

Shell's Experience with Hurricane Ivan

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API – 2005 Hurricane Readiness and Recovery
Conference

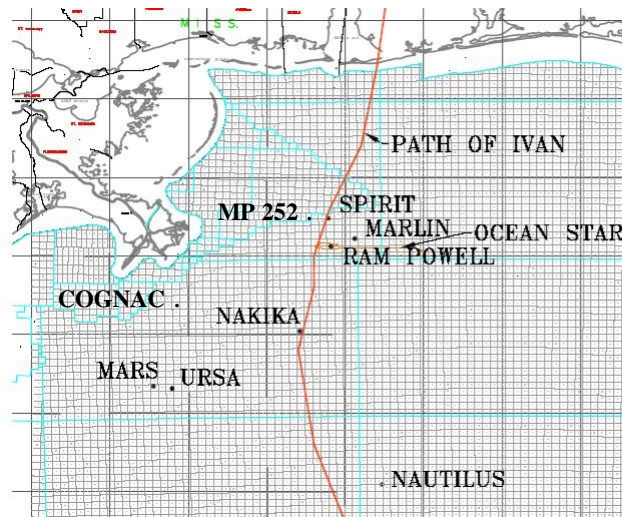
Objectives

- **Describe Hurricane Incident Command Team**
- **Describe Response Post Landfall**
- **Describe Damage and Repairs on Shell Assets**

Hurricane Incident Command Team

- Team members include:
- Team is multi-disciplined.
 - Drilling
 - Production
 - Construction
 - Logistics
 - Regulatory Affairs
 - Engineering
- Equipment and Resources secured.
- Evacuation and recovery plans updated and changed as hurricane approaches.
- On September 13, 2004, 850 people evacuated safely.

Path of Ivan



Response Post Landfall

➤ Damage Assessment

❖ Non Severe Storm → Use helicopter operations

❖ Severe Storm → Use Fixed Wing Planes

➤ Fixed wing plane was used Post Ivan.

➤ Fixed wing plane mission to determine suitability for helicopter operations.

➤ Damage assessments performed as soon as heliports were okay.

Cognac Description

➤ Mississippi Canyon 194 A (Cognac) is a drilling and production platform in 1025 ft of water, installed in 1978.

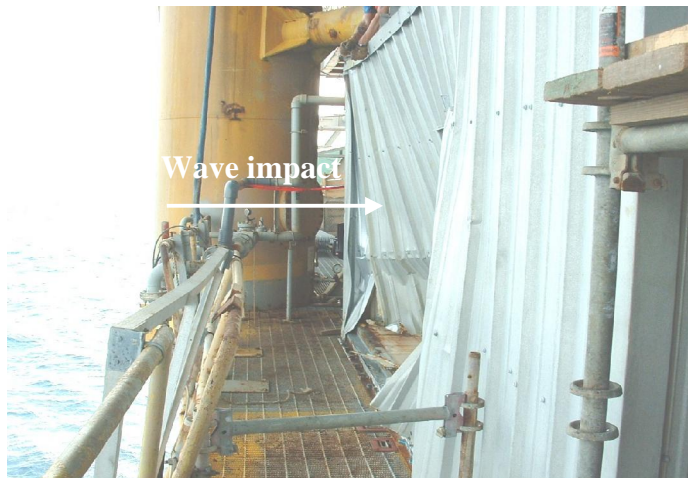


Damage Assessments – MC 194

- Evidence of Green Water in the deck, 45 feet above the water line; platform 100 miles from the eye of the storm.

- Platform damage consisted of:
 - ❖ Missing Grating and Handrails
 - ❖ Minor Facilities equipment
 - ❖ Gaugers Shack

Damage Assessments – MC 194



Main Pass 252 Description

- The Main Pass 252 complex consists of 2 bridge connected platforms in 300 feet of water. The 252 complex primarily supports 7 subsea wells.



Damage Assessments – MP 252

- Evidence of Green Water in the deck, 50 feet above the water line. Platform was near the eye of the storm.
- Estimated wave height 65 - 70 ft which corresponds to the maximum design wave of 72 feet.
- Platform damaged consisted of:
 - ❖ Missing Grating and Handrails (100 % at boatlanding to 20 % on lower deck)
 - ❖ Facilities equipment, cable tray and mostly support utilities

Damage Assessments – MP 252



Viosca Knoll 956 A Description

➤ Viosca Knoll 956 A (Ram Powell) is a TLP in 3214 feet of water.



