinstated and their integrity is confirmed once all work is complete. A tag-label shall be used as the method of identification. Both halves of the label are completed by the person carrying out the work and the details recorded on a Breaking of Containment Register. When the flange or connection has been re-made, the lower half of the tag is removed and recorded on the register. The upper half is left to allow the integrity of the reinstated joint to be monitored during leak testing and startup. The tag is removed when the plant is back up to its normal operating conditions and kept in place for a **minimum of 2 days after startup**.

Consideration should be given to tagging critical neighbouring joints which have not been broken but which could be affected by the reinstatement activity.

C2.3 Control of Isolations

The ICC, cross-referenced to all relevant Permits, shall be the principal means of control once isolations are in place. The ICC performs the following functions:

- Identifies the plant concerned and the reasons for isolation
- Authorises isolation by disciplines
- Records the complete list of isolations and valve tag numbers used for a particular task
- Records bleed points for checking valve integrity. The operation of the bleed valves to check integrity need not be recorded as an amendment on the ICC
- Confirms that the isolations have been effected
- Authorises any temporary de-isolations and isolations necessary for testing
- Authorises and records de-isolation on completion of the task

The ICC shall show a complete list of isolations and valve tag numbers. A marked-up P&ID/EFD or other suitable drawing must be attached to the ICC, together with a record of the Isolation Level 2 Risk Assessment where this is needed.

C2.3.1 Control of Isolations for Well Operations Activities

During well operations the isolation of the xmas tree from the process plant shall be controlled via an ICC. This isolation should be used in conjunction with a Well Handover Certificate to manage the handover to well operations. The recommended practice is to include the appropriate flowline isolation valves, the wing valve and the hydraulic supplies to the UMV and DHSV, on the ICC, thus documenting the isolation from the process. The Well Handover Certificate details the status of all tree valves at handover and confirms valve integrity and depressurisation details thus documenting the isolation from the reservoir. During the wireline operations, the swab valve, upper and lower master valves and DHSV are under the control of the Wireline Supervisor and the appropriate detailed operating procedure which will cover removal and reinstatement of the swab cap. On completion of the wireline work the Wireline Supervisor will use the Well Handover Certificate to document the tree status for handover to Operations. During production logging operations where it is necessary to flow the well a specific PERMIT will be raised for the wireline work that requires the well to be online and this will be cross-referenced to the ICC described above and run under sanction to test.

C2.3.2 Locked Open/Locked Closed Valves

For integrity reasons, certain process and drain valves will be in the normally locked open or locked closed position. It is vital that the position and security of these valves is carefully controlled. A register shall be maintained of all these valves to record any changes from their normal position and a regular audit shall be carried out to confirm the security and position of these valves. It is important that these valves are in their correct position, particularly after de-isolation where they have been part of an isolation (refer toparagraph C3.2.4). If these valves are moved from their normal position for operational reasons or as part of an isolation then this movement and subsequent return to their normal position shall be recorded in the register.

C2.4 Testing Isolation Integrity

All isolations shall be tested and shown to be effective before containment is broken. Integrity tests shall be conducted for a minimum of 10 minutes.

Typical valve isolation integrity tests for DBB and single valve isolations are described in Appendix D. It is important that all bleeds (vents/drains) are checked free from obstruction prior to testing. It is also important to realise that a bleed which is hard-piped to a closed drain or flare line will provide single valve isolation only from the drain/flare line.

On completion of checking valve integrity, a bleed valve shall be left in the closed position, unlocked to allow regular monitoring. A pressure gauge may be fitted to the bleed valve to monitor for pressure buildup.

An isolation can only be considered to be of DBB standard if the integrity of both valves has been proven.

If zero pressure buildup is not achievable when checking integrity of a valved isolation, consideration should be given to either including additional isolation valves, installing positive isolation or carrying out an assessment of risk to determine whether it is acceptable to

proceed.

Alternative methods of valve integrity testing may be considered where there are practical difficulties in using the conventional method, providing that they have been endorsed by the relevant Technical Authority.

