



Okha SBF and Piping Vibrations – NOPSEMA Notice Number 532

19th March 2014

Issued for Approval

	Person	Role	Signature	Date
Prepared By:				2/4/14
Checked By:				2/4/14
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Required Actions: Responses

(a) Take all reasonably practicable steps to ensure that the CWLH Okha facility has appropriate technical and other controls implemented to ensure that hydrocarbon process pipework is safe and without risk to health due to vibration induced fatigue failure in the interim.

WEL has taken all reasonably practicable steps to ensure the integrity of SBF by carrying out a SBF vibration survey on all hydrocarbon process piping and critical non hydrocarbon process piping to verify the project design. This has been done in accordance with WEL Engineering Standard *W1000SM3130754 Static Equipment Vibration Fatigue Assessment* and assessment in accordance with WEL Engineering Standard *W1000SM3130748 Small Bore Fitting (SBF) Vibration Fatigue Assessment*.

Outstanding areas requiring corrective actions are captured in the Rectification Plan and risk assessed to prioritise implementation. To date, 67 systems have been screened out of 69. The remaining 2 systems are scheduled as part of the rectification plan attached to this note. The 67 systems surveyed so far are the highest risk systems. The remaining 2 are:

- GT3 running on diesel (low risk because not a hydrocarbon process pipework, infrequently run on diesel – normal mode is to run on gas – and GT1 and GT2 have been screened on diesel, and passed)
- GT4 running on diesel (low risk because not a hydrocarbon process pipework, infrequently run on diesel – normal mode is to run on gas – and GT1 and GT2 have been screened on diesel, and passed)

Deviation 92012129 Piping/SBF Vibration Exceedances (WEL Technical Change Management System TCMS) is used to manage the risk in the interim to ensure integrity and safe operation.

(b) Undertake a risk assessment on the hydrocarbon process pipework on the CWLH Okha facility to ensure its continued integrity. This study should take into account the Energy Institute 'Guidance on Vibration Induced Fatigue', or other recognised industry good practice. Consideration should be given to steady-state operations (including process parameter changes), and to transient events including, but not limited to, shutdown and blowdown events;

A conservative approach has been taken to select all hydrocarbon process piping systems and the seawater and firewater systems to be surveyed in steady state operation. WEL Engineering Standards mentioned above have been used in lieu of the *Energy Institute Guidelines for the Avoidance of Vibration Induced Fatigue Failure in Process Pipework*. The WEL Engineering Standard *W1000SM3130754 Static Equipment Vibration Fatigue Assessment* and *W1000SM3130748 Small Bore Fitting (SBF) Vibration Fatigue Assessment* standards are aligned with the Energy Institute Guidelines. This has been confirmed by the WEL Mechanical Technical Authority.

Transients were assessed as follows:

- Transient events are included in the FPSO Piping Stress Specification EH0000SM0116.
- The WEL Process Engineer identified the flare system as requiring an Acoustic Induced Vibration (AIV) Study (EH6200MR0500) in accordance to *WEL Engineering Guideline W1000MM3903975 Guideline – Avoidance of Acoustically Induced Fatigue Failure in Pipes* which references the Energy Institute Guidelines. The study included transient events for blowdown.
- Visual assessments during transient events were performed on specific packages during commissioning which includes startup and shutdown. Any areas of concern were captured on the project punchlist.

The results of the vibration surveys have been risk assessed, and recommendations from the risk assessment and the surveys have been incorporated into the rectification plan actions table attached to this note. Completion of the rectification plan actions will ensure continued integrity of the pipework.

(c) Submit a rectification action plan to NOPSEMA describing the Operator's plan to implement solutions in response to the recommendation resulting from the risk assessment described in (b) above.

Refer to Table 1: Rectification Plan – Corrective Actions as at 19th March 2014. In addition, the SBF in the location around the failed Test Separator line will be improved.