Damage Assessments – VK 956

- Evidence of Green Water in the deck, 90 feet above the water line. Platform near the eye of the storm.
- Estimated wave height at this location is around 100 ft. Design wave was around 87 ft.
- Platform damaged consisted of:
 - ❖ Drilling rig moved off location
 - ❖ FGC 2 exhaust
 - ❖ Missing Grating and Handrails (100 % at boatlanding to 20 % on lower deck)
 - ❖ Facilities equipment, cable tray and mostly support utilities

Damage Assessments – VK 956



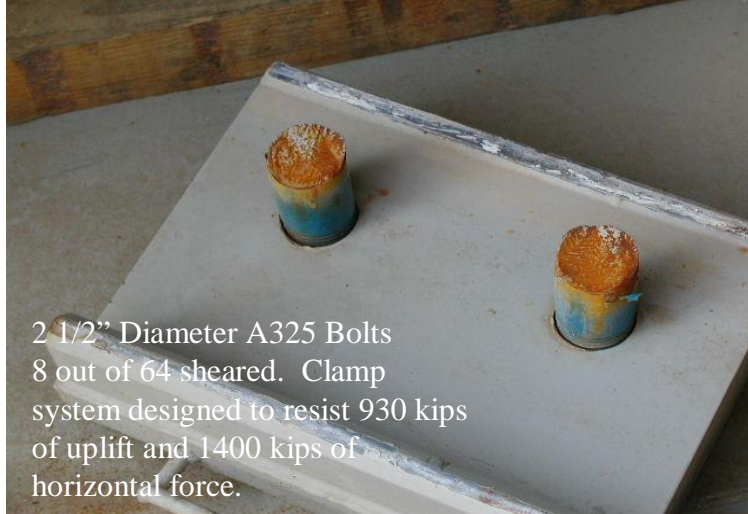
Damage Assessments – VK 956



Damage Assessments – VK 956



