

## IMCA Safety Flash 20/16

August 2016

These flashes summarise key safety matters and incidents, allowing wider dissemination of lessons learnt from them. The information below has been provided in good faith by members and should be reviewed individually by recipients, who will determine its relevance to their own operations.

The effectiveness of the IMCA safety flash system depends on receiving reports from members in order to pass on information and avoid repeat incidents. Please consider adding the IMCA secretariat ([imca@imca-int.com](mailto:imca@imca-int.com)) to your internal distribution list for safety alerts and/or manually submitting information on specific incidents you consider may be relevant. All information will be anonymised or sanitised, as appropriate.

A number of other organisations issue safety flashes and similar documents which may be of interest to IMCA members. Where these are particularly relevant, these may be summarised or highlighted here. Links to known relevant websites are provided at [www.imca-int.com/links](http://www.imca-int.com/links). Additional links should be submitted to [webmaster@imca-int.com](mailto:webmaster@imca-int.com)

Any actions, lessons learnt, recommendations and suggestions in IMCA safety flashes are generated by the submitting organisation. IMCA safety flashes provide, in good faith, safety information for the benefit of members and do not necessarily constitute IMCA guidance, nor represent the official view of the Association or its members.

### Summary – Diving Incidents

All the incidents in this safety flash relate to diving. The first and second incidents cover the unplanned or inappropriate release of divers' helmets. The third covers a differential pressure fatality. The fourth relates to the failure of links which in turn led to the loss of lift bags. The fifth, a near miss incident, relates to failure of umbilicals.

#### 1 Near Miss: Unintentional Release of Diving Helmet – Neck Dam/Helmet Securing Arrangements

A member reported a near miss incident during diving operations in which the neck dam and helmet separated whilst the diver was wearing a Kirby Morgan 37. The incident occurred in 9m water and there was minor water ingress into the helmet. The diver maintained vertical position, activated his free-flow and was recovered to the surface safely. The hat did not flood and communications between the diver and supervisor were maintained throughout. On his safe arrival to the surface, he was examined immediately by the on board doctor and pronounced well.

On notification of the incident, all diving activities were terminated and a full incident investigation by the diving contractor and the client was conducted. All personnel were brought ashore to be interviewed and video evidence was examined from both deck cameras and the divers helmet camera.



An investigation noted the following:

- ◆ Immediately after the incident the helmet was quarantined and inspected by qualified personnel;
- ◆ The helmet appeared to have no defects, structural damage or other identifiable issues which may have caused or contributed to the separation;
- ◆ Separation occurred via the mechanism designed for releasing the helmet from the neck dam;
- ◆ The certification of this particular helmet was valid in accordance with company standards;
- ◆ Pre-dive checks were logged and reported with video evidence available of them occurring;
- ◆ The investigation team concluded with the information available to them that the **root cause** of failure was human error. It appears that the tender did not fit the hat correctly to the diver during pre-dive checks.

The following lessons were learned:

- ◆ Stress the importance of a well-defined and highly detailed pre-dive call out checklist;

- ◆ Divers pre-water entry “call out” list to be repeated a *second* time and signed off by the diver’s tender and a competent second person;
- ◆ Helmet lock pins should be fitted with approved Kirby Morgan sleeves as an additional control;
- ◆ Duties and responsibilities for all personnel should be made clearly known by tool box talk on a “Dive by Dive” basis, i.e. each person is to know his exact emergency location in the event of a diving related in water emergency;
- ◆ In this case, owing to the distance between the diving launch and recovery systems, a swim line was placed between the two to allow the emergency/standby diver easier and quicker access to any stricken diver;
- ◆ Training around the risk of complacency should continue.

Members may wish to refer to the following incidents:

