

Safety Alert

MMS

U.S. Department of the Interior
Minerals Management Service
Gulf of Mexico OCS Region

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Human Engineering Factors Result in Increasing Number of Riser Disconnects

A significant number of accidental riser disconnects have been experienced in deepwater operations during the last five years. Each event had the potential for causing serious well-control issues.

After the first incident in 2000, MMS issued a Notice to Lessees and Operators (NTL), No. 2000-G07, which clarified 30 CFR 250.107 (a) and 250.400 (July 2002) and prescribed measures to prevent the accidental disconnect of the lower marine drilling risers from floating drilling rigs. The NTL addressed ergonomic measures to prevent human error and offered measures focused on technological improvements.

Since the issuance of this NTL, nine accidental drilling riser disconnects and one accidental production riser disconnect have occurred. Two riser disconnects have occurred thus far in 2005. Investigation results indicate human error as the cause for both incidents.

Human error contributed to over 50 percent of the total number of events. Failure to implement the written operating procedures to function-test the lower marine riser package (LMRP) and the BOP stack while in the moon pool or prior to water entry has resulted in many of these events. Historical information is provided in the attached table.

The MMS recommends that you review NTL No. 2000-G07, which states in part the following:

- a. Lock out any LMRP disconnect that is not part of a sequential disconnect process before the BOP/LMRP enters the water (ensuring that a well is secured by blind or blind-shear rams before the riser disconnects).
- b. Ensure that the sequential LMRP disconnect process, including the isolation of the wellbore, is designed so that the LMRP can be disconnected only as the result of a deliberate act.
- c. Ensure that human engineering measures such as labeling the panel button are clearly distinguishable from other functions, and fit LMRP and wellhead connector functions with securable protective covers.
- d. Remove confusing metal tags temporarily used to identify functions, as they may have been incorrectly placed. Rely on stamped receptacle identifications to ensure that the control circuits on the wellhead or LMRP connectors have not been disturbed. The subsea engineer must first ensure that proper Subsea Function Test Checklist Procedures are in place, and then observe, verify, and document all function testing of the BOP's in the moon pool.
- e. During BOP function and pressure testing on the stump, all functions should be operated through the test stinger to confirm the hoses are installed appropriately on both pod receptacles.

Historical Subsea Riser Disconnects from January 2000 to Present

MONTH/YEAR	BLOCK/LEASE	EVENT	
1	Jan-00	MC 822	Human Error-Inadvertent Riser Disconnect Plan to test blind shear rams, but pushed wrong button, disconnecting LMRP
2	Feb-00	MC 538	Human Error-Inadvertent LMRP disconnect and blowout event Inadvertent LMRP disconnect from BOP while installing lock-out device
3	Jun-00	GC 743	Equipment Malfunction-Inadvertent Riser Disconnect while logging PLC program card failure in BOP control system resulting in low 24-volt DC power supply Voltage interruption interpreted by PLC and EDS sequence initiated
4	Jan-01	EB 599	Equipment Failure-Emergency Riser Disconnect Lost power and rig drifted off location; activated emergency disconnect of LMRP when riser angle reached 5 deg
5	Jun-01	GC 202	Human Error-Production riser connector inadvertently released Procedure to retrieve riser running tool unclear. Adequate details to guide operator through process not available.
6	Jun-01	GC 1001	Equipment Failure-Dynamic Position Failure-Drift Off-Emergency Riser Disconnect Loose wiring on two of the DP panels; loss of power to thrusters
7	May-03	MC 822	Equipment Failure-Parted Riser Failure initiated in one of six inserts in female connector of one joint. Cracks inside shoulder area allowed propagation of hydrogen embrittlement, leading to environmentally assisted cracking and ultimate failure. Failure of first insert transferred loads to adjacent inserts and bolts, which subsequently failed Emergency systems activated closing casing shear RAMS and lower shear RAMS
8	Jun-03	MC 725	Human Error-Controlled Emergency Disconnect-Drift Off Operator error for maintaining current on beam of ship, rather than maneuvering heading to bow. Not following the DP Model System Selected heading caused drift off. Insufficient power on rig did not allow operator to correct heading to maintain station.
9	Apr-04	GC 653	Weather Related-Emergency Disconnect Procedure Initiated Dynamic Position Operator unable to maintain heading, turns difficult due to 60 knot winds fluctuating. Ship drifted off location until Red Dynamic Position watch circle reached at 283 feet off location
10	Mar-05	EW 965	Human Error-Riser Disconnect-Hydraulic hoses for blue pod latch and unlatch functions cross connected. Blue pod and yellow pod competing with each other during function testings.
11	Mar-05	GC 157	Human Error-Inadvertent Riser Disconnect Incorrect hydraulic connections on yellow control pod

Summary of Events By Root Cause	
1	Weather-Related (Apr 04)
6	Human Engineering (Jan 00, Feb 00, June 01, June 03, Mar 05, Mar 05)
4	Equipment-Related (June 00, Jan 01, June 01, May 03)