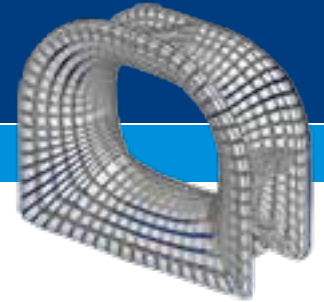
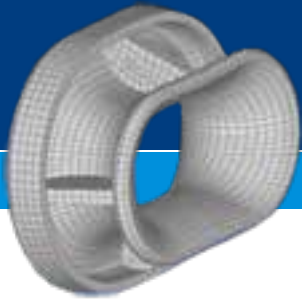




DETERMINATION OF MOORING FITTINGS SAFE WORKING LOAD (SWL)



Preamble

Determination of mooring fittings safe working loads (SWL), has recently become a 'hot issue' especially for the existing ships aging from 5 to 20 years. The main reasons for the determination or re-determination of the SWL are:

- the need for an upgraded SWL value of the mooring fittings to cover Oil Majors requirements, international marine standards and port authorities restrictions.
- the lack of relevant information especially regarding Panama / closed chocks, bollards and stand rollers.

Type and extent of calculations

FEM Analysis and conventional calculation methods (only for stand rollers) are being utilised for the extraction of the results.

The examination analysis may be concentrated either on the mooring fittings only or could also be extended to the underdeck structures*



DNV
Nauticus
3-D Beam
Software

*this is compulsory upon submission for approval to the Class

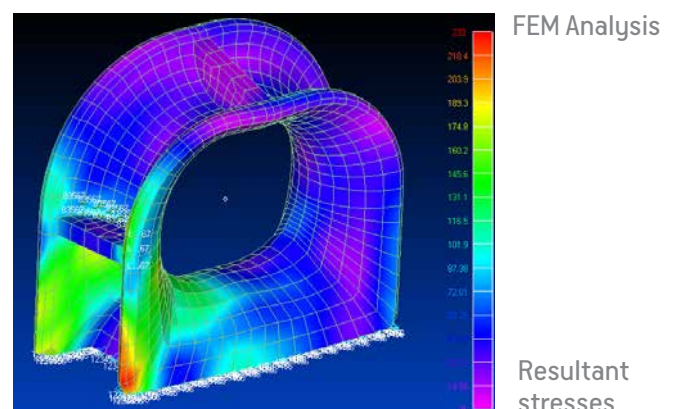
Required info

ALPHA MARINE SERVICES (AMS), has been dealing with several cases over the past couple of years and in this context has elaborated a list with the required information that should be taken into account for the particular calculations. Main topics are shown below:

- geometry & locations of mooring fittings
- fittings' materials
- underdeck structure

Plan approval & Certification

If the Owners / Managers do not require submission to the Class (study is considered for internal use only), then upon conclusion of the assignment, relevant certificates stating the calculated SWL of all fittings under examination are issued. In a