JACK BATES

INCIDENT PRESENTATION

SERIOUS NEAR HIT

“Drawworks Disc Brake System Failure”

(November 27th, 2007)

Presented by: Lindy Fullwood

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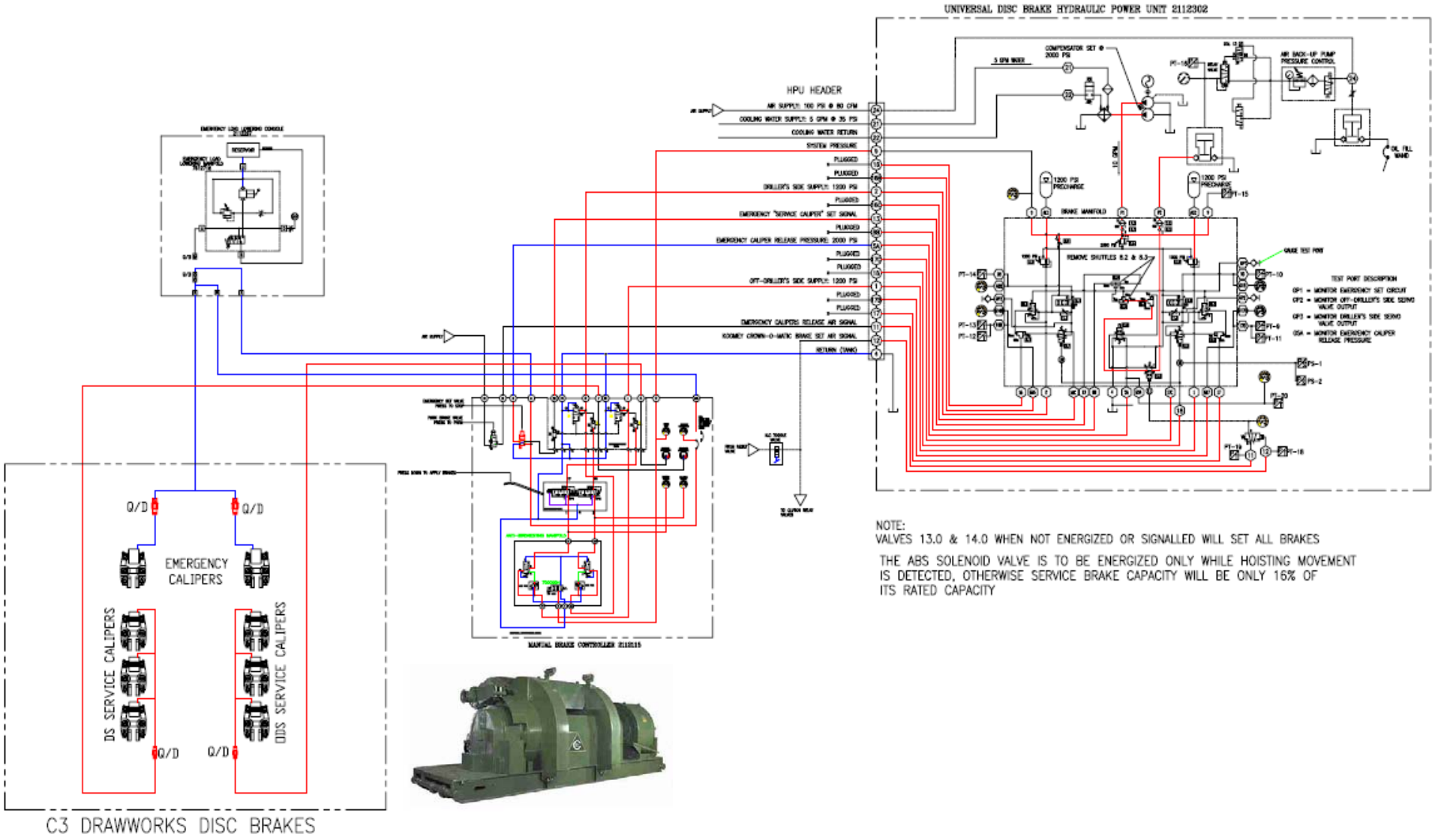
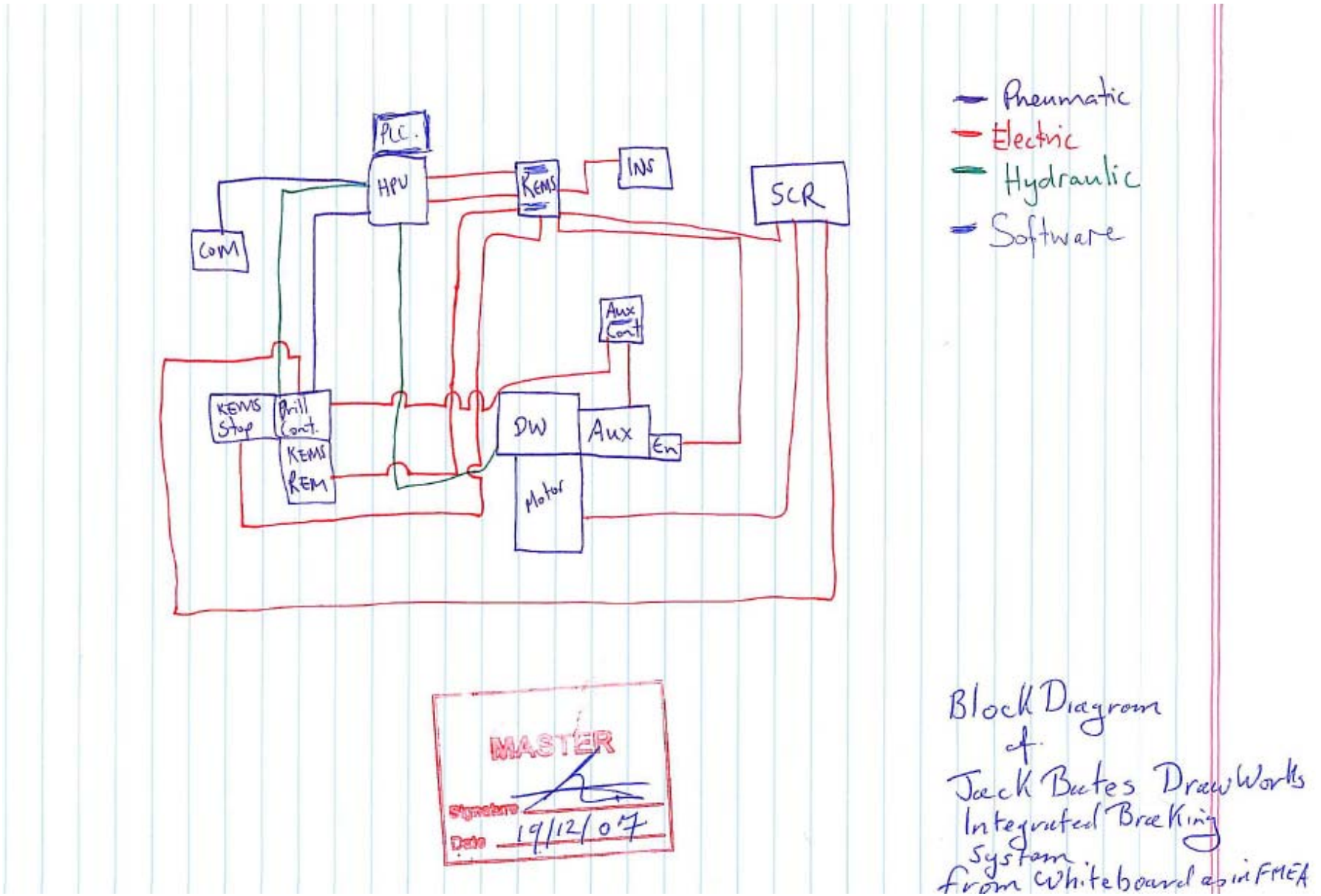
Drawworks Braking System Description



Drawworks Braking System Description



The Event – What Happened?

