A topic sheet prepared by © IRATA International (2018)

SAFETY AND HEALTH TOPIC SHEET NO. 17: ISOLATIONS

A safety and health 'topic sheet' aimed at raising awareness of hazards in the rope access industry. The series may be of use as a toolbox talk.

1 INTRODUCTION

1,1 Oil refineries, oil and gas production installations and chemical processing plants are typically characterised by long lengths of continuously welded pipework and pipelines connecting process vessels, plant and installations. The contents are often hazardous substances, which may be flammable and/or toxic and are often at high temperatures and/or pressures. These are referred to as 'containment hazards' (and sometimes as 'stored energy').

1.2 These production installations and process plants, as well as other buildings and facilities, may also include 'personal injury hazards' and 'non-process isolation hazards':

- Mechanical equipment;
- Electrical equipment (including process control systems);
- Hazardous atmospheres in confined spaces;
- Special hazards, e.g. radioactive sources and static electricity.

1.3 Other industries also rely on isolations, e.g. railways, renewable, power generation and distribution, etc., before rope access work can commence.

2 WHAT CAN GO WRONG …

2.1 Any intrusive activity can allow the escape of hazardous substances. The implementation of adequate isolation practices is critical to avoiding loss of containment.

2.2 Additionally, any inadvertent movement of machinery or sudden release of potential energy in mechanical, electrical or pressure form is a hazard to workers. Isolation from sources of energy is required.

Case studies
When working at height a rope access technician was killed when one leg of his twin-legged energy absorbing lanyard was severed by a passenger lift that had not been isolated. **Source:** IRATA Serious Incident Briefing No. 1, Fall from a height
During derrick inspection activities whilst using rope access both ropes of a team member were destroyed, caused by accidental activation of the derrick elevator (near miss). **Source:** IRATA Safety Bulletin No. 37

3 WHY THINGS CAN GO WRONG …

3.1 Reasons that things can go wrong include:

(a) Poor procedures - or lack of procedures - outlining a safe system of work (including a permit-to-work);
(b) Poor design and maintenance;
(c) Human factors;
(d) Lack of clarity over roles and responsibilities;
(e) A lack of training and competence (including a failure to recognise the risk and/or the consequences); and
(f) Poor monitoring, audit and review.

3.2 Release of hazardous substances due to inadequate process isolation may lead to:
(a) Local immediate effects to people (death or injury) and to the environment.
NOTE: Long-term effects to people and the environment may be equally serious.
(b) Escalation of the initial release, causing wider damage to plant and other systems, e.g. damage resulting in further releases of content.

3.3 Possible non-process hazards include:
(a) Electrical (e.g. live cables and electrical equipment);
(b) Mechanical (e.g. cranes, lifts, rails, fork lifts, machinery, racking, etc.);
(c) Process/pipework (e.g. hot pipes, venting, pressure releases, valve operations (emergency shut down), gas/steam releases, etc.);
(d) Safety systems (e.g. deluge, exhausts (from emergency standby), sirens (sudden noise), flares, etc.);
(e) Location (e.g. rocks, weather, etc.);
(f) Third party intrusions (e.g. vehicles, rock climbers, residents, trespass, welders above, etc.).

4 WHAT YOU CAN DO …

4.1 The basic principles for risk management are to:
(i) Avoid the hazard, wherever possible;
(ii) Carry out risk assessment to evaluate risks that cannot be avoided;
(iii) Take action to reduce risks to 'as low as reasonably practicable' levels (ALARP); and
(iv) Reduce risks at source, wherever possible.

4.2 It is important to follow any risk assessment, permit-to-work and safe work method statement.

5 HOW YOU CAN DO IT …

5.1 Hazards associated with mechanical machinery

5.1.1 You should (if suitably qualified):
(a) Isolate hydraulic, pneumatic and process powered machinery by closing the appropriate isolation valves. Prevent any possibility of machinery movement by disconnecting the power fluid supply and return pipes, or otherwise making safe.
(b) Isolate engine-driven machinery by shutting off the engine fuel supply and then isolating all the starting systems. For electrically driven machinery, switch off the power supply to the motor and ensure that the equipment is securely disconnected and separated from all sources of electrical energy.

5.1.2 Any residual mechanical, electrical or pressure energy which may be locked within any part of the machinery mechanism should be safely released:

Mechanical

- High and low speed rotating elements need to be run down and springs released.

Electrical

- Capacitors should be discharged and batteries disconnected and/or removed.

Hydraulic

- Accumulators and pressurised pipework should be depressurised.

Pneumatic

- The system should be depressurised. If valves could be operated by residual trapped air, the line should also be disconnected.

Services

- Steam, gas or fuel may need to be depressurised, vented, purged or drained.

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

5.2 Hazards associated with electrical equipment

5.2.1 Hazards to workers include electric shock, electrical burns, and electrical arcing resulting in the ignition of flammable gas, vapours or materials. The provision of a safe system of work is fundamental to the effective control of risks. Different advice applies to the isolation of high voltage electrical equipment from that of low voltage equipment.

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

5.2.3 Devices suitable for isolation include:

- Circuit breakers with the required contact separation and locking facilities;
- Disconnectors (commonly referred to as isolators) with locking facilities;
- Switch disconnectors with locking facilities;
- Plug and socket outlets;
- Fuse links; and
- Removable links.