Damage Assessments – VK 956

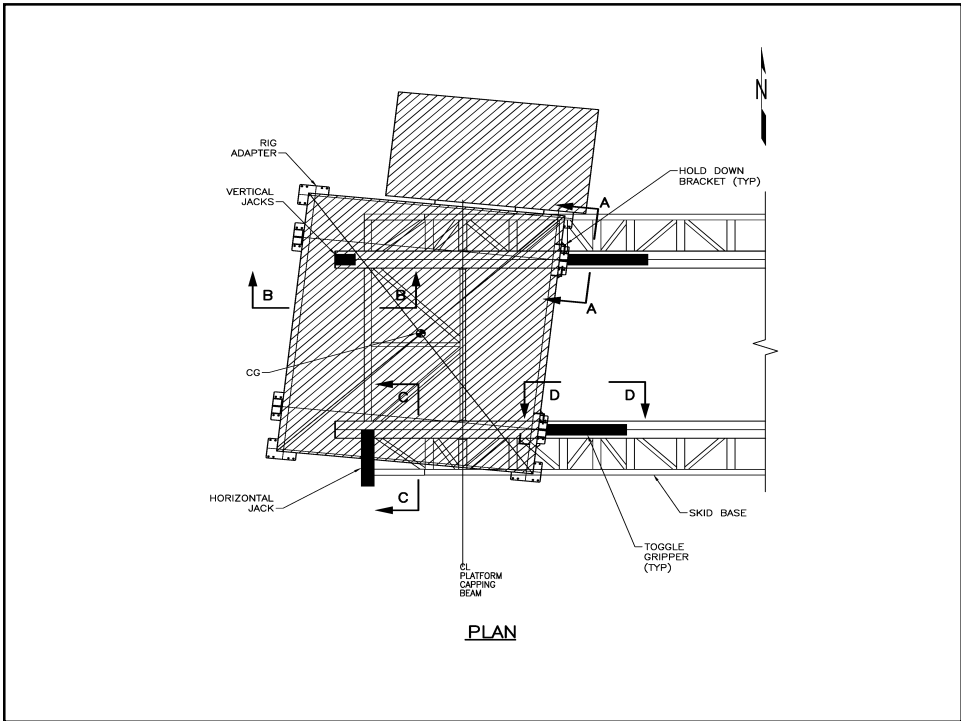
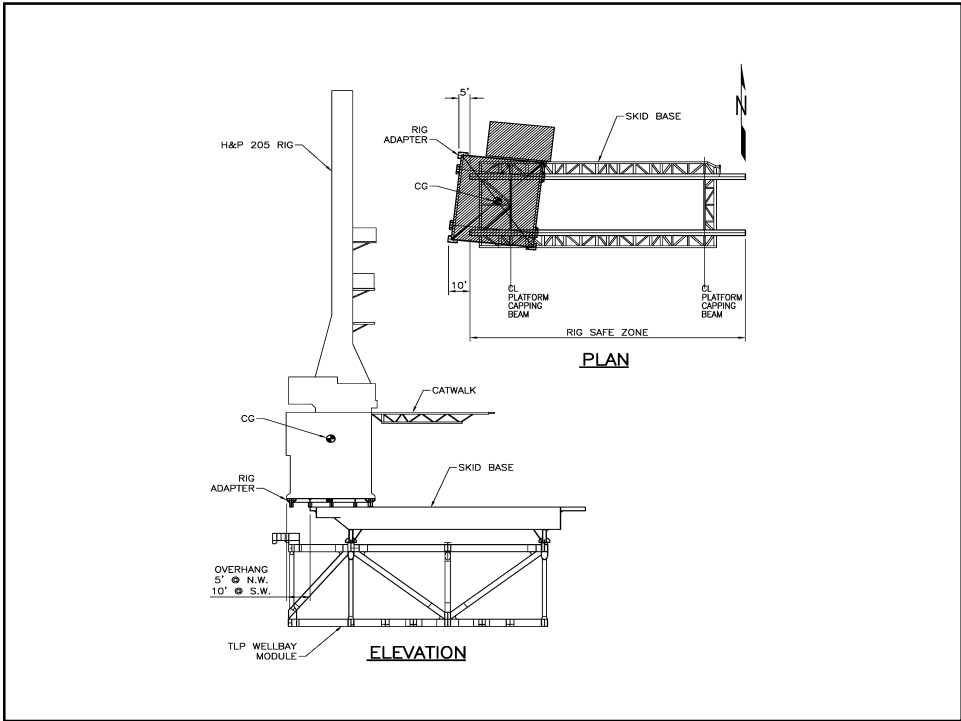


2 1/2" Diameter A325 Bolts
8 out of 64 sheared. Clamp
system designed to resist 930 kips
of uplift and 1400 kips of
horizontal force.

VK 956 A – Drilling Rig Recovery

– Challenges

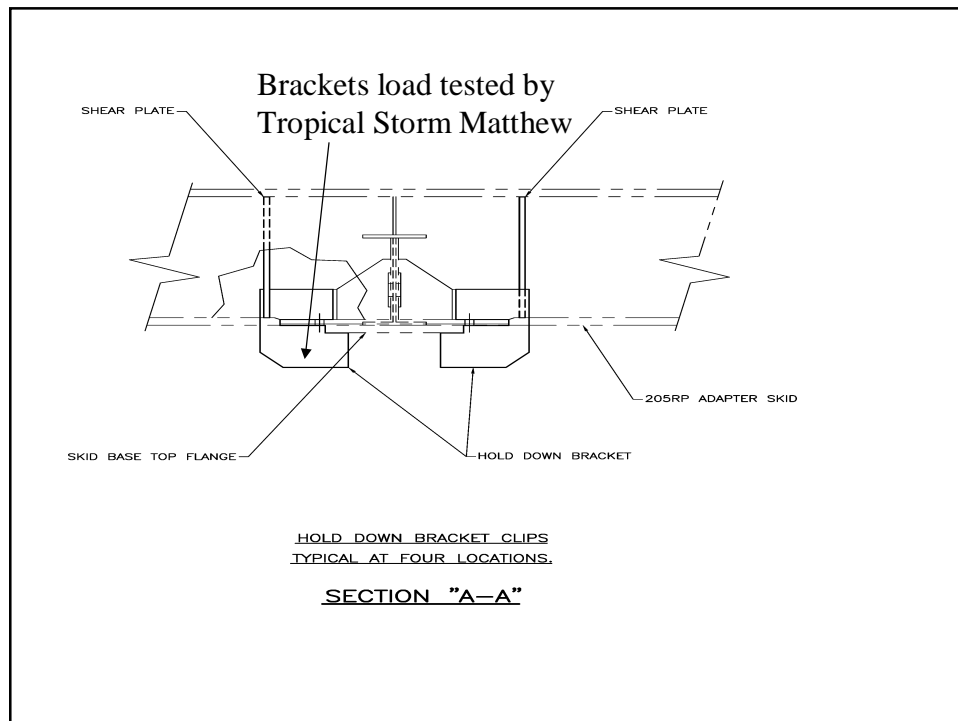
- Rig was located in potentially unstable position.
- Rig had to be secured to prevent further damage.
- 2500 ton rig to be a) lifted vertically then slid back into position or b) disassembled and then reassembled.
- Option a) was selected