- The BOP was being recovered after malfunction on yellow pod (i.e. Riser double and BOP left to recover)
- Crown-o-matic (COM) was tripped
- The Toolpusher (relieving driller for lunch break) engaged the parking brake and left the driller's shack to move the toggle and reset the COM
- The TP returned to driller's shack and resumed lifting the BOP, OIM made presence at Drillers shack to observe operations
- After approximately 2 feet, KEMS activated
- Upon activation of the KEMS, the TP applied the manual brake

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The Event – What Happened? (cont.)

- The TDS began to descend towards the rotary
- The TP actioned the emergency stop buttons (clarified as parking brake and emergency brake)
- The TDS continued to descend toward the rotary
- The Elmago brake and manual brake were engaged again
- The OIM engaged the drawworks clutch
- The TDS continued to descend toward the rotary
- The TP and OIM took action to evacuate the driller's shack prior to the TDS striking the gimbal

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The Consequences

- **The TDS impacted the spider gimbal and stopped, suspending the load with the riser double below the rotary table and BOP beneath the surface of the water. The dead end of the drill line had been pulled from the drawworks drum, traveled around the crown fast-line sheave and fell to the traveling block which was resting above the TDS and Compensator.**

- **One Floorman sustained a minor First Aid injury while taking evasive action.**

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Post Incident Photos

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Post Incident Photos (cont.)

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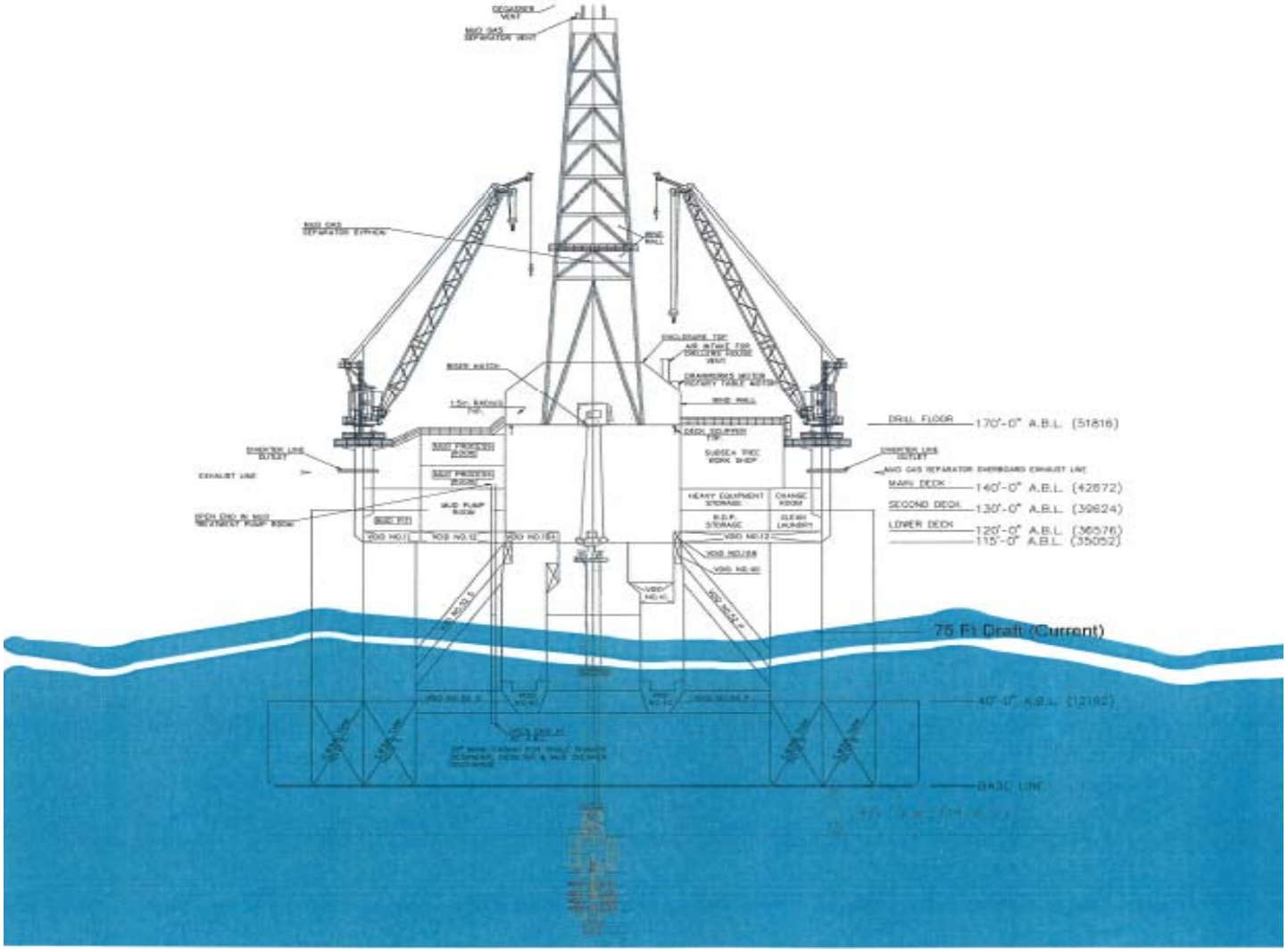
Schematic of position of BOP post incident



