

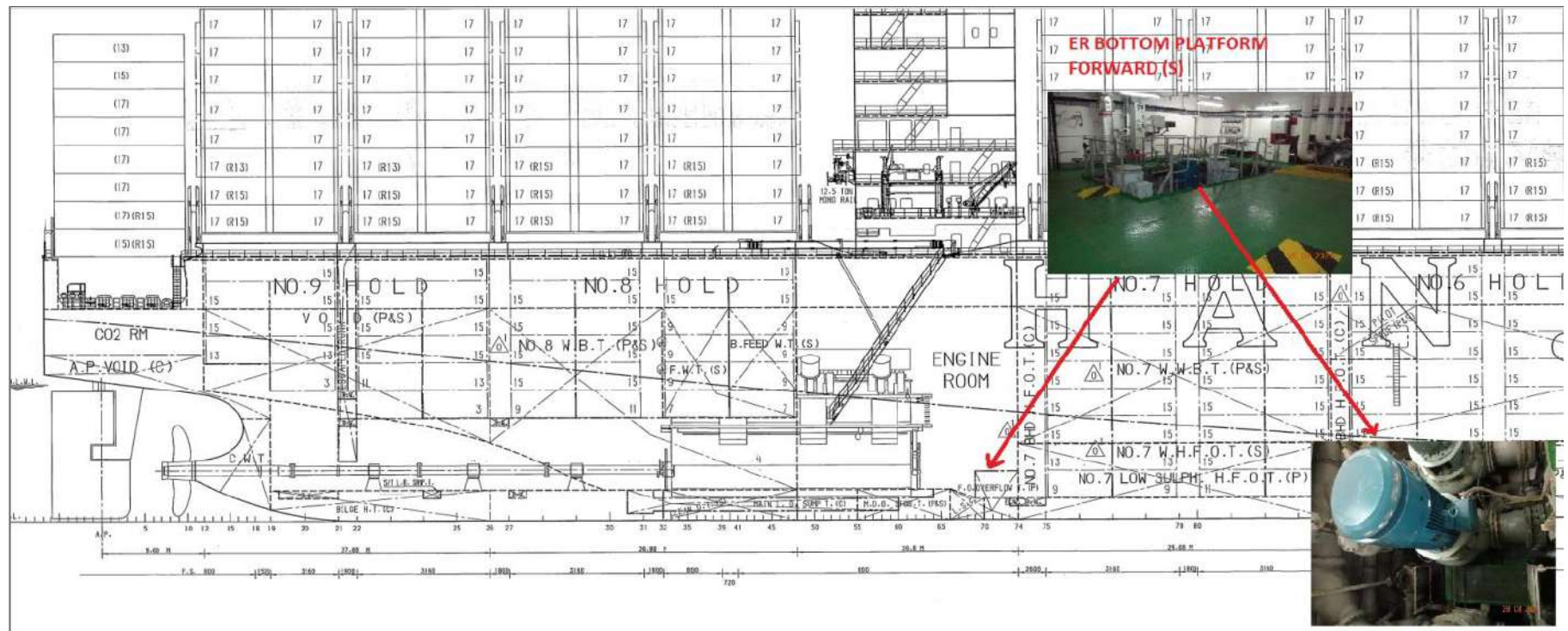
Koi

Fatality due to Electrocution

The Case



Vessel was en route from Jeddah to Tangier after crossing Suez Canal, northbound. During the reconnection work of electrical cables on the Main Cooling Sea Water Pump No. 2, Electrical Officer sustained electrical shock. He was administered CPR, and later air evacuated with assistance from Hellenic Coast Guard, Greece. He was declared dead on arrival at Heraklion hospital.



The work plan

On 16th Aug 1300 hrs, a toolbox meeting was done in ECR where the planned work for reconnecting cables to the electric motor of Main Cooling Sea Water Pump no.2 was discussed. The meeting was attended by E/O, C/E, 2/E and Wiper1. Electrical Work Permit PTW-06 was issued by 2/E at 1320



Two fuses of the circuit were removed



Main breaker was confirmed to be switched off and locked out.

