SAFETY BULLETIN NO. 44:
ROPE ACCESS MAIN ROPE FAILURE

A safety bulletin aimed at raising awareness of hazards in the rope access industry. The text may be of use as part of a toolbox talk.

DISCLAIMER:

*This safety bulletin - including, where given, any conclusions - is not as a result of any investigation undertaken by IRATA. It is based on information provided by a **non-member** company. IRATA does not attribute any blame; nor provide opinion on any root causes. Neither is any opinion expressed or implied on liability or culpability. The following summary is provided to assist others in applying any 'lessons learnt'. Rope access is defined in the IRATA ICOP, Part 1, 1.3, Definitions. In essence, it is a two-rope system (working line and safety line). For the purposes of this summary, any reference to 'on-rope' or 'off-rope' should be construed accordingly.*

1 INTRODUCTION

1.1 This safety bulletin summarises the findings of a main rope failure.

2 BACKGROUND INFORMATION

2.1 Date of incident: March 2017

2.2 Time of incident: 2.20pm

3 WHAT WENT WRONG …

3.1 **Task being performed when the incident occurred:**

A technician - undertaking non-destructive testing - was ascending a rope access system to reach their work area.

3.2 **Detail:**

3.2.1 A rope system was rigged by a Level 3 rope access technician over an insulated pipe, to establish a high-point deviation (sometimes known as an "up and over" directional). See **Figure 1**. Both the main rope and the safety rope were placed in a single, fabric rope protection sleeve to guard against rough and uneven surface hazards.

3.2.2 The technician ascended the ropes from ground-level. When the main rope was loaded, the system moved laterally such that it made contact with an exposed metal plug located on top of the insulated pipe.

NOTE: The surface temperature of the 1" diameter metal plug was found later to be approximately 550 degrees Fahrenheit (288 degrees Celsius).

3.2.3 Once the technician reached approximately 6 metres in elevation, the hot plug melted through both the rope protector (nylon/canvas) and the main rope to the point of failure. The technician fell approximately 1 metre until arrested by their back-up safety system. The technician immediately transferred body weight to the adjacent structure and, secured in position with an additional anchorage, waited until a new set of ropes were lowered into position.

3.2.4 After a safe descent was complete the team cleared the equipment, exited the unit, notified operations and stopped work.

3.2.5 An inspection of the damaged equipment involved showed that the main rope had melted through and the back-up safety rope had melted half through (approximately). See **Figure 2**.

