

ShipRight FDA Level 2 for LPG carriers

Longitudinal end connection assessment for greater confidence in fatigue performance



Lloyd's Register's (LR's) ShipRight FDA Level 2 software for LPG carriers provides cost-effective evaluation of the fatigue performance of ship structural details, helping designers identify critical locations or 'hotspots' and reduce the risk of failure in service.

FDA Level 2 allows you to assess the fatigue life for end connections of longitudinal stiffeners during the design stage, helping you ensure that build tolerances of critical structural details are monitored during construction, and gain greater confidence in fatigue performance through life.

Our FDA notations provide increased confidence that in-service fatigue failures will not occur.

Why choose ShipRight FDA Level 2

Fatigue design assessment (FDA) of longitudinal end connections, for a typical LPG carrier, requires that over 5,000 critical fatigue locations in the cargo hold region are assessed. Our ShipRight FDA Level 2 software provides this capability. Applying the FDA procedure:

- helps ensure that your ships have sound fatigue performance in service
- assesses fatigue performance for new designs, leading to assignment of the FDA or FDA Plus class notation
- assesses fatigue performance for existing designs enrolled in LR's Condition Assessment Programme (CAP).

The ShipRight FDA Level 2 procedure

ShipRight FDA Level 2 employs advanced spectral fatigue theory to predict damage of ship structural details. The procedure considers the following key elements:

- the hydrodynamic ship motions and wave loads of the assessed ship
- the trading wave environments where your ships sail
- the expected speed of your ship
- all ship to wave headings and wave conditions
- the influence of structural details.

For a full description of how the software works, see overleaf.

Improvement based on experience

Over the last 20 years, LR has continuously invested in the development of ShipRight FDA procedures. Thousands of new designs and existing ships have been assessed using LR's original FDA Level 2 software.

The recent FDA Level 2 modules for oil tankers, LNG carriers and container ships incorporated the latest technology developments and feedback from the industry.

This new FDA Level 2 module for LPG carriers builds on these improvements, making the assessment more robust and versatile.



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How the FDA Level 2 software works

The main particulars of your ship are input at the 'CONCEPT DESIGN' stage of the software roadmap (Figure 1) and the longitudinal scantlings and end connections are modelled with the ShipRight FDA Level 2 Modeller (Figure 2).

Once the modelling is complete, the structural response coefficients are calculated, and from here, the ShipRight FDA software roadmap guides you to complete the fatigue design assessment.

The first step of the assessment is to determine the ship motions and wave loads for the LPG ship model. Next, the short-term fatigue damage is determined for each sea state. Then, the long-term

fatigue damage is calculated based on the required design fatigue life and trading wave environments.

Once the computations end, you can quickly and easily review fatigue performance results and check them against the required criteria. The results are presented graphically and as a table, for all stiffener end connections in the modelled transverse sections (Figure 3).

The ShipRight FDA Level 2 software includes a complete step-by-step User Guide so that you can get started immediately with this type of fatigue assessment. After a short period of familiarisation, you will be able to carry out analyses quickly and efficiently.

Features of ShipRight FDA Level 2 for LPG carriers

- Fatigue life is based on a full spectral analysis.
- More accurate calculation of ship motions and hydrodynamic loads. This overcomes the existing limitation which is constrained by parametric methods.
- New solver to accurately take into account load component interactions (cargo inertia loads, wave bending moments and wave pressures).
- Stress concentration factors are calculated from an LR database which has been determined from a parametric study of a range of different end connection details using finite element analysis.
- Validation of the stress and fatigue results of the structural details by means of finite element tools.
- Extensive tests and validations against Lloyd's Register's experience of fatigue design assessments.
- New features based on users' feedback and comments.

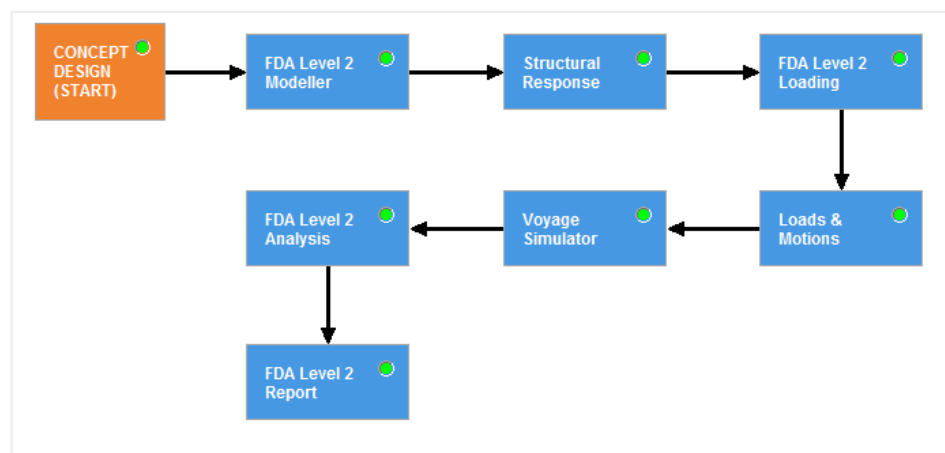


Figure 1: The roadmap of the FDA Level 2 process

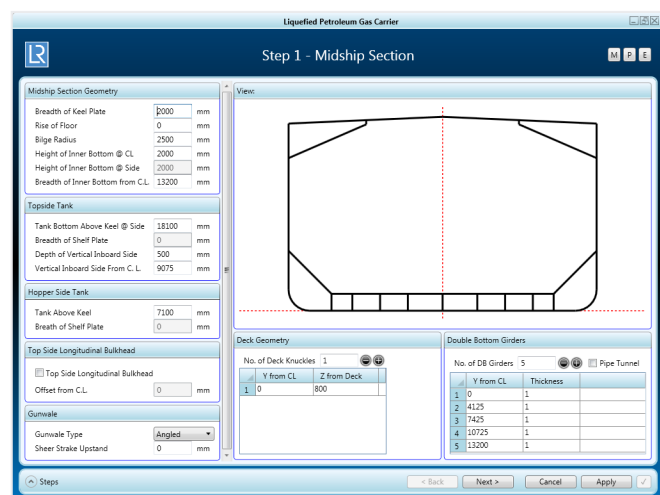


Figure 2: The FDA Level 2 LPG Modeller

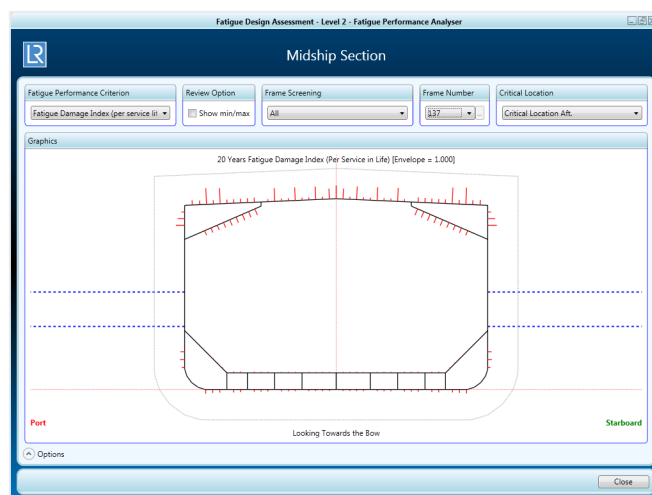


Figure 3: Fatigue damage index results for an LPG carrier

For more information about how ShipRight FDA Level 2 can help you, email es.support@lr.org or to download the software, visit www.lr.org/shipright

www.lr.org

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