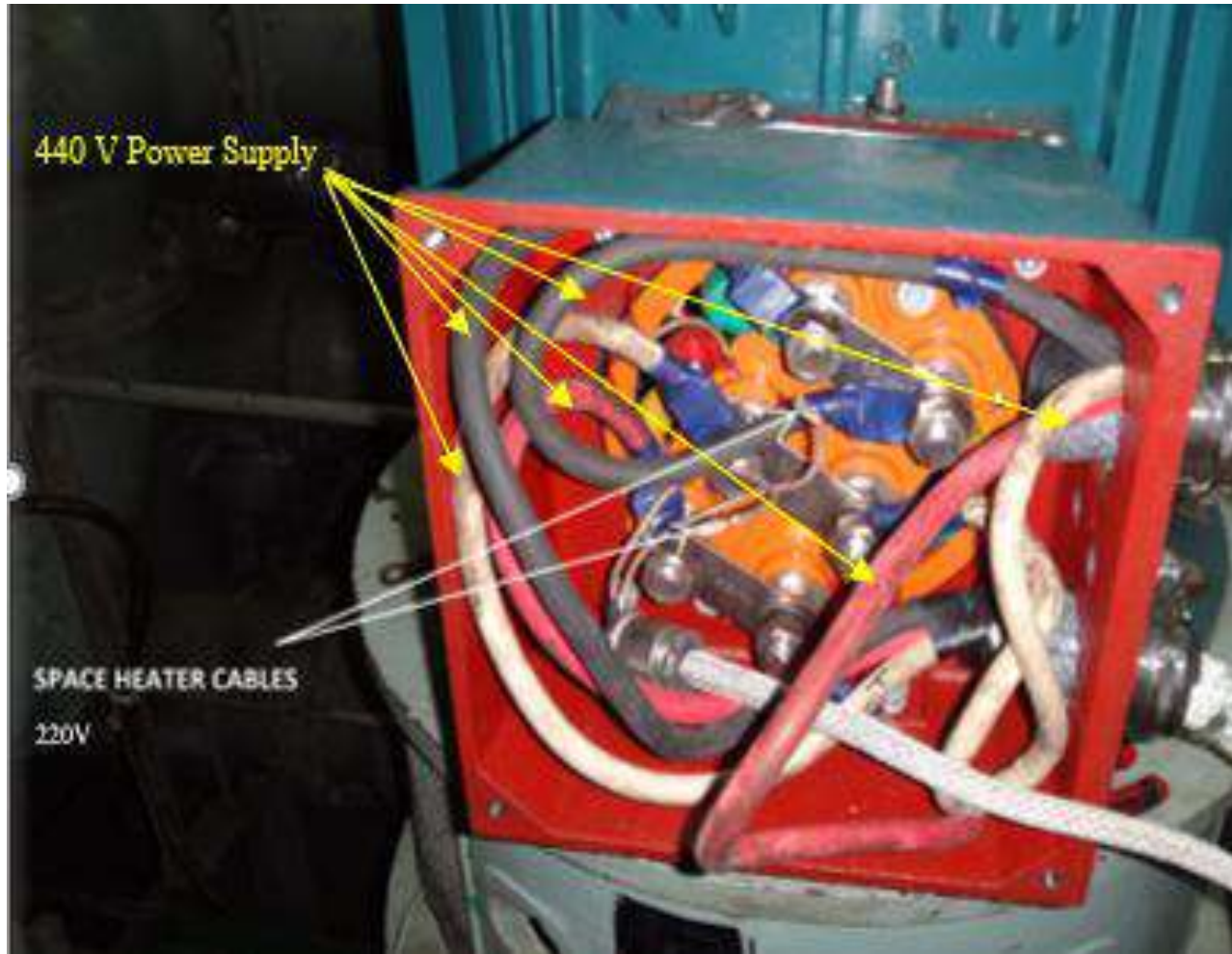


Location of the incident!