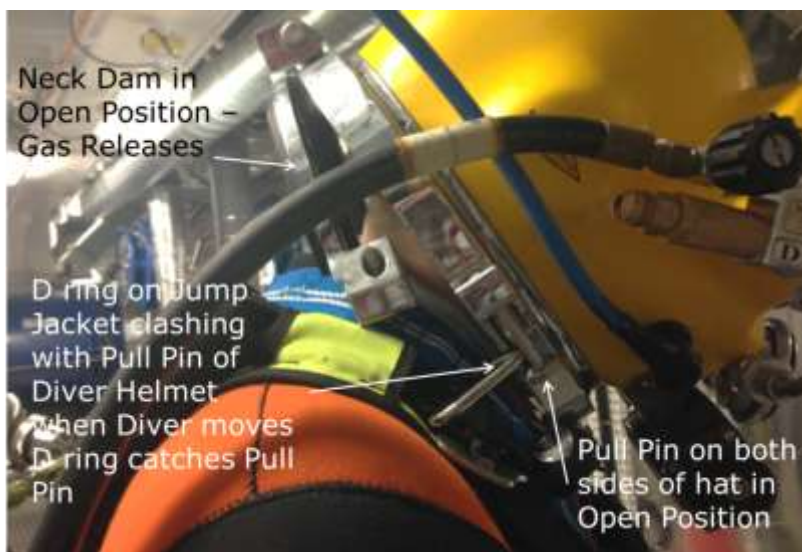
- ◆ [IMCA SF 12/03](#) – Incident 1 – *Near miss involving diver’s neck dam*;
- ◆ [IMCA SF 06/05](#) – Incident 3 – *Near miss: flooding of a diver’s helmet*;
- ◆ [IMCA SF 06/07](#) – Incident 2 – *Weld failure on Kirby Morgan KM17B 505-055 neck clamp*;
- ◆ [IMCA SF 02/11](#) – Incident 1 – *Kirby Morgan SL 17C partially detached from neck dam*;
- ◆ [IMCA SF 15/13](#) – Incident 4 – *Diving helmet: failure of sealed pull pin.*

## 2 Unintentional Release of Diving Helmet – Neck Dam/Helmet Securing Arrangements

A member reported two incidents in which there has been unintentional release between neck ring and helmet on a KM17C diving helmet during saturation diving operations. Members are encouraged to ensure that diving personnel are aware and that they check the interface between helmet and its securing arrangement towards other equipment supporting the diver. Working conditions could also give same results, e.g. working close to (taut) wires or large insertion bolts, etc.

Our member identified the following corrective actions:

- ◆ Verify that interface between helmet and other diving equipment is such that it cannot hook up the release mechanism;
- ◆ Be aware of the potential of release such that operational measures could be taken to prevent this;
- ◆ Report any further problems (with helmet and locking mechanisms) immediately.



*Incident details*

The manufacturer has developed a **Pull Pin Sleeve** which may also work to prevent this from recurring. See the Kirby Morgan website for more details: [www.kirbymorgan.com/support/bulletins/2012/bulletin-07-2012](http://www.kirbymorgan.com/support/bulletins/2012/bulletin-07-2012).



## Kirby Morgan Dive Systems, Inc.®

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### Part #525-112 Pull Pin Sleeve Kit

Part #	Description	Qty
550-232 (sold as 525-112 kit only)	Pull Pin Sleeve	2

**Tools Needed:**  $\frac{1}{4}$ " Hex Wrench     $\frac{1}{4}$ " Torque Wrench with Hex Attachment

#### Instructions:

**IMPORTANT:** Pull pins should be in the closed position when installing.

1. Using a  $\frac{1}{4}$ " hex wrench remove the pull pins (P/N 505-110), *fiberglass helmet shown at right.*



#### FOR STAINLESS STEEL HELMETS:

If the pull pins and sleeves will be installed onto a stainless steel helmet then the sleeves need to be trimmed at the trim line. No trimming is needed if the sleeves are used with pins on fiberglass helmets.

2. Slide pull pin sleeve (P/N 550-232) onto pull pins as shown, *untrimmed pull pin sleeve shown.*



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3. Reinstall pull pins with pull pin sleeves installed and torque the screws to 24 inch pounds for fiberglass helmets and 12 inch pounds for stainless steel helmets.

