

## GUIDE FOR

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# SPECTRAL-BASED FATIGUE ANALYSIS FOR FLOATING PRODUCTION, STORAGE AND OFFLOADING (FPSO) INSTALLATIONS MAY 2010

### NOTICE NO. 2 – January 2018

The following Changes were approved by the ABS Rules Committee on 30 May 2017 and become **EFFECTIVE AS OF 1 JANUARY 2018**.

*(See <http://www.eagle.org> for the consolidated version of the Guide for Spectral-Based Fatigue Analysis for Floating Production, Storage and Offloading (FPSO) Installations, 2010, with all Notices and Corrigenda incorporated.)*

*Notes - The date in the parentheses means the date that the Rule becomes effective for new construction based on the contract date for construction. (See 1-1-4/3.3 of the ABS Rules for Conditions of Classification – Offshore Units and Structures (Part 1).)*

## SECTION 9 FATIGUE LIFE (DAMAGE) CALCULATION AND ACCEPTANCE CRITERIA

### 5 Low Cycle Fatigue Damage

#### 5.5 Stress Range Calculation

*(Revise Subparagraph 9/5.5.1, as follows.)*

##### 5.5.1 Elastic Hot Spot Stress Range Calculation (2018)

*(Preceding text remains unchanged.)*

The number of cycles for installation's loading and unloading,  $n_{LCF}$ , is assumed to be not less than 1200 for 20 years. The actual cycles of loading/offloading may be used for historical sites in FPSO phase.

Assume there are  $10^8$  wave cycles within 20 years,  $n$  is then equal to:

$$\frac{10^8}{2n_{LCF}}$$

In general, it is expected that the time in tension will not equal the time in compression. For a conservative analysis, the larger of the two might be selected.

(Revise Subparagraph 9/5.5.3, as follows.)

5.5.3 Low Cycle S-N Curve and Damage Calculation (2018)

The design S-N curve in the low cycle region is defined in Section 9, Figure 4. It may be considered to be a modified D-Curve.

The low cycle fatigue (LCF) design S-N curve is given as:

$$NS^q = B \quad \text{for } 100 < N < 10^4$$

where

$$q = 2.4$$

$$B = 3.51 \times 10^{10} \text{ (MPa units)}$$

It is assumed that the LCF design S-N curve is applicable to static induced stresses. Basic application of Miner's rule produces the expression of static stress damage  $DM_{LCF}$  is:

$$DM_{LCF} = \frac{N_{LCF} S_L^q}{B}$$

$n_{LCF}$  is the total cycles of loading/offloading, which is not to be less than 1200 for a ship-type installation to be operated for 20 years. The actual cycles of loading/offloading may be used for historical sites in FPSO phase.