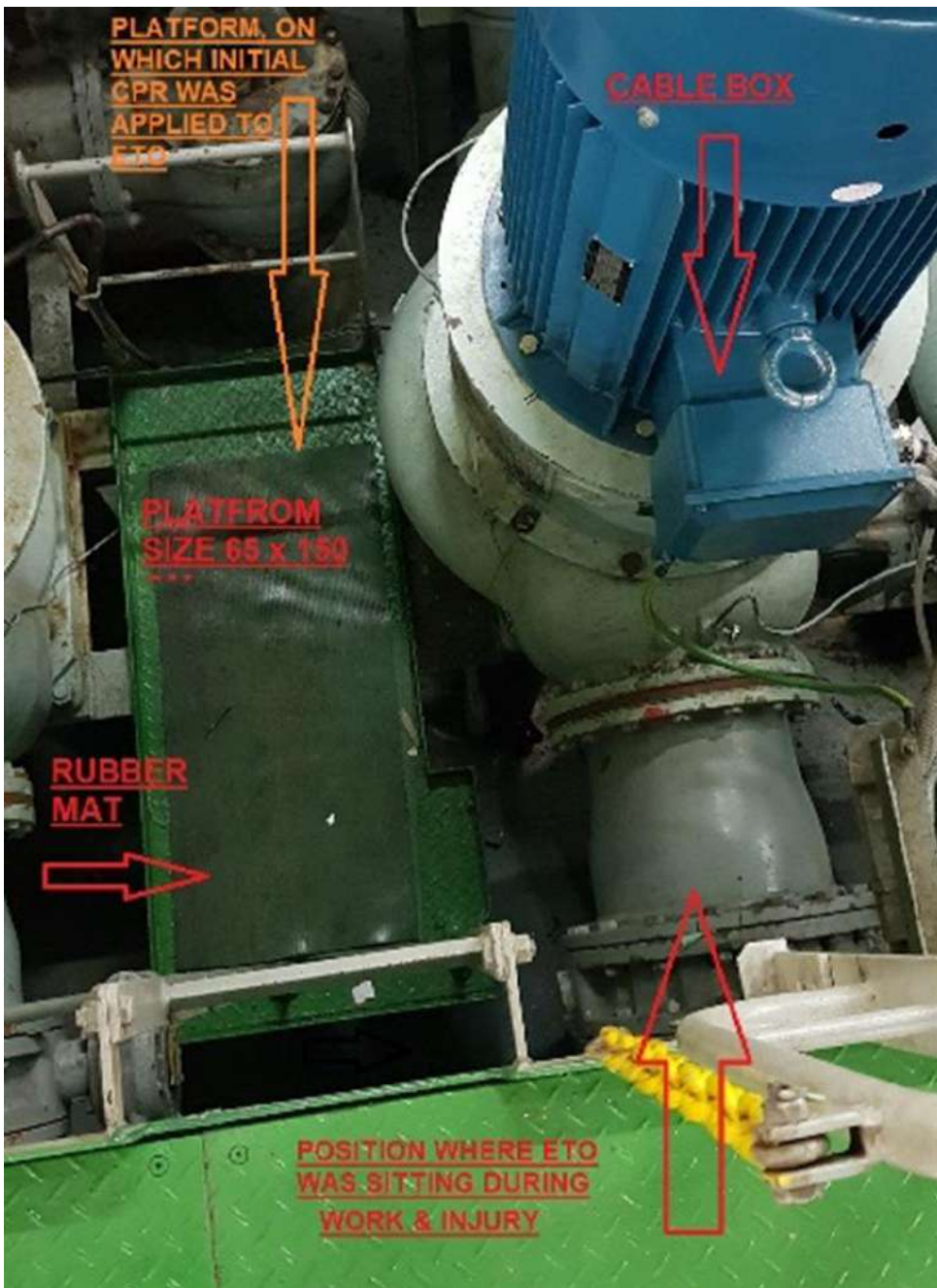
After the toolbox meeting, the Electrical Officer Wiper1 proceeded to carry out the job of connecting the power cables of the motor of the Main Sea Water Pump.

To carry out the connections, the Electrical Officer was sitting on the steel pipe (shown in the picture). **Note: The faulty motor was removed by the previous Electrical Officer a few months back.**

How did the electrocution happen?



Around 1455 LT:
Electrical Officer, sitting on the steel pipe completed connecting the connected the main power cables of the motor (440V) and was in process of connecting the power cables of the space heater (220 V) when he got electrocuted.