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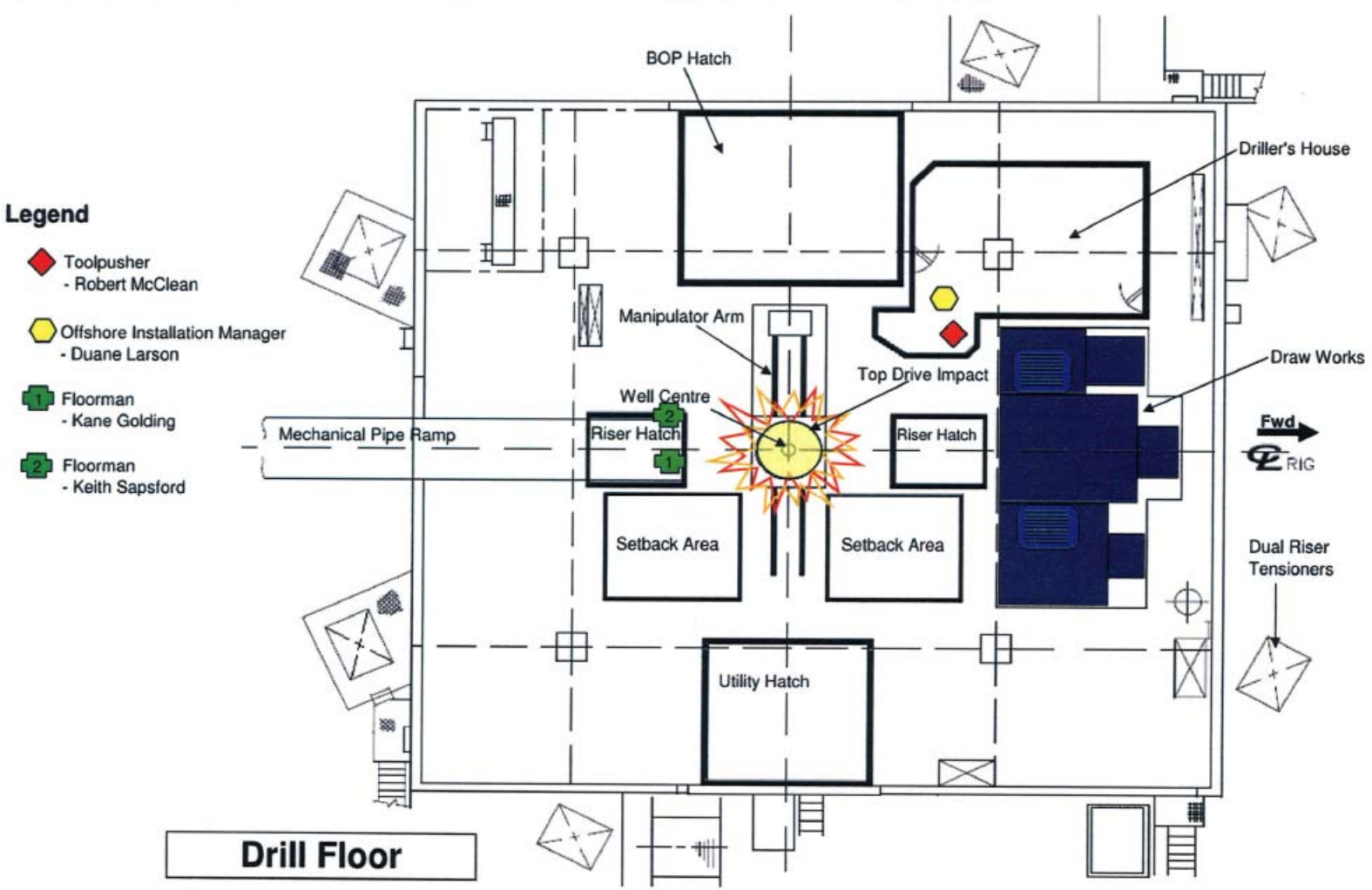
Crew position at time of incident (Drill Floor)



