

# SAFETY ALERT



**Safety Alert No. 340**  
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## Caisson Well Surface Safety Valve Actuator Explodes

In January 2018, an explosion occurred on an offshore production caisson in the Gulf of Mexico. As a satellite well was being brought online in extremely cold weather, the operator could not get instrument gas to the well on the caisson in order to open a surface safety valve (SSV) because of a frozen supply gas line. As a result, the operator stated that he installed a 3/8-inch stainless steel tubing jumper from a 1/2-inch needle valve on the top of the well tree (downstream of the closed SSV) to the actuator.



*Bottom of SSV Actuator*



*Top Diaphragm Case*



*Capped off fitting in place of pressure relief device*



*Damaged Grating*

The latest, recorded, shut-in tubing pressure (SITP) on the well was 2,960 pounds per square inch (psi). The pressure indicated on the tree, prior to opening the SSV, was 163 psi. After the operator opened the needle valve, without the use of any type of regulator to step down the upstream pressure, the actuator experienced an

overpressure. Therefore, the explosion occurred when the SSV opened upon actuator pressurization, which rapidly introduced 2,276 psi (recorded trend pressure) of non-regulated well gas through the tubing jumper and into the SSV actuator, which was designed for a maximum operating pressure of 150 psi. The overpressure caused the fastener bolts to fail, allowing explosive separation of the diaphragm case, top shaft, and diaphragm/diaphragm retainer plate from the lower diaphragm case. The operator reported that no injuries or pollution had occurred; however, nearby grating was damaged along with the SSV.

Although the diaphragm actuator design included a ½-inch pressure relief device installed and sized for instrument gas regulator failure, it had been removed/replaced with a capped-off tubing fitting at some prior point in time.

The lease operator found that their operating procedures for this caisson did not cover the start-up of the well without the use of the fuel gas system. They also found that the job safety analysis (JSA) did not cover the steps in the actual process used to bring the platform on-line. Additionally, the lease operator's procedures did not incorporate the practice of running a jumper line from the top of the tree to the actuator, and the operator was unaware of the cause and effects that could occur by doing such. Furthermore, the operator appeared unaware that the equipment had been altered from the original design.

**Therefore, BSEE recommends that operators consider the following:**

- Do not alter equipment from original design without fully understanding potential consequences.
- Institute operating procedures that account for start-up during all potential conditions.
- Initiate stop work for any deviation from safe operations.
- Follow Management of Change procedures when confronted with a situation for which there is no published Operating Procedure.
- Fully understand cause and effects during all operations.
- Safely supply instrument and fuel gas where applicable.

**A Safety Alert is a tool used by BSEE to inform the offshore oil and gas industry of the circumstances surrounding an accident or near miss. It also contains recommendations that should help prevent the recurrence of such an incident on the Outer Continental Shelf.**