4. Check to make sure the sealed pull pins are functioning correctly.

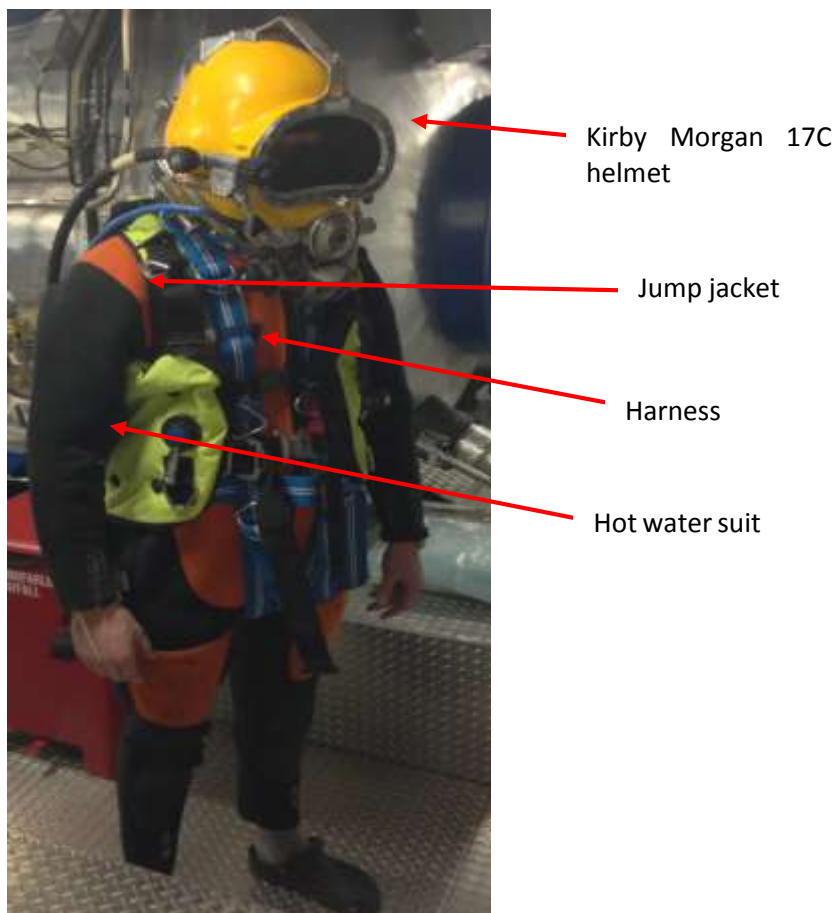
## ⚠ CAUTION

Use only KMDSI original replacement parts. The use of other manufacturers' parts will interfere with the performance characteristics of your life support equipment and may jeopardize your safety. Additionally, any substitutions will void any warranties offered by KMDSI. When ordering spares, always insist on Kirby Morgan Genuine Parts.

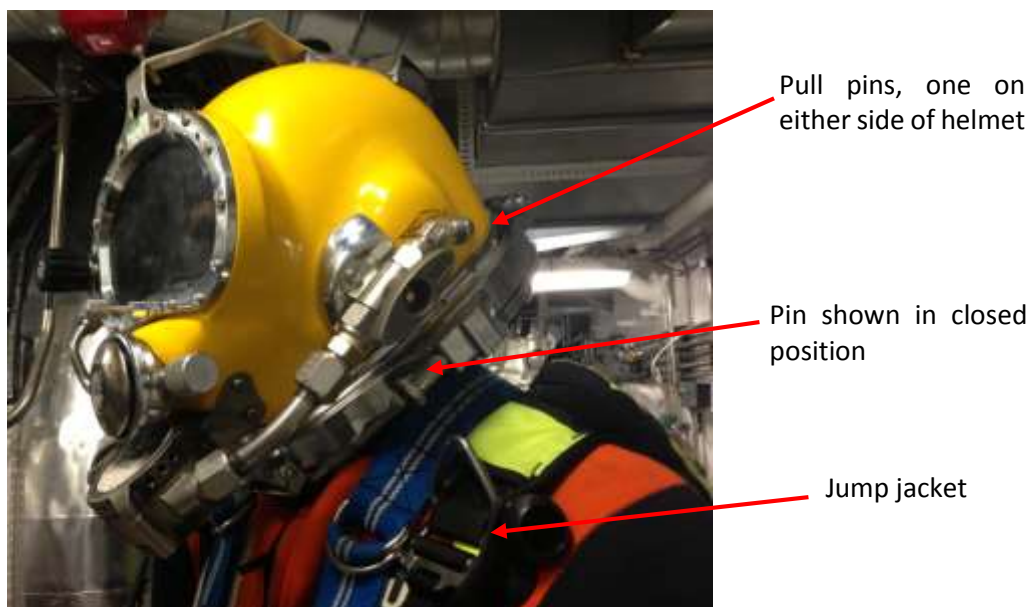




A series of photographs follows for illustrative purposes:



*Figure 1: Divers Equipment interfacing with harness and jump jacket*

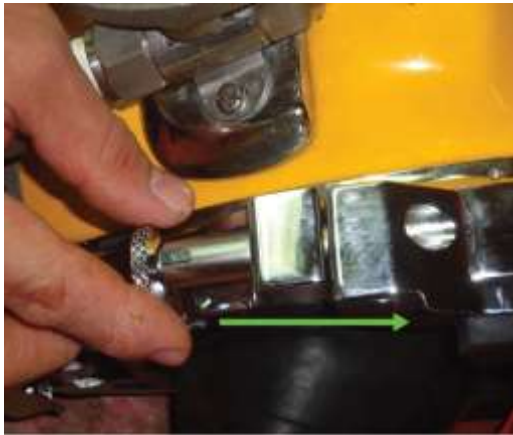


*Figure 2: Kirby Morgan 17C Divers Helmet with Jewel 601 Reclaim Hat*



*Clash between diver helmet Pull Pin and jump jacket*

### **Helmet/Neck Ring Pull Pin securing mechanism**



*Pull Pin shown in closed position*



*Pull Pin shown in open position*

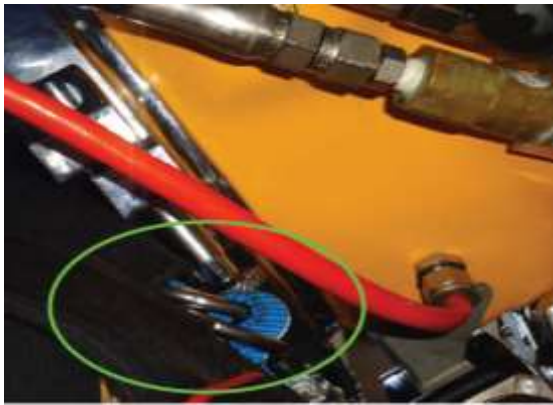
### **Evaluation of the bale-out system**



*Position of Helmet/Neck Ring Pull Pins in relation to divers harness with head in normal upright position*



*Position of Helmet/Neck Ring Pull Pins in relation to divers harness with head bent forward looking down*



*Position of Helmet/Neck ring Pull Pin in relation with Bailout/Jump jacket equipment with head bent forward looking down*

### 3 Fatal Diver Incident Due to Uncontrolled Differential Pressure

The International Association of Oil and gas Producers (IOGP) has published the following safety alert regarding a diving fatality which was caused by uncontrolled differential pressure. The incident occurred when the diver was preparing to blind off the torpedo pipe on the rig's pontoon. The torpedo pipe is a 0.45m diameter pipe running through the pontoon of the rig to allow for wires used when thrusters are to be replaced. The length of this pipe was 13m, with one lower valve 1m up from the bottom, and one upper valve 1.2 m from the top of the pipe. The valves were partly open to equalise the pipe.

A safety meeting had been conducted before work started, and this pipe was the seventh to be worked on. The diving was carried out following the NORSOK U-103 standard for inshore diving.

#### What Went Wrong?

When the diver introduced air into the pipe an artificial, undiscovered concrete plug on top of the upper valve broke and the divers head and left arm were sucked into the pipe causing great pain. The standby diver, being fully dressed, entered the water immediately (within 30 seconds) and the wounded diver was brought to the surface within 9 minutes. At the time he had stopped breathing, but his breathing and pulse were regained through CPR. The diver was sent to hospital where he died two days later.

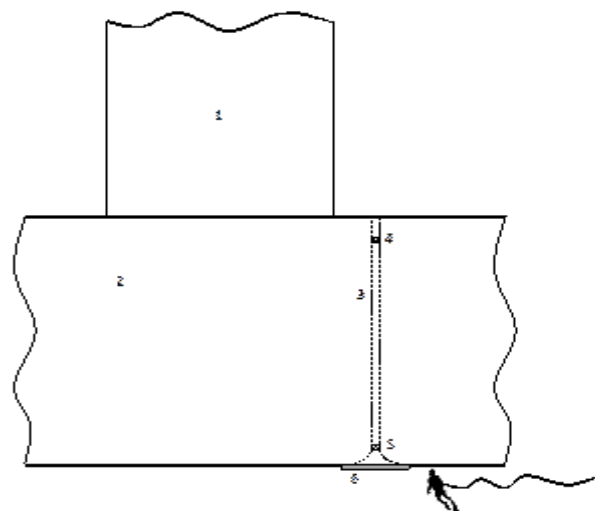
This fatal diving incident was due to uncontrolled differential pressure.

IOGP Safety Alert number 275 can be seen [here](#).

Members may wish to review the following similar incidents (search words: *differential, pressure*):

- ♦ [IMCA SF 14/11](#) – Incident 2 – *Identification of differential pressures subsea during diving operations*;
- ♦ [IMCA SF 06/14](#) – Incident 1 – *Fatality during air diving operations*.