Hydrocarbon Process Piping

Module #	P&ID Number	P&ID Name	SVT Survey Report	Notes for outstanding/ Items	H&S Risk	Planned Closeout Date
Module 3	EH2200DP0114.0001	EGC Scrubber & 1st Stage Compressor (Train 1).pdf	Survey Trip 3 FN03-1022781.3 RevB Hydrocarbon Piping and SBF Survey Final Report Rpt01-1223781-RevA-27Sep13	Bracing installed, re-survey required to verify rectification work	Medium	Jul-14
Module 7	EH2200DP0100.0001	Vapour Recovery Units	Survey July 2013 FN01-1022781.11 RevB	Engineering: Bracing to be designed and installed. The VRU has online vibration monitoring which trips when limits are exceeded.	Low	Dec-14
Turret RTM Test Sep	EH0987DP0100.0001	Production Manifold and Swivels.pdf	Survey July 2013 FN01-1022781.11 RevB	Short Term Control: Engineered clamp currently installed. Engineering: Development of permanent repair solution in progress with external engineering consultants. [Priority Action]	High	Dec-14

Seawater & Utilities Piping

Module #	P&ID Number	P&ID Name	SVT Survey Report	Notes for outstanding/ Items	H&S Risk	Planned Closeout Date
Module 1	EH2600DP0100.0001	Crude Cooler.pdf Seawater Side	Hydrocarbon Piping and SBF Survey Final Report Rpt01-1223781-RevA-27Sep13	Engineering: Bracing to be designed and installed	Low	Dec-14
Module 3	EH2200DP0108.0001	EGC Driver & Utilities (Train 1).pdf	Survey Trip 3 FN03-1022781.3 RevB	Rectified. Re-survey required to verify rectification work	Low	Jul-14
Module 6	EH0100DP0100.0001	Well Services Pump	WSP Survey Rpt06-1022871.4-RevF-05Jan12	Package infrequently operated. Engineering: Solution to be developed. [Priority Action]	High	Dec-14
Module 7	EH2200DP0101.0001	FGC Suction Cooler.pdf	Survey Trip 3 FN03-1022781.3 RevB	Engineering: Solution to be developed and implemented	Medium	Dec-14
Module 7	EH2100DP0103.0001	Glycol Regeneration.pdf	Hydrocarbons Trip 2 1022781.3-FN02-RevC-30Jul12	*Rectified. Re-survey required to verify rectification work	High*	Jul-14
Module 7	EH2100XP1007.0001	Glycol Regeneration Package.pdf	Hydrocarbons Trip 2 1022781.3-FN02-RevC-30Jul12	*Rectified. Re-survey required to verify rectification work	High*	Jul-14
Module 11	EH4000DP0103.0001	Power Generation (4).pdf	Survey Trip 3 FN03-1022781.3 RevB	Next Survey: Equipment surveyed on fuel gas. To be tested on diesel.	Medium	Jul-14
Module 11	EH4610DP0101.0001	Cooling Medium Pump A.pdf	Hydrocarbon Piping and SBF Survey Final Report Rpt01-1223781-RevA-27Sep13	Engineering: Bracing to be designed and installed	Medium	Dec-14
Module 11	EH4610DP0101.0001	Cooling Medium Pump C.pdf	Hydrocarbon Piping and SBF Survey Final Report Rpt01-1223781-RevA-27Sep13	Engineering: Bracing to be designed and installed	Medium	Dec-14
Module 11	EH4610DP0102.0001	Cooling Medium Coolers A B and C	Seawater & Firewater Survey - 2nd Trip Rpt03-1022871.2-RevB-02Sep11	Next Survey: Not all items screened, rope access technicians to be aligned with survey	Low	Jul-14
Module 12	EH4000DP0102.0001	Power Generation (3).pdf	Survey Trip 3 FN03-1022781.3 RevB	Next Survey: Equipment surveyed on fuel gas. To be tested on diesel.	Medium	Jul-14
SWLP	Seawater System Topsides			Engineering: Improve SBF piping support and develop test plan to identify vibration root cause.	Low	Dec-14

Table 1: Rectification Plan - Corrective Actions as at 19th March 2014

References

Reference documents

1. WEL Engineering Standard *W1000SM3130754 Static Equipment Vibration Fatigue Assessment*
2. WEL Engineering Standard *W1000SM3130748 Small Bore Fitting (SBF) Vibration Fatigue*
3. *FPSO Piping Stress Specification EH0000SM0116*
4. *Review of Okha Flare System for AIV EH6200MR0500*