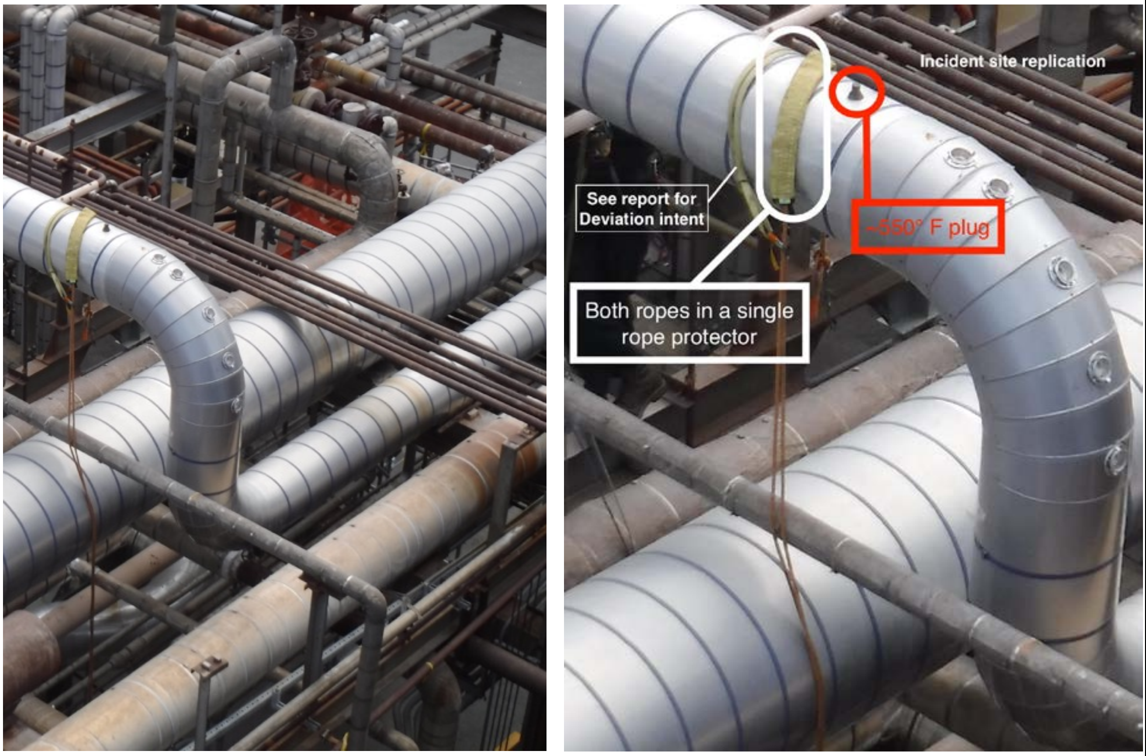

Figure 1: Recreation of the incident scene

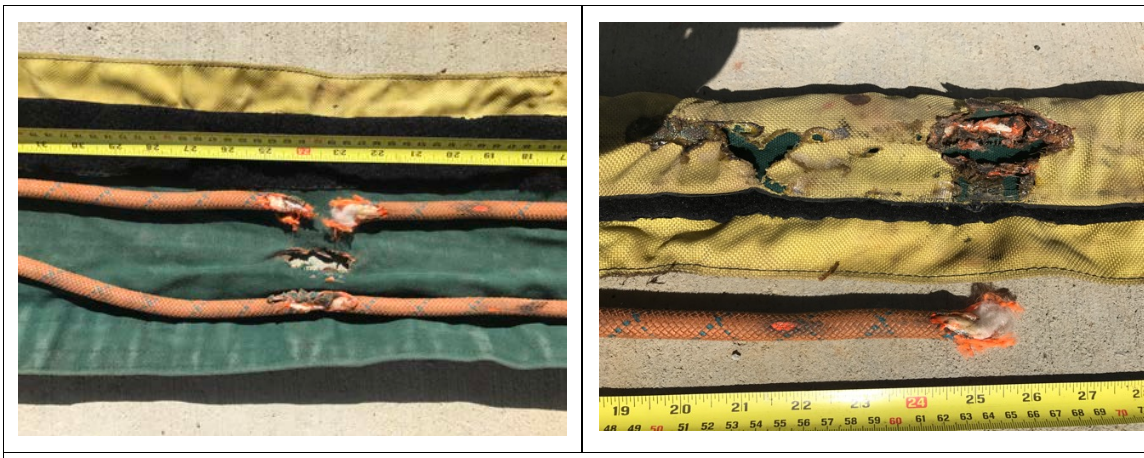

Figure 2: Damaged ropes and rope protector

3.3 **Effects of the incident**:

- The team members were shaken, even though no injuries were sustained.
- Rope access equipment was damaged.

3.4 **Actions taken immediately following the incident:**

- The unit's operations department were notified and work stopped.
- A safety 'stand-down' took place at the site and an investigation was initiated.
- The rope access teams reviewed the incident, discussed mitigating steps and returned to work.

4 PRIMARY AND CONTRIBUTORY FACTORS

4.1 **Primary causes of the incident:**

The primary causes identified were:

(a) Failure to identify the heated metal plug on top of the insulated pipe.

(i) Due to its location, the L3 technician did not observe the small and protruding hot metal plug.

(ii) The L3 technician knew the insulated pipe was hot. However, other temperature-related hazards were not identified in the risk assessment in sufficient detail, e.g. exposed metal elements.

(b) The decision to place both ropes in a single rope protector exposed both the main rope and the safety rope to the same hazard simultaneously.

(i) Rigging/anchor angles were a contributory factor. The L3 technician decided that one rope protector was sufficient for potential sharp edges, based solely on the insulation bands encasing the hot pipe. When the technician, below, weighted the system the rope protector caused both the main rope and the safety rope to slide into the unrecognized hot plug hazard.

(ii) The deviation (see **Figure 1**, right) was intended to guard against a different hazard (viz. rope travel over the large pipe's elbow) and, therefore, did not engage the rope system early enough to prevent contact with the hot metal plug.

4.2 **Contributory factors:**

Other contributory factors were:

(a) The L3 technician had extensive off-shore rope access experience, but was new to accessing high temperature piping in a refinery setting.