*Figure 1. Schematic drawing of worksite.*



1. The column going up to the top of the rig
2. The port fwd side of the port pontoon
3. The torpedo pipe
4. The upper valve, approx. 1.2 m from top of pontoon
5. The lower valve, approx. 1m up from flat bottom
6. Cover used to seal the lower opening of the pipe

The following information will also be of use and interest:

- ♦ Association of Diving Contractors International (ADCI) video on the dangers of differential pressure: <http://videos.adc-int.org/dangers-of-delta-p;>
- ♦ UK Health & Safety Executive (UKHSE) Diving Information: *Sheet No 13 Differential pressure hazards in diving;*
- ♦ UKHSE research report: *RR761 Differential pressure hazards in diving.*

#### **4 Loss of 3 Tonne Lift Bags Owing to Equipment Failure**

A member has reported an incident in which links failed on a number of 3 tonne (closed, salvage type) lift bags. The incident occurred when the diver was filling lift bags during a saturation dive.

Diver 1 filled lift bag No. 2 and disconnected the air hose once the bag was fully inflated to prepare to move to the next lift bag, No.4. At this moment the No. 2 lift bag broke away from the connecting shackle on the webbing strap installed on the pipe-line. The event was clearly observed by both the diver and the Diving Supervisor. Diver 1 then also noticed that Lift Bag No. 3 was also missing. In the position where Lift bag No. 2 had been installed, the diver recovered the triangular lifting link which had failed. The link was recovered to the surface for inspection.

The vessel Master had observed the lift bag coming to the surface close to the air dive station and informed Saturation Dive Control that the starboard azimuth thruster had been stopped in order to prevent the bag from entering. The bag had drifted with the current towards the stern of the vessel and then disappeared from view. Dive Control were informed of the degraded status caused by the intentional stopping of one of the thrusters and the decision was taken to abort the dive. The divers were safely recovered to the bell.

Our member notes the following:

- ♦ The **primary cause** of the incident was the failure of the stainless steel lifting link;
- ♦ Had the diver or his umbilical not been clear, the results of the failure of the lifting link would have been catastrophic;
- ♦ It appears that this was caused by the failure of the material (stainless steel) of which the lifting link was made;
- ♦ The lift bags were new and each bag had a certificate;
- ♦ The safety factor recorded in the certificate is 6 times the normal operating load, i.e. 3 tonnes SWL with a safety factor of 6;
- ♦ Metallurgical analysis of the failed ring was conducted, and it was discovered that:
  - tests show it starting to fail at 10KN = 1 tonne – rather than 18 tonnes (3 tonnes SWL with a safety factor of 6) as in the certificate
  - the rings were bent and welded during production, which compromises strength significantly;
- ♦ The conclusion reached by our member is that the supplied lift bag certificates were counterfeit and the equipment supplied was incorrectly designed.

#### **Prevention:**

- ♦ After careful examination of the failed material, it was decided to condemn all of the remaining 3 tonne bags and before recovery of the remaining bags on the pipe-line, the ROV was used to puncture the bags so that divers could safely recover the deflated bags;



The broken lifting link is shown in the accompanying photos together with a link from another bag for comparison.



