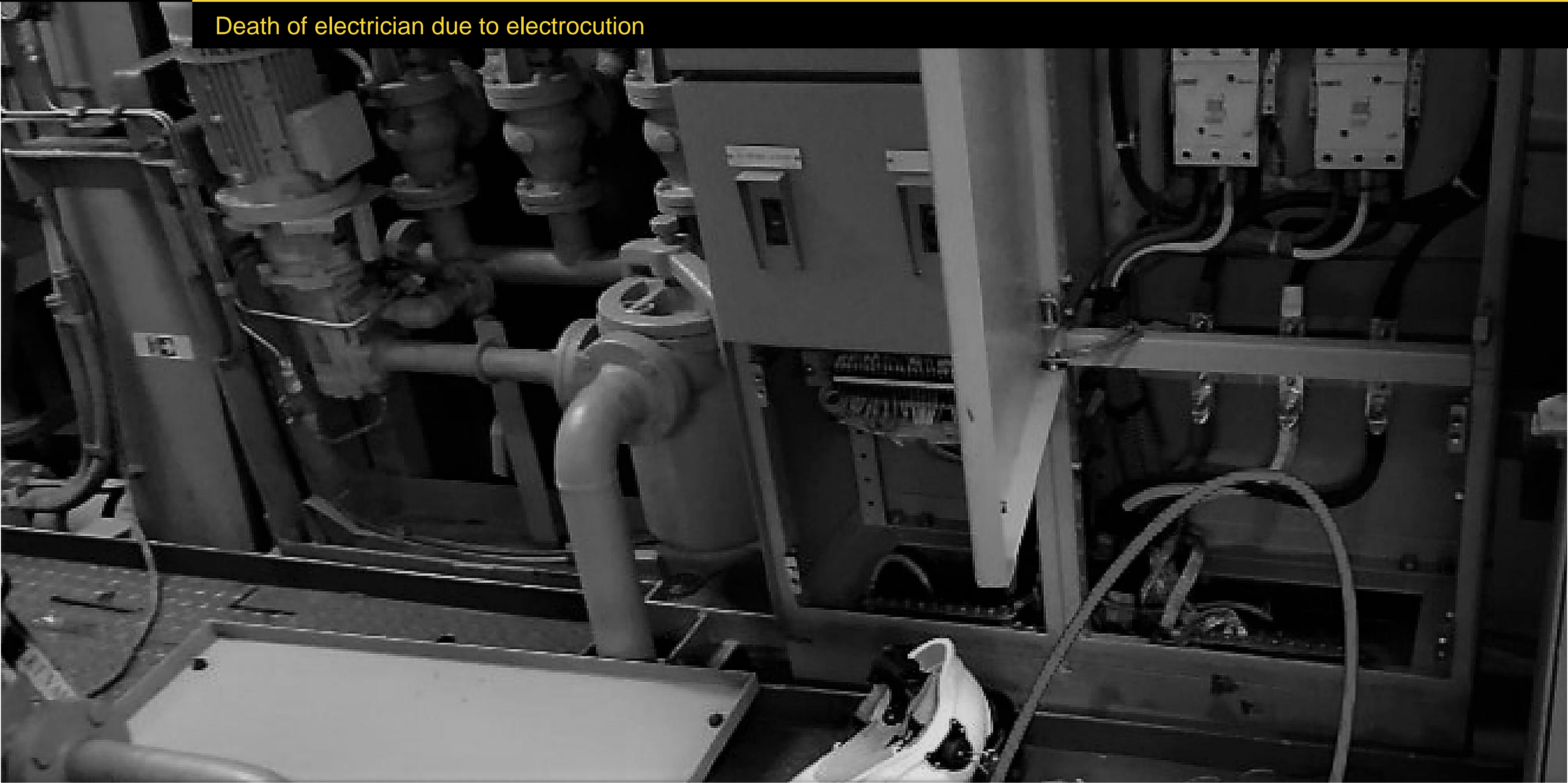


Death of electrician due to electrocution



Death of electrician due to electrocution

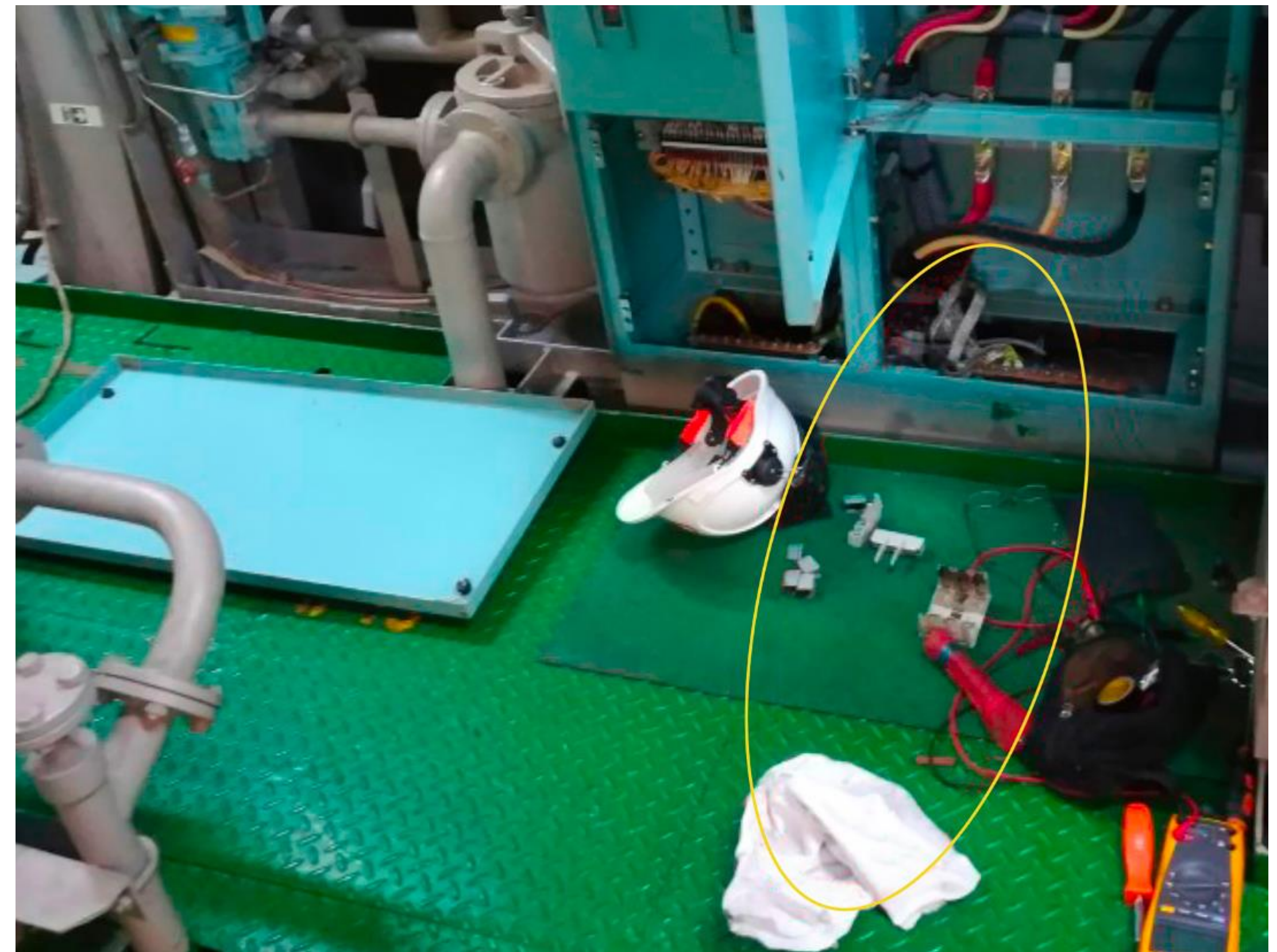
BACKGROUND

- **The ship, an oil tanker, was on passage. Before starting work in the morning on the day of the incident, the second engineer (2/E) held a Toolbox Talk to discuss the work planned for that day.**
- **The electrician mentioned he might work on the inert gas (IG) scrubber pump starter panel, but he did not specify the items to be completed, nor the timeframe for the work.**
- **No formal risk assessment, permit to work or Lock Out/Tag Out (LOTO) procedure were completed, although these were all specifically required by the Safety Management System (SMS).**
- **The IG scrubber pump starter panel was located on the engine room's bottom platform inside a local group starter panel (LGSP) cabinet.**
- **The LGSP cabinet had several sections: the upper sections held starter controls for various types of machinery, while the lower section contained the 440V power terminals. The pump starter panel door could only be opened after turning the main power breaker lever to the off position, which de-energized the equipment in the panel.**
- **Unlike other starter cabinets on the ship, the LGSP cabinet had no horizontal divider between the upper and lower section. Also the three power cable terminals in the lower section did not have covers over the power terminals to prevent accidental contact.**

Death of electrician due to electrocution

THE INCIDENT (continued)

