

# Notifiable incident

**Incident ID** [5391](#)

**Duty holder:** Shell Australia Pty Ltd  
**Facility/Activity:** Prelude FLNG  
**Facility type:** Floating liquefied natural gas facility

Incident details	
<b>Division</b>	Occupational Health and Safety
<b>Notification type</b>	Incident
<b>Incident date</b>	02/05/2018 01:00 AM (WST)
<b>Notification date</b>	07/05/2018 10:07 AM (WST)
<b>NOPSEMA response date</b>	30/04/2018 10:20 AM (WST)
<b>Received by</b>	[REDACTED]
<b>Nearest state</b>	WA
<b>Initial category type</b> <i>(based on notification)</i>	Dangerous Occurrence
<b>Initial category</b> <i>(based on notification)</i>	Damage to safety-critical equipment
<b>3 Day report received</b>	09/05/2018
<b>Final report received</b>	09/05/2018
<b>All required data received</b>	09/05/2018
<b>Final category type</b> <i>(based on final report)</i>	Dangerous Occurrence
<b>Final category</b> <i>(based on final report)</i>	Damage to safety-critical equipment
<b>Brief description</b>	OHS-DSCE-LNG Tank deluge failed to meet performance standard
<b>Location</b>	Deck
<b>Subtype/s</b>	Facility integrity
<b>Summary</b> <i>(at notification)</i>	Operator advised that during testing of the deluge systems for the LNG tanks (set 22 and 26) the coverage was good but following analysis of the flow rates it was determined that these were less than the performance standard. The OIM did not have the flow rate information to hand during the notification but this information would be contained in the initial report.

<p><b>Details</b> (from final report)</p>	<p>Operator advised that during testing of the deluge systems for the LNG tanks (set 22 and 26) the coverage was good but following analysis of the flow rates it was determined that these were less than the performance standard. The OIM did not have the flow rate information to hand during the notification but this information would be contained in the initial report.</p> <p>During an SCE verification activity to measure deluge coverage of two deluge skids that cover a section of the main deck (over some of the LPG and LNG tank domes), it was identified that the coverage did not meet the performance criteria, specified in Performance Standard, PS001 Deluge System. The performance standard requires 10 L/min/m<sup>2</sup>, however the systems produced, on average, 4-6 L/min/m<sup>2</sup>.</p> <p>At the current state of the facility, pre-LNG import, the hydrocarbon loss of containment MAEs are not active, however, post LNG import these deluges will become relevant.</p> <p>Following the failed performance test on deluge skids A-60022 and A-60026, the focus of the investigation was on the potential increase in risk associated with the lower flowrates, and the reasons why the system produced lower than expected coverage.</p> <p>To determine the risk impact, the reason for the installation of the deluge skids on the main deck was investigated. It was found that they are based on an IGC code requirement for exposed tank domes. During design development of FLNG, the main deck was extended to cover and protect the exposed tank domes. These covers were specified with passive protection and the necessary explosion overpressure design accidental loads. As a result of including the tank dome covers in the design, the A-60022 and A-60026 deluges became a supplementary measure and were not directly contributing to reducing the risk to exposed tank domes.</p> <p>Nonetheless, the performance standard requires 10 L/min/m<sup>2</sup>, and A-60022 and A-60026 produced, on average, 4-6 L/min/m<sup>2</sup>. This coverage is lower than the performance standard, however, the coverage and spray were visually assessed as good, by the 3rd party verification body (Lloyds Register). As such, this barrier is partially impaired and would provide local cooling in the event of a localised fire.</p> <p>When investigating the design, it was found that the deluge valves have been incorrectly sized, and this is the reason for the lower flowrates. In order to achieve the required flowrates, larger deluge valves are required. Upon investigating the availability of larger valves, it has been found that manufacture of new valves is required, and the initial estimate of the time required for procuring new valves is in the order of 3 months. Other options of reconfiguring the system to reduce the pressure drop were not found to be sufficiently effective.</p> <p>With the above analysis of the risk and the plan to bring the system into line with the performance standard, the Operator has deemed it acceptable to continue operating over an interim time period until the larger deluge valves can be procured and installed. This position is also supported by the validation/verification body, Lloyds Register.</p> <p>This risk will be managed as an impaired SCE, as described in the safety case. In addition, some mitigations have been considered:</p> <ol style="list-style-type: none"> <li>1. Remotely activated firewater monitors pointing at the main deck area. Not valid, fixed firewater monitors are only available above the process deck A, so would not reach the main deck area.</li> <li>2. Full time stand-by personnel at the bypass deluge valves to activate immediately in case of emergency. Not considered ALARP. The reduction in risk associated with the fast response does not justify the exposure risk to the personnel.</li> </ol>
<p><b>Immediate cause/s</b></p>	<p>Deluge testing identified two deluge skids that did not meet the performance criteria for PS001 Deluge System for deluge coverage.</p>
<p><b>Root cause/s</b></p>	<p>ED - DESIGN - Design specs - design not to specs</p>
<p><b>Root cause description</b></p>	<p>Deluge valves for A-60022 and A-60026 are undersized</p>

Duty inspector recommendation	
Date	07/05/2018
Duty inspector	[REDACTED]
Recommendation	Do not conduct Major Investigation
Reasoning	Does not meet MI threshold based on information received
Supporting considerations	

Major investigation decision	
Date	07/05/2018
Decision	Do not conduct Major Investigation
Reasoning	Does not meet MI threshold based on information received
Supporting considerations	

Non-major investigation review and recommendation	
Date	07/05/2018
Inspector	[REDACTED]
Risk gap	Moderate
Type of standard	Established
Initial strategy	Investigate

Recommended follow up strategy	
Recommended strategy	Investigate
Supporting considerations	Deluge system flow rate did not meet the performance standard. Cause of failure to meet PS to be determined.

Non-major investigation decision	
Date	07/05/2018
RoN	[REDACTED]
RoN review result	Agree with recommendation
Strategy decision	Investigate
Supporting considerations	

Associated inspection	
Inspection ID	1772