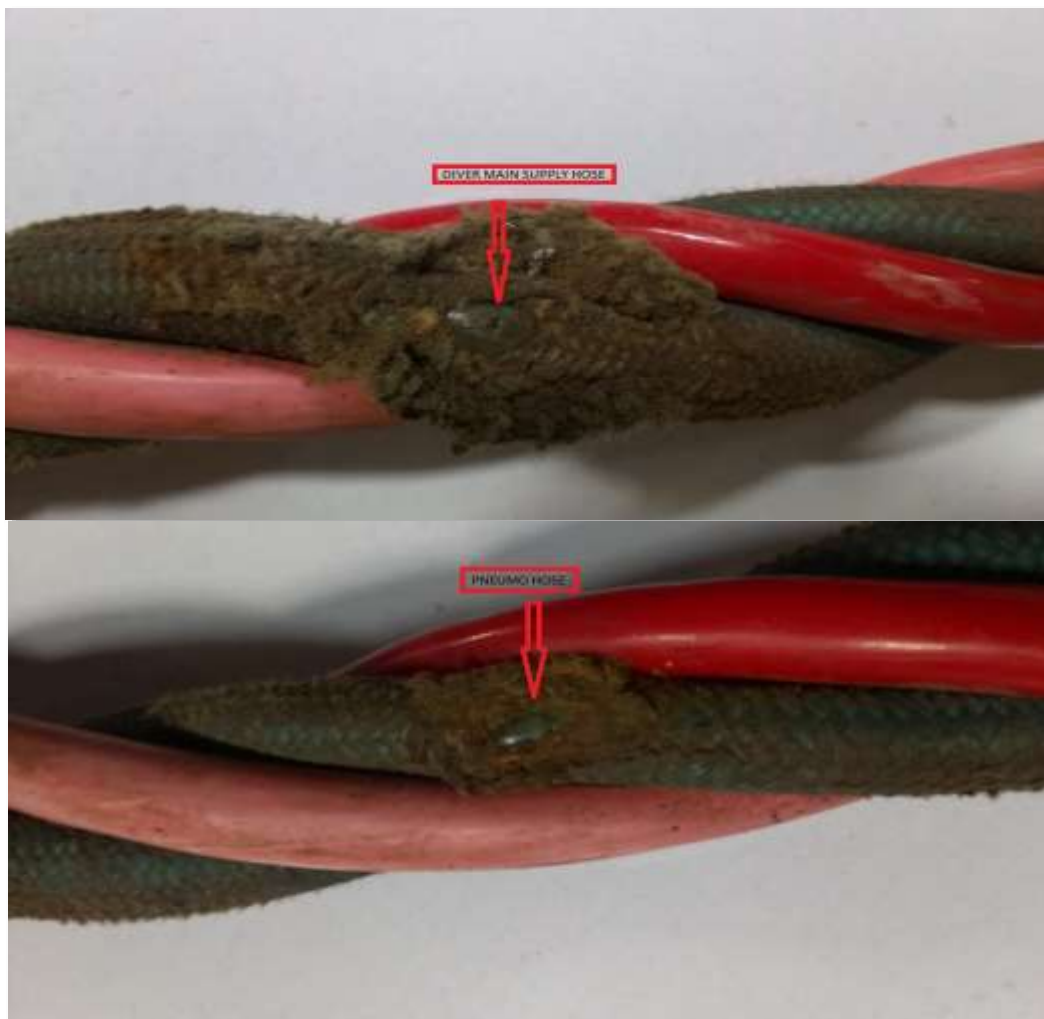
**Important Note:** The lift bags involved in this incident were not designed or manufactured by an IMCA member company.

IMCA members have recorded a number of incidents of unplanned release of lift bags to the surface but in all cases the cause was human error rather than equipment failure. Failure of lifting equipment, whether subsea or otherwise, through corrosion or other metallurgical issue is something that also arises from time to time.

## 5 Near Miss: Divers' Umbilical Rupture During Routine Maintenance

A member has reported a near miss incident in which a divers' umbilical ruptured. A dive system technician was doing routine pressure testing (following company planned maintenance schedules) on one of the divers' umbilical. As the umbilical was being brought up to testing pressure, the distinct sound of an air leak was heard. The dive technician stopped further pressurization and went to investigate the air leak.

Before the final test pressure could be reached the umbilical breathing hose ruptured at about 14 Bar pressure.



Our member's investigation noted the following:

- ◆ There was damage to the outer coating of the divers breathing hose at the area of the leak;
- ◆ The actual hose had some mechanical damage that may have contributed to the cause of the burst during the pressure test;
- ◆ The damage on the breathing hose was 80m from the diver's end. Since the damage was found 80 meters from the diver's end, the damage is likely to have occurred somewhere on the diving platform;
- ◆ The outer coating of the pneumo hose was damaged at the same location;
- ◆ The umbilical was part of a diving system that had just returned from a project and was undergoing a pressure test as per company procedures.

Our member noted that pressure testing should be carried out in a clearly marked designated area, and that all nearby personnel should be informed when a pressure test is to be carried out. Personnel conducting the test should be using the correct personal protective equipment (PPE). There should be close visual inspection of the umbilical for surface damage before the pressure testing starts – if any area is found to be damaged, the adjacent area should be cordoned off whilst pressure testing.

Our member reiterated the importance of safe umbilical handling and making efforts to keep the divers' umbilical safe from any damage even on the diving platform at all times.

Members may wish to refer to the following incident (search word: *umbilical*):

- ◆ [IMCA SF 05/16](#) – Incident 2 – *Near miss: fouled diver umbilical.*