(b) There was no clear procedural guidance to verify the full rope path prior to clearing the system for technician use, particularly when rigging from above when technicians access the rope system from below.

(c) There was insufficient identification of high temperature hazards in the risk assessment the related job planning and pre-start briefings.

(d) There was no 'line of sight'.

5 CORRECTIVE ACTIONS

5.1 **Steps that would have prevented this incident from occurring in the first place:**

Steps identified were:

(a) Establish enhanced awareness of high temperature hazards, regardless of type, e.g. exposed hot plugs, flanges, valves, etc. Identify and review them as part of any risk assessment and job planning.

(b) Modify the company rope access procedures to highlight enhanced awareness of rope path.

(c) Inspect the full path of the rope system, including potential movement, once the ropes are weighted; or ensure that all hazards are identified and are suitably mitigated.

(d) Separate the main rope and safety rope, including rope protection, whenever possible to reduce the risk of concurrent damage or failure; reducing the risk of total system failure.

5.2 **What should be done to systematically prevent this type of incident in the future:**

(a) **Engineering:**

(i) If possible, cool hot elements before accessing the work area (Example: access process piping during shutdowns).

(b) **Administrative:**

(i) Seek to enhance project planning documents, including the risk assessment and permit-to-work, to take unique heat hazards into account further. Review findings with the site and project team as a key component of pre-job briefings.

(ii) Revise company rope access operational procedures and training protocols to emphasise the need to assess the complete rope path before authorisation is given to use the system.

(iii) Establish enhanced supervision and mentorship of new and/or short service employees who may not be adequately familiar with the job scope or work environment, regardless of prior experience elsewhere.

(c) **Work practice:**

(i) Technicians who are responsible for rigging should ensure that all critical hazards along the rope path are identified and addressed. This includes lateral movement of the system during work. Maintain 'line of site'.

(ii) Technicians should load the primary rope access system to check for movement at the anchorage(s) and rope protection, before committing to ascent or descent.

(iii) Teams accessing process piping should be equipped/utilise infrared temperature guns.

(iv) Work planning should consider the use of high-temperature ropes and/or rope protection solutions suitable to heat-related hazards, as well as wire slings.

(v) Confirm the temperature of the pipework with the plant operator.

(d) **Personal protective equipment:**

(i) Not a factor in this incident.

6 COMMENTS

6.1 The reporter states:

"… 75% of the rope system failed. The technician was possibly seconds away from taking approximately a 15' fall to the ground. The nearness of this near-miss cannot be overstated.

The amount of training and experience a rope access technician has accumulated does not substitute for job/site specific training, detailed project planning and a local mentoring process. These remarks are particularly true when a technician is new to the team, is exposed to new job scopes or is placed in unfamiliar work environments.

Note how these same conclusions are not unique to rope access. Instead, they can be applied to ***any*** *team member regardless of specialty particularly when working in safety sensitive and complex environments. …".*

6.2 IRATA notes that, where possible, deviations should be "engaged" with the working rope, rather than set up to 'catch' the ropes if they move.

7 FURTHER INFORMATION

7.1 Further information can be found in:

(a) IRATA International code of practice for industrial rope access (Third edition)[1]:
- Part 2, 2.7.10, Protectors for anchor line
- Part 2, 2.11.3, Use of anchor lines
- Part 3, Annex P, Recommended actions for the protection of anchor lines

(b) Training, Assessment and Certification Scheme (TACS) for personnel engaged in industrial rope access methods (Edition 3.1, October 2015)[2]
- 6.2.3.2.2, Hazard identification and risk assessment
- 6.4.1, Rigging
- 6.4.6, Hazard avoidance and rope protection
- 6.4.8, Deviations
- 6.6.12, Edge obstructions at the top

(c) IRATA Safety and Health Topic Sheets:
- No. 5, HS-085ENG, Safe rigging of rope access equipment
- No. 6, HS-086ENG, The protection of ropes

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

8 RECORD FORM

8.1 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.

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1 https://irata.org/downloads/2055
2 https://irata.org/downloads/2059

IRATA SAFETY BULLETIN – RECORD FORM					
Site:					
Date:					
Topic(s) for discussion:			Safety Bulletin No. 44: Rope access main rope failure		
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:					