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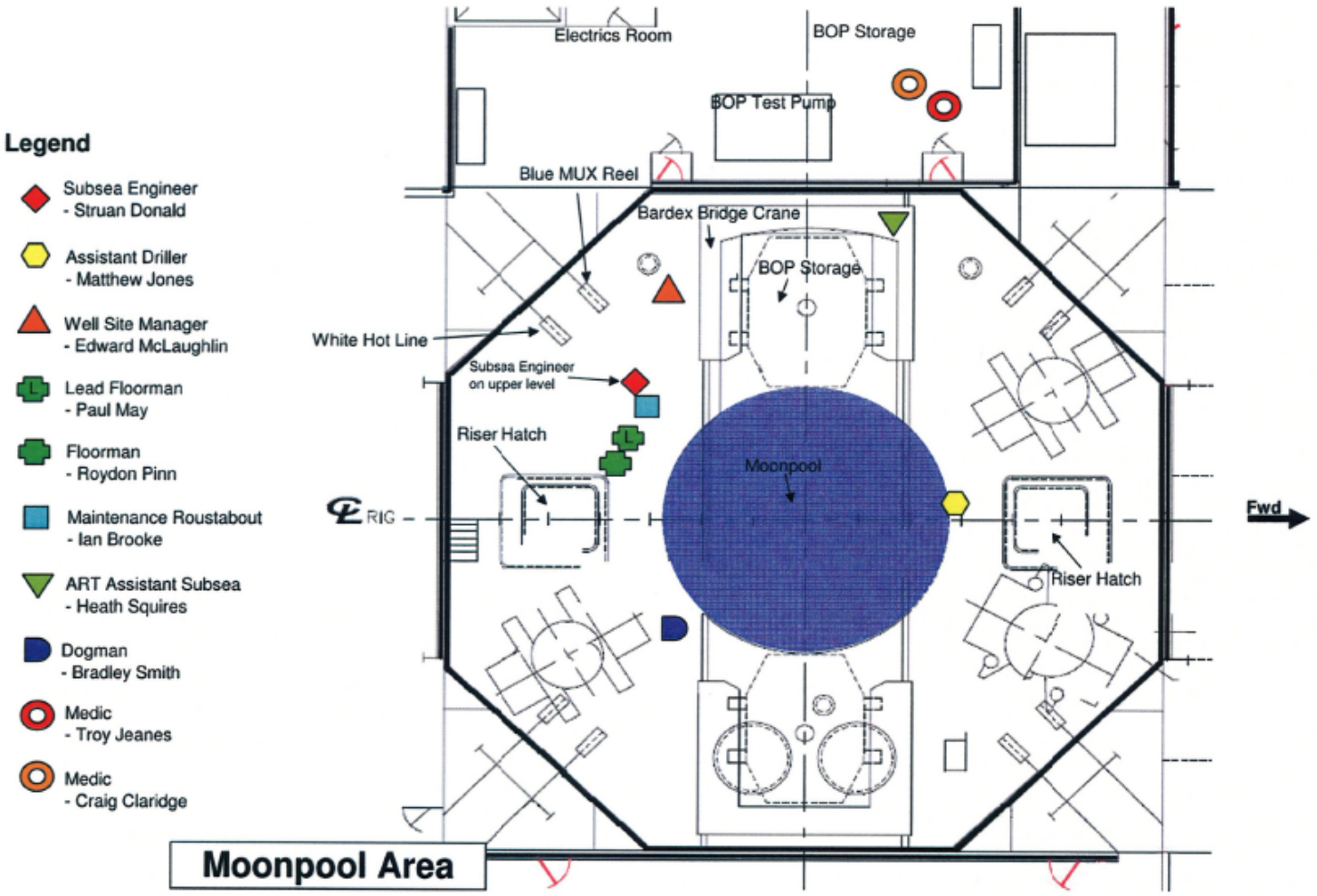
Crew position at time of incident (Moonpool)