Once the Area Authority is satisfied with the integrity of the valved isolation and that the system is depressurised and drained, containment may be carefully broken either to effect positive isolation or to perform the required task (taking into account all precautions regarding H_2S, pyrophoric scale, Low Specific Activity (LSA) scale, Naturally Occurring Radioactive Material (NORM) or hydrates).

The extra security of untested but witnessed positive isolation, in addition to the valved isolation used to effect it, is normally acceptable for most confined space entry tasks. However, for longer term positive isolations (eg a week or more), or where the valved isolation used to effect the positive isolation needs to be removed for operational reasons, then integrity testing of the positive isolation is required. This shall be done by service leak testing or formal leak testing of the joint, depending on the level of risk.

Where a single flare or vent valve forms part of an isolation it may not be possible to fully test integrity. In this situation the valve cannot be considered as a reliable barrier and therefore an isolation risk assessment shall be carried out to determine whether the task should proceed.

C2.5 Plant Preparation - for Breaking Containment

All plant preparation work covering the draining and flushing of vessels or pipework shall be carried out under a Permit within the Safe Systems of Work (SSOW). For more complex operations a marked-up P&ID and a specific procedure should be used to support the activity.

C2.5.1 Potential Hazards

Some of the potential hazards that should be considered when planning these activities are as follows:

- Chemical reactions between cleaning materials and a tank or its fittings (eg acidic cleaning fluid attacking a blanking spade installed for isolation)
- Leakage or collapse of a tank or its supports caused by reaction with cleaning materials, excessive weight of wash solutions, or by creating vacuum conditions
- Accidental spillage during draining/flushing (environmental impact)
- Possibility of radiological contamination from LSA / NORM
- Pyrophoric scale which can be formed in systems that may contain H_2S. If these systems are subsequently opened up and the scale is exposed to currents of air, there is a danger that the scale could ignite. The pyrophoric scale shall be rendered harmless by constant thorough wetting until the scale is either removed or the system is again closed up
- Gaskets containing asbestos which shall be handled and disposed of in accordance with the guidance identified in Working with Asbestos Procedures
- Explosions and fires caused by the sudden mixing of water with hot oil, either during steam cleaning or on the admission of hot oil into systems which have just

been steamed or flushed with water and which have not been thoroughly drained and dried

- Static electricity as an ignition source or electric shock during steam cleaning or high-pressure water jetting if equipment is not earth bonded
- Possible asphyxiation through personnel exposure to nitrogen
- Accidental spillage and freezing effects of nitrogen

C2.5.2 Depressurising and Draining Containment Systems

For this purpose containment systems may be divided into:

- Pressurised vessels and pipelines/pipework
- Atmospheric tanks and vessels

C2.5.2.1 Pressurised Vessels and Pipelines/Pipework

The precautions for depressurisation and draining of pressurised hydrocarbon and chemical containment systems include the following:

(1) The system shall be adequately isolated from fluid pressure and inventory for the purpose of emptying.

(2) The appropriate Material Safety Data Sheet (MSDS) and Control of Substances Hazardous to Health (COSHH) or Chemicals Agent Risk Assessments (CARA) shall be studied.

(3) The pressure within the system shall be relieved in a safe manner and the system drained. The residual pressure within the system shall be substantially atmospheric before containment is broken.

(4) Systems containing gas shall be depressurised to a closed system or a vent/flare header designed to accept such gas. If possible, venting to flare is preferred.

(5) Gas systems shall only be depressurised to the atmosphere under strictly controlled conditions. Persons working downwind of any drainage/venting operation shall be warned by the Area Authority or his nominee and, if instructed, shall vacate the area. All hot work shall cease within the affected area.

(6) Where suitable facilities exist, liquid residues shall be drained to a closed system. Where this is not possible, an estimate should be made of the quantity of liquid remaining in the system. Catchment facilities should then be provided sufficient for at least this quantity. Liquid can then be drained by carefully opening a flange at a low point in the system. Precautions should also be taken to prevent the spread of any accidental spillage.