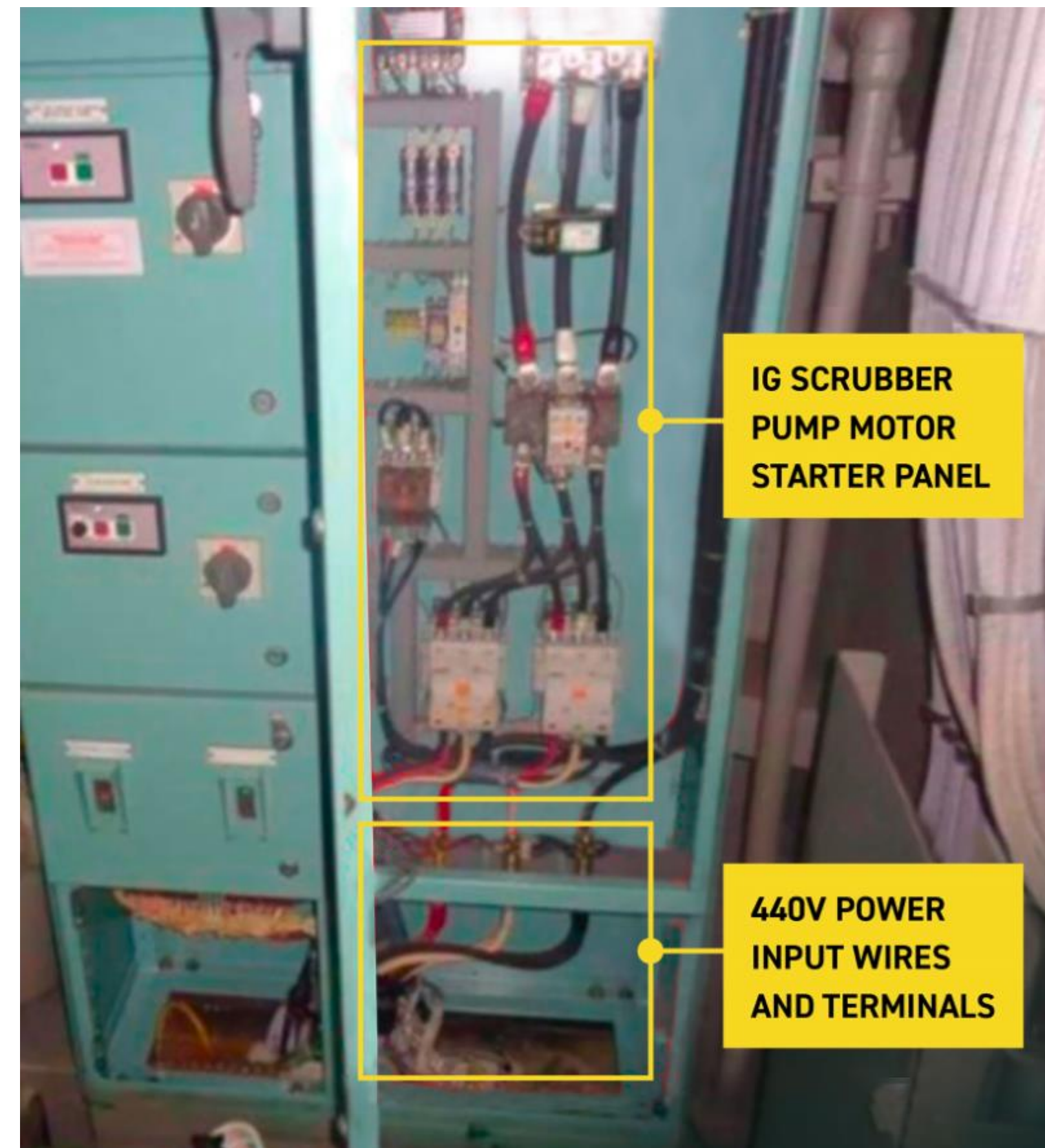
- At about 1130, the electrician told the engine cadet that he would be working on the IG scrubber pump starter panel.
- The cadet did not question the electrician about the work, nor did he tell any other engineering officer.
- At 1144, the engine control room (ECR) received a low 440V insulation alarm. The 2/E instructed the cadet to tell the electrician to investigate the cause.
- The cadet found the electrician unconscious, lying on the deck with his head and hands inside the lower section of the LGSP cabinet.



Death of electrician due to electrocution

THE INCIDENT

- The cadet then removed the electrician from the cabinet by pulling on his safety shoes.
- The cadet alerted the third engineer (3/E) and motorman working nearby. They moved the electrician further away, found he had no pulse and started cardiopulmonary resuscitation (CPR).
- A general alarm raised and emergency medical equipment brought to the scene. Despite continued CPR, the electrician could not be resuscitated.
- The ship diverted to a nearby port and the electrician was pronounced dead by shore medical personnel.



Death of electrician due to electrocution

THE INCIDENT

- The main circuit breaker inside the pump starter panel was found in the off (open) position.
- The star contactor for the pump starter was missing a spring and cover locking pin – they were found on the cabinet's lower framing and deck.
- The investigation presumed that the electrician inadvertently touched the energized 440V power terminals while retrieving the star contactor spring or the cover locking pin from the cabinet's lower section.