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Causal Factors / Findings

- Incorrect installation of the anti-bird nest / disc brake hydraulic interface
- Inadequate commissioning of the upgraded (May 07) disc braking system.
- The disc brake system handover from NOV to rig personnel was inadequate
- Management of Change Process during system upgrade was not implemented effectively
- Follow up and understanding of previous disc brake incidents inadequate

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Technical Investigation Findings

- **National Oilwell Varco experts performed testing on location. From the seven tests performed, the key results were:**

- ❑ **When the drawworks are hoisted into the KEMS upper limit the anti-bird nesting system reduces the pressure to the service brakes from 1200 psi to 200 psi and the emergency brake pressure is dumped allowing the calipers to set. Due to the limited supply pressure of 200 psi, the service calipers had minimal, if any, effect. The emergency calipers and Elmagco brake were not designed to stop the load under dynamic conditions on their own.**

- ❑ **The anti-bird nesting components are incorrectly installed thus limiting the 1200 psi used to function the service brakes to 200 psi.**

- ❑ **If the anti-bird nesting relay is physically removed prior to reaching the upper KEMS limit, full pressure (1200 psi) remains available for use on the service brakes.**

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Causal Factor's: Root Causes / Actions

- **Incorrect installation of the anti-bird nest / disc brake hydraulic interface**

➢ No signed scope of work at time of initial equipment installation to clearly communicate responsibilities and expectations.	✓ FMEA, Approved installation and Commissioning procedures
➢ MOC process not utilised correctly (Rig and line management did not recognise the approval authority exceeded the installation team and the installation team did not have adequate knowledge to proceed with installation).	✓ Review of MOC process by TOI installation personnel and Onshore Management

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Causal Factor's: Root Causes / Actions

- **Inadequate commissioning of the upgraded (May 07) disc braking system.**

➢ **MOC process not utilised correctly (Upgrade work with clear work scope and accountabilities not identified, clear acceptance criteria not documented).**

✓ **Review of MOC process by TOI installation personnel and Onshore Management**

➢ **Commissioning procedures focused on individual system elements and not system interfaces**

✓ **FMEA, Approved installation and Commissioning procedures**

➢ **Poor understanding of the interaction between KEMS, Anti-Bird Nesting and Disc Brake systemsby rig personnel.**

✓ **Operating manuals, partslists and schematic drawings for KEMS, ABN, and disc brakes updated to reflect hardware installed. NOV must provide training to system users and maintenance personnel as related to craft.**

➢ **Inconsistent nomenclature between vendor and installation personnel**

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Closing Comments

- **ANY COMMENTS OR QUESTIONS??**

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