(7) The existence of possible ‘dead-legs’ in the system must be borne in mind. Such traps may have to be flushed with water to remove residual liquids if there are no flanges or connections.

(8) Oil contaminated/soaked lagging material shall be removed from hot equipment as it is prone to spontaneous ignition.

C2.5.2.2 Atmospheric Tanks and Vessels

When emptying atmospheric tanks and vessels in preparation for either changing their contents, carrying out inspections, repairs or modifications, or prior to dismantling, the following guidelines shall be observed:

(1) Prior to emptying any tank/vessel, reference shall be made to the as-built engineering drawings. These drawings show in detail the internals of the tank/vessel which will aid in the methods to be adopted for draining and isolation, eg a bottom offtake of a vessel from the outside may lead to the assumption that the offtake is flush whereas the drawing may show that the offtake is raised internally.

(2) Storage tanks and vessels shall be emptied initially by means of the normal off-take lines, until suction is lost. The contents should be transferred to another suitable tank or, onshore, to a mobile tank, if appropriate.

(3) When emptying and draining, care shall be taken to avoid pulling a vacuum. This may occur if the atmospheric or vacuum vents are blocked, or by excessive lowering rates through large diameter lines.

(4) Once suction is lost through the normal offtake it may be necessary to remove residual liquid contents by means of either a portable pump operating through an open manhole (by the use of the tank water drain valve) or possibly by water-flotation, taking appropriate precautions against spillage.

(5) The hazards of using portable pumps in an area likely to be contaminated with flammable vapour must be taken into account. Appropriately sited, air-powered pumps should be used where possible.

(6) Residual liquids and sludge must be disposed of in accordance with the requirements of pollution-control legislation.

C2.6 Cleaning and Gas-freeing Methods

After depressurisation and draining, residual hydrocarbon liquids, vapours and gases must be removed before further work can proceed.

Caution: If a Confined Space Entry is required, please also make reference to procedure UNIF HSE-PRO-108 Confined Space Entry

Various media can be used for this purpose but the choice is liable to be governed by what is available at the work location.

C2.6.1 Water Flooding

Cold water is usually the most readily available cleaning medium. It is reasonably effective at displacing hydrocarbons, although it does not easily remove sludges or oils trapped in complex pipework or vessel internals.

Before a tank or vessel is flooded with water, it shall be confirmed that its supporting structure is capable of sustaining the weight. In addition, adequate run-down and draining facilities shall be provided, due to large volumes of water usually necessary for these operations.

To avoid a buildup of a static charge when this method is used, water shall be added from the base of the tank or vessel. If a hosepipe is used, the velocity shall be kept low until the end is submerged, and the nozzle shall be electrically earthed. Flooding with water shall not be relied upon to remove all petroleum vapour, liquid or solid residues.

It is possible to carry out hot work on the external surface of a water-flooded tank or vessel without further removal of internal hydrocarbon residue providing the work is below the water level and an appropriate level of risk assessment has been conducted.

Water used for displacing and removing liquid hydrocarbons will be heavily contaminated after use. It must be disposed of in an environmentally-responsible manner.

C2.6.2 Inert Gas

Nitrogen (N_2), Carbon Dioxide (CO_2) or combustion gas (N_2/CO_2 mixture) may be used to displace hydrocarbon gas and vapour. This method may be useful if it is impracticable to introduce water into a system in case of damage. Care should be taken to ensure when injecting such mixtures not to induce localised freezing of valves, gauges etc due to excessive injection rates.

Particular care should be taken with systems which may contain pyrophoric scale from high-sulphur bearing hydrocarbons. If such scale is subsequently exposed to the air, it may rapidly burst into flame. Water sprays may be used to prevent this by keeping the scale constantly wetted.

A quantity of inert gas at least double the volume of the vessel being purged is likely to be necessary to ensure adequate dispersal of hydrocarbon gases. Introduction of gas at reasonably high velocity is also helpful in ensuring good mixing. Purge with inert gas until concentration of flammable vapour is less than 4% in emerging mixture of flammable/inert gas.

Normal flammable vapour monitoring devices will not work accurately in atmospheres which are deficient in oxygen, therefore it is necessary to use specialised equipment to determine the effectiveness of an inert gas purge.

Following the displacement of hydrocarbon vapour with inert gas, the vessel or tank should then normally be purged again with air to displace the inert gas. This shall always be done in cases where man-entry is planned, regardless of any intended use of PPE.

C2.6.3 Steam

At onshore sites, steam may be available in sufficient quantities to use for purging and cleaning vessels, tanks and pipework. Steam is the most effective of the common media for this purpose. It should be used at low pressure, not exceeding 1bar maximum.

Two methods of steaming may be employed; open or closed steaming:

- Open steaming is used where the tank, vessel and its associated system is fully open to the atmosphere
- Closed steaming is used for closed vessels and their associated equipment. During this operation, the temperature is raised allowing volatile liquids to vaporise and disperse together with the bulk of the steam via a condensing system. The heavy constituents can flow freely and be drained off with the condensed steam from the base of the system

For all but the largest vessels and tanks, sufficient steam should be available to raise the

external surface temperature to at least 95°C. Steaming should be continued until the condensate flowing from the vessel is substantially free of hydrocarbon.

Steam may be used in the case of process vessels, small storage tanks and medium sized insulated tanks. It is essential that following a period of closed steaming, adequate provision is made to prevent damage due to a vacuum being drawn by condensation of steam. In large tanks, the rate of condensation of steam is such that adequate purging is not possible.

After steaming, it is normal practice to cool down the equipment with copious quantities of water, this gives an additional wash to help remove residual hydrocarbons.

Where residual material is left on the tank or vessel surface after prolonged steaming, such residual material may still evolve vapour on application of heat, eg burning or welding. In such cases, cold cutting may be employed or the internal surface kept thoroughly wet during the heating operation.

All temporary steam hoses used shall be electrically bonded and earthed.

C2.6.4 Air

Where it is not possible or practicable to use any of the foregoing methods, it may be necessary to use air directly to ventilate equipment and remove hydrocarbon vapour.

When a decision is made to use this technique, every effort shall be made to pump out as much oil and sludge as possible before opening the tank or vessel. Where practicable, forced ventilation shall be used so that flammable vapour is cleared in the shortest possible time. During this purging operation, the flammable range will be passed through, presenting an explosion hazard if an ignition source is nearby. All electrical equipment used shall therefore be suitable for use in a Zone 1 Hazardous Area. Other equipment within the hazard range of flammable vapour shall be effectively isolated.

Air movers shall be fitted at the roof or top manhole so as to pull air in at low level. Temporary trunking may be needed to achieve high-level disposal. In order to minimise the emission of gas/vapour when the lower manhole door is opened, the air movers shall be started up first to obtain a slightly negative pressure before the lower manhole is opened.

Vapour issuing from shell manholes may give rise to a dangerous concentration in a bunded or confined area and, under such conditions, no kind of ignition source is allowed. Removal of vapour by air movers attached to the roof manhole is the recommended safe practice.

Care shall be taken when using natural draught ventilation during periods of calm weather at onshore sites, since vapour released from tanks can travel considerable distances without being dispersed. Due regard shall be taken of wind direction and the risk to adjacent premises or to the public.

Owing to the possible presence of pyrophoric scale within tanks or vessels which have contained sour crude or products, provision shall be made for continuous wetting of the internal surfaces by means of water from one or more water fog nozzles inserted into the roof opening. The nozzles shall be turned on first and the air movers opened immediately afterwards. A shell manhole shall be opened after approximately 5 minutes operation, when the internals are thoroughly wet. With the air movers still in operation, the fog nozzles should then be removed and loose scale dislodged with high-pressure water streams.

CAUTION: WHEN THIS METHOD IS EMPLOYED, THE WATER NOZZLES SHALL BE EARTHED

C 3 PLANT REINSTATEMENT

C3.1 General

The reinstatement of plant and equipment requires equal attention to planning and detail as the initial isolation. **Historical data shows that many incidents involving failure of an isolation occur during reinstatement.** Reinstatement of process plant is not complete until the section where containment was broken has been leak tested.

The reinstatement leak test is different from strength tests as required by Code, which are pressure/strength tests to prove the structural integrity of the system.

The purpose of reinstatement leak testing is to render the production equipment and piping systems safe for the introduction of hydrocarbon gases and liquids, and to create an auditable record to demonstrate the integrity of all hydrocarbon production systems.

For an an overview of the leak testing process refer to the SSOW for Leak Testing (Document No. UNIF-HSE-PRO-202-C2).

C3.2 De-isolation of Plant

C3.2.1 Integrity Checks

Prior to reinstatement, the integrity of any isolations associated with the removal of spades or other isolations devices should be reassessed to confirm that it is safe to proceed with the reinstatement work.

C3.2.2 Sequence of De-isolation

In some cases the sequence of de-isolating plant is critical and requires planning to ensure safe reinstatement.

C3.2.3 De-isolation of Non-manual Valves

Removal of a valved isolation does not necessarily involve any opening or closing of the valves, just the removal of locking devices and/or other immobilising equipment. Particular care should be taken with regard to electrically, pneumatically or hydraulically operated valves, which may open or close on reinstatement of the operating source/medium.

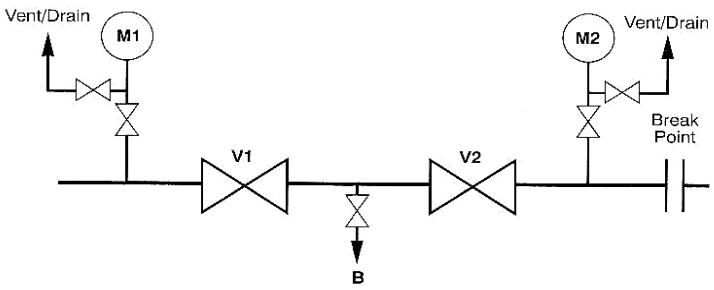
C3.2.4 De-isolation of Safety Critical Valves

Care must be taken to ensure that safety critical valves are returned to their correct position during de-isolation. These valves are registered as Locked Open (LO) or Locked Closed (LC) and each site holds a register which records the current position of all LO/LC valves. During de-isolation, these valves should be returned to their correct position for plant operation and the register updated accordingly.

APPENDIX D - TYPICAL VALVE ISOLATIONS INTEGRITY TESTS

Double Block and Bleed Isolation Integrity Test (Two Valves)

Diagram



Key

V1 - First (upstream) isolation valve from live system.

M1 - Live side-monitoring point (pressure gauge or vent/drain).

V2 - Second (downstream) isolation valve from live system.

M2 - Monitoring point between valves and break point (pressure gauge or vent/drain).

B - Bleed point between the isolation valves.

Procedure

1. If possible, ensure tapings at M1, M2 and B are not blocked and pressure gauges, where installed, are operating.
2. Close downstream valve V2 and secure in closed position.
3. Record pressure at monitoring points M1 and M2.
4. Vent/drain section of line to be broken and monitor at M2 until the pressure is near zero.
5. Close vent/drain at break point and monitor at M2 for a minimum of 10 minutes. No pressure build-up at M2 indicates the integrity of the downstream valve V2.
6. Close upstream valve V1 and secure in closed position.
7. Record pressure at M1 and B.
8. Vent/drain between V1 and V2 (B) and monitor at B until pressure is near zero.
9. Close vent/drain (B) and monitor at M1 and B for a minimum of 10 minutes. (No pressure build-up at B indicates integrity of upstream valve V1).
10. Leave vent/drain (B) in closed position to allow further monitoring.

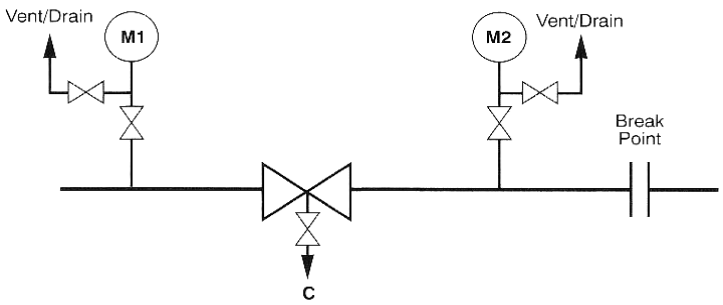
Isolation Summary

Both block valves are now closed and secured. The bleed valve is closed but not locked. It is possible for pressure to build up between the two block valves therefore regular monitoring of the isolation is essential; a suitable calibrated pressure gauge may be fitted to the vent to monitor for any pressure.

For further information refer to Section C1.2.2 Double Block and Bleed

Isolation Integrity Test (BP-Approved Double Sealed, Single Valve)

Diagram



Key

M1 - Live (upstream) side monitoring point.

M2 - Monitoring point between valve and break point (downstream).

C - Cavity drain (between seals).

Procedure

1. If possible, ensure tapings at M1, M2 and C are not blocked and pressure gauges, where installed, are operating.
2. Close isolation valve and secure in closed position.
3. Record pressure at M1, C (in cavity) and M2.
4. Vent/drain downstream section of line to be broken and monitor pressure at M2 until pressure is near zero.
5. Close vent/drain at break point and monitor at M2 and C for a minimum of 10 minutes. (No pressure build-up at M2 and no pressure fall-off at C indicates integrity of downstream seal.)
6. Record pressure at M1 and C.
7. Vent/drain off fluid in cavity (between seals) and monitor at C until the pressure is near zero.
8. Close cavity vent/drain (C) and monitor at M1 and C for a minimum of 10 minutes. (No pressure build-up at C indicates integrity of upstream seal).
9. Leave vent/drain C in closed position to allow further monitoring.

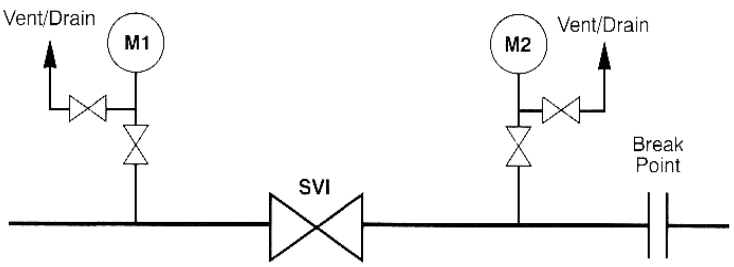
Isolation Summary

The double sealed, single block valve is now closed and secured. The bleed valve is closed but not locked. Any fluid passing through the upstream seal will be detected at the cavity drain C. Regular monitoring of the isolation is therefore essential and a suitable calibrated pressure gauge may be fitted to the vent to monitor the pressure.

For further information refer to Section C1.2.2 Double Block and Bleed

Single Valve Isolation Integrity Test

Diagram



Key

M1 - Live (upstream) side monitoring point.

M2 - Monitoring point between valve and break point (downstream).

Procedure

1. Ensure tapings at M1 and M2 are not blocked and pressure gauges, where installed, are operating.
2. Close isolation valve and secure in closed position.
3. Record pressure at M1 and M2.
4. Vent/drain downstream section of line to be broken into and monitor at M2 until pressure is near zero.
5. Close downstream vent/drain and monitor at M2 for a minimum of 10 minutes. (No pressure build-up at M2 indicates integrity of single valve.)
6. Leave downstream vent/drain at break point in closed position to allow further monitoring.

Isolation Summary

The single isolation valve is now closed and secured, and the downstream vent/drain is closed. Any fluid passing through the single valve seal would be monitored by means of the mandatory additional safeguards listed in Appendix B Table 1.

APPENDIX E - ENERGY ISOLATIONS FLOWCHART