Death of electrician due to electrocution**REFLECTIVE LEARNING**

The questions below are intended to be used to help review the incident case study either individually or in small groups:

- **What do you believe was the immediate cause of the incident?**
- **What other factors do you think contributed to the incident?**
- **What do you believe were the barriers that should have prevented this incident from occurring?**
- **Why do you think these barriers might not have been effective on this occasion?**
- **What should the electrician have done to recover the dropped contactor spring and cover locking pin?**
- **What specific actions does your company's Permit to Work require should be taken before working on electrical systems? How far in advance of a planned task does your company's Permit to Work have to be completed by?**
- **What should the second engineer and cadet have done when the electrician mentioned that he was intending to work on the starter panel on the day of the incident?**
- **What should the cadet have done when he discovered the electrician lying on deck by the starter panel cabinet?**

Death of electrician due to electrocution

LESSONS LEARNED

The following lessons learned have been identified based on the available information in the investigation report and are not intended to apportion blame on the individuals or company involved:

- **Adherence to safe work procedures** – If completed prior to the work being undertaken, the existing processes required by the Company's SMS would have acted as safety barriers to prevent this incident: a formal risk assessment, a Permit to Work (PTW), Lock Out/Tag Out (LOTO) procedures and a Toolbox Talk.
- **Clear communication** – A clear communication between the 2/E and the electrician regarding the work plan would assist in identifying and completing the necessary safety procedures before the work began.
- **Permit to Work** – Completing the PTW would have resulted in implementing LOTO procedures (which was a key condition of a permit) and de-energizing circuits and equipment in and around the work area.
- **Working alone** – The presence of another crew member, as required by PTW, could have resulted in an appropriate challenge and stopped the unsafe work.
- **Stop Work Authority (SWA)** – A number of team members had the opportunity and obligation to stop the electrician from undertaking the task, but did not act. If used appropriately, the SWA would have resulted in stopping the unsafe act.
- **Physical barriers / electrical equipment protection** – If the cabinet had a similar section divider and terminal guarding as all other starter cabinets, it could have prevented this incident from occurring.

Death of electrician due to electrocution

<u>HIERARCHY OF BARRIER CONTROLS</u>		EXAMPLES OF POSSIBLE RISK MITIGATION CONTROL MEASURES RELATED TO THE CASE STUDY
MOST EFFECTIVE	ELIMINATE THE HAZARD	ENSURE system being worked on is de-energised and secured. DESIGN of cabinet door covers to ensure they can only be opened after power lever is turned to off position.
	SUBSTITUTE THE HAZARD	USE of protective devices, if permitted by function and design.
	ISOLATE THE HAZARD	PHYSICAL CONTROLS/BARRIERS GUARDING for 440V power terminals. PHYSICAL BARRIER between upper (starter panel) and lower (440-V terminals) sections of cabinet.
	INFLUENCE BEHAVIOURS	ADMINISTRATIVE CONTROLS/BARRIERS PERMIT TO WORK including Toolbox Talk, Job Hazard Analysis. LOCK OUT/TAG OUT (LOTO). WARNING SIGN on lower cover (440V terminals).
	PROTECT	BEHAVIOURAL/SKILL CONTROLS/BARRIERS TRAINING in electrical safety hazards. STOP WORK AUTHORITY system. SECOND PERSON in attendance.
LEAST EFFECTIVE	PPE CONTROLS	USE of appropriate shock PPE (eg. insulated gloves, footwear, no metal fittings on clothing/footwear, tools.) PROVISION of a dry insulating mat.

The suggested barriers/controls above are provided to help generate reflective discussions, and should not be considered as conclusive/definitive or comprehensive for the provided case study. The risk and control measures relating to any similar scenario or activity must always be appropriately assessed based on the specific onboard arrangement and circumstances.

Death of electrician due to electrocution

CONCLUSIONS

This fatality could have been prevented if the existing safety processes and barriers were fully implemented, adhered to and monitored as part of the SMS.

If deviations from the process occur and are not immediately rectified, it may create a level of acceptance which in turn may result in the lack of an appropriate challenge when due.

An effective onboard safety culture should result in invoking the SWA whenever an unsafe behaviour or condition occurs. The use of SWA should be encouraged and supported.

A short, job-specific Toolbox Talk immediately prior to commencing work should reflect on the findings of the JHA to ensure that everyone involved is focused on achieving the task safely. Using Toolbox Talk to plan for a whole day may result in personnel moving from one task to another without another opportunity to identify any unaddressed hazards, which may arise as a result of events and interactions throughout the day.

A lack of clear communication was identified as one of the causal factors. Effective communication is a skill that needs to be practised daily. Safety-critical information should be acknowledged, understood and clarified if necessary. Ambiguity leads to making assumptions and may have a significant impact on safety.

Death of electrician due to electrocution

QUESTIONS