The Wiper1 managed to pull the cable from ETO's hand and tried to revive him, but ETO was still unconscious.

Wiper1 rushed to the ECR and informed the C/E and 2/E

C/E, 2/E and Wiper1 arrived on site and found ETO unconscious, and no breathing/pulse was noticed.

They immediately started CPR to the ETO on the pump stack platform (platform located toward the port side of the Main Sea Water Pump No.2).

1510 LT: Casualty shifted from pump stack platform (dimensions 150 cm x 65 cm), where it was difficult to attend to casualty, to a more open space on the Engine Room bottom platform to continue CPR efforts.

The vessel frequently contacted 3 Cube remote medical services for guidance while the efforts were being made to arrange for evacuation.

Medication was administered as per radio medical advice, but the casualty did not show any signs of recovery.

1550LT: Casualty transferred to the Engine Control Room on a stretcher, and the crew continued administering CPR and oxygen resuscitation.

1654LT: The casualty shifted to the ship's hospital and was given oxygen resuscitation using the 40-litre oxygen resuscitator

Medical evacuation



Vessel contacted RCC Alexandria, Medico Israel, RCC Greece and a deviation was made towards Kalilimenes (Greece) where the casualty was evacuated around 2048 hrs.

At the hospital, Electrical Officer was declared dead on arrival.



Mediterranean RCC Zone chart -Approximate position of the vessel at the time of the incident.

Electrical Circuit



VFD (Variable frequency drive) system was installed for the motors of the Sea Water pumps. (The modification was done before the vessel came into AESM management)

Originally the 230 V power supply to the space heater of each pump was through a step-down transformer tapped from the main 440V supply line of that particular pump

As per the modified electrical circuit, the main power for the seawater cooling pumps can be switched off for each pump individually by means of individual breakers in the ECR, but even with the main breaker in the ECR switched off, the control panel of that pump would be still 'live' with 230V.

This 230V power supply provides power to the

- Motor space heaters (one for each pump),
- Panel cooling fans (two for each pump) and
- Control circuits (one for each pump).

Electrical Circuit



On the frequency drives panel, there is (for each of the three pumps) a switch to cut off the power to the space heater. This switch is a single-pole switch which means the heater is switched off but there is still power on one of the two wires to the heater.

In this case, the voltage measured between cables will be zero, but the Voltage measurement between one of the cables and the ground will not be zero.

The 230V power supply could only be completely switched off by switching off either of the two breakers present in series, one at the 230V feeder panel in the ECR and the other at the frequency drive panel.

If one of these two breakers is switched off, all power to the control panels is switched off. This also means that in this case, none of the three main seawater cooling pumps can be operated (a black-out would occur shortly).

What went wrong!



- It is presumed that a careful check to ensure none of the wires is live was not carried out.
- Even though ETO was wearing rubber-soled shoes, he was seated on a pipe without using any insulation mat, which completed the electrical circuit when he touched the wires
- As per the Maker's drawing, putting off the main circuit breaker should have made all supply cables dead, but modification in the circuit was carried at the time of installing VFD, while the vessel was under previous management. This change was not present in the drawing kept at the control panel of the MSWP. Possibly, this detail was missed by the Electrical Officer when checking the drawing.
- At the frequency drive panel, a single-pole isolation switch was installed instead of a two-pole switch, which would have prevented power on both the cables of the space heaters.



Preventive actions

- Ships drawings were amended as per the changes in the circuit, these amended drawings were kept at the main circuit breaker and starter panels of the pumps. Obsolete drawings were removed from all locations and destroyed.
- 220V auxiliary power supply for each of the three seawater pumps was provided directly from their 440V individual breaker supply in the ECR. For this solution, an additional step-down transformer, 440V to 220V, was installed after the main breaker for each pump. The auxiliary power for each pump was then taken from its transformer. Hence, only one switch is to be turned off to stop the main power supply and the auxiliary power supply.
- Electrical Isolation permit and the isolation sections of other permits amended to include the following points:
 1. Has there been any modification of equipment wiring? If “Yes” is the latest drawing available.
 2. Non conducting material placed at the worksite to ensure that circuit with the earth is not completed. (such as insulation mat)



Thank you