VK 956 A – Drilling Rig Recovery

– Strategy

- Secure rig using hold down brackets.
- Hold down brackets designed for additional hurricane force conditions.
- Use a system of strategically placed jacks, cylinders and grippers to recover rig.



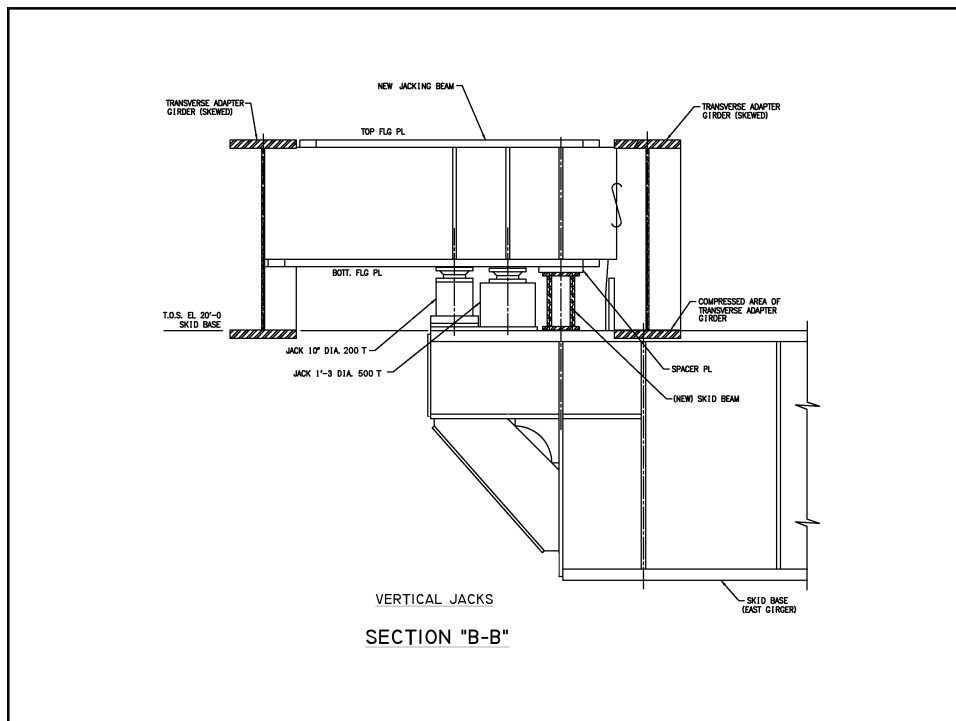
VK 956 A – Drilling Rig Recovery

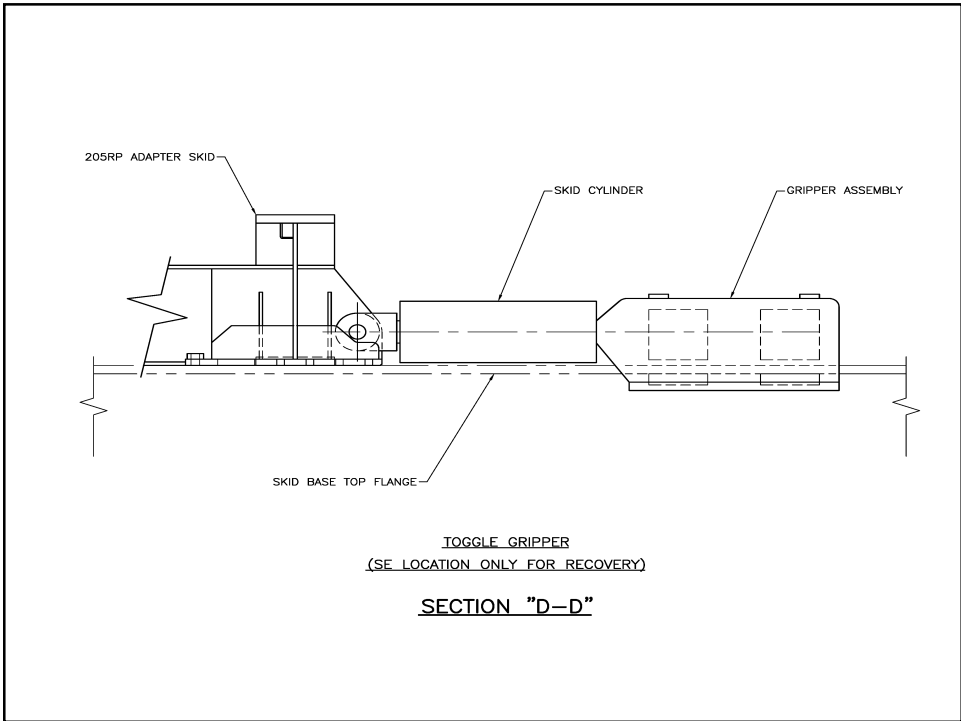
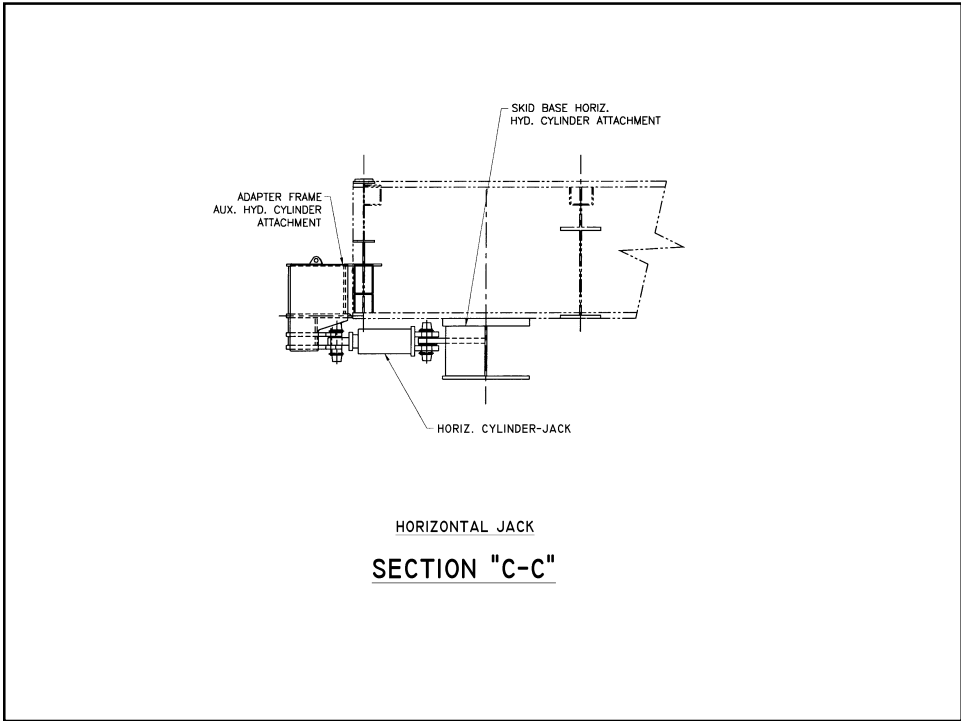
– Vertical Recovery:

- Weld reaction and jacking beams in place.
- Use 500 ton and 200 ton vertical jacks in combination to lift rig vertically. Actual force to lift the rig 3 inches was 1300 kips.
- Apply lubricant to skidding surfaces.

– Horizontal Recovery:

- Use hydraulic horizontal cylinder and horizontal gripper to “square” rig on support beams and pull back to proper operating location. Actual force required was around 500 kips.





Conclusions / Learnings

- Rig tie-down criteria exceeded.
- Wave design criteria probably exceeded.
- Shell participating in industry-wide efforts to address findings.
- An equipment replacement strategy is an enabler.
- Consider temporary offshore housing vs. day tripping.
- Coordinated approach allowed synergy.
- Repairs executed without major safety or environmental incidents.