5.2.4 ***In all case, whether high voltage or low voltage, you are advised strongly to seek advice from an electrical specialist.***

5.3 Hazards associated with entry into confined spaces

5.3.1 Entry into a confined space must be considered only where there is no reasonably practicable alternative way to carry out the work. Vessels, e.g. separators, tanks, reactors, distillation columns, etc., are the most obvious form of confined space, but sumps, pig launchers or work inside pipes or machinery modules can present the same dangers.

5.3.2 The hazards from entry include:

- Flammable or toxic vapours from process materials;
- Toxic vapours evolved from residues or their by-products (e.g. carbon monoxide may be evolved when a coking vessel is first opened to atmosphere);
- Asphyxiation from gases (e.g. nitrogen) used for inerting the confined space or adjacent areas;
- Oxygen depletion or enrichment;
- Carbon dioxide build-up; and
- Drowning by the ingress of liquid or free-flowing solid.

5.3.3 A very high standard of **positive isolation** should be achieved, by physical disconnection or the insertion of spades (for example).

5.3.4 You should eliminate or minimise 'hot work' wherever reasonably practicable. Any proposed site weld on or near process equipment should be justified by risk assessment. Where a system contains or has contained a flammable substance, isolation to carry out hot work such as welding or grinding will require additional precautions to mitigate against risks from residual material.

5.3.5 Consider the impact of hot work on any live systems in the vicinity of the worksite. You may need to isolate, depressurise and, if appropriate, drain any systems where hot work could cause fire or inadvertently breach containment of a hazardous fluid.

5.3.6 ***You are advised strongly to seek specialist advice on working in confined spaces.***

5.4 **Hazards associated with radioactive sources**

5.4.1 Radioactive sources are used for inspection and measurement purposes in various instruments. The source can normally be withdrawn into a shroud or housing in the instruments and this should be confirmed prior to carrying out nearby work by checking radiation dose rates. For extensive work, it may be necessary to remove the device to a secure source store to prevent it being damaged.

5.4.2 ***You are advised strongly to seek specialist advice. Local legislative requirements may apply.***

5.5 **Hazards associated with static electricity**

5.5.1 Vessel cleaning using high pressure water, solvent or steam jetting can create static electricity hazards.

5.5.2 ***You should seek advice on controlling the generation of electrostatic charges arising from jetting and other activities.***

6 ACTION

7.1 Review your management system's procedures for the safe isolation of plant and equipment.

7 REFERENCES

8.1 Further information can be found in:

(a) IRATA International code of practice for industrial rope access (Third edition, September 2016)[1]. Generic advice on isolations is given in:
- Part 2, 2.2.4.5, Risk assessment
- Part 3, Annex B, Safety method statements

(b) IRATA Topic Sheets:
- No. 10. Policy, procedures and permit to work
- No. 12, Hazard identification and risk assessment

(c) For a list of current (and past) 'safety communications' by IRATA, see www.irata.org

8 RECORD FORM

9.1 An example *Safety and Health Topic Sheet: Record Form* is given below. Members may have their own procedure(s) for recording briefings to technicians and others.

9 FURTHER READING

The safe isolation of plant and equipment, HSG253, HSE (2006)[2]

City & Guilds SCQF Level 5, Competence in safe isolation of process plant and equipment[3]

Electricity at Work Regulations 1989, Guidance on Regulations, HSR25, HSE (2015)[4]

Electricity at work: Safe working practices, HSG85, HSE (2013)[5]

Series of standards: BS EN 60947, Low-voltage switchgear and control gear

Work with ionising radiation, Ionising Radiations Regulations 1999, Approved Code of Practice and guidance, L121, HSE (2000)[6]

PD CLC/TR 50404:2003, Electrostatics - Code of practice for the avoidance of hazards due to static electricity, BSI[7]

Safe work in confined spaces, Confined Spaces Regulations 1997, Approved Code of Practice, Regulations and guidance, HSE (2014)[8]

Safe use of work equipment, Provision and Use of Work Equipment Regulations 1998, Approved Code of Practice and guidance, HSE (2014)[9]

1 https://irata.org/downloads/2055
2 www.hse.gov.uk/pubns/priced/hsg253.pdf
3 http://aset.co.uk/course/465
4 www.hse.gov.uk/pubns/priced/hsr25.pdf
5 www.hse.gov.uk/pubns/priced/hsg85.pdf
6 www.hse.gov.uk/pubns/priced/l121.pdf
7 http://shop.bsigroup.com/ProductDetail/?pid=000000000030089438
8 www.hse.gov.uk/pubns/priced/l101.pdf
9 www.hse.gov.uk/pubns/priced/l22.pdf

IRATA SAFETY AND HEALTH TOPIC SHEET – RECORD FORM			
Site:			
Date:			
Topic(s) for discussion:		Topic Sheet No. 17: Isolations	
Reason for talk:			
Start time:		**Finish time:**	
Attended by *Please sign to verify understanding of briefing*			
Print name:		**Signature:**	
Continue overleaf (where necessary)			
Matters raised by employees:		**Action taken as a result:**	
Continue overleaf (where necessary)			
Briefing leader *I confirm I have delivered this briefing and have questioned those attending on the topic discussed.*			
Print name:		**Signature:**	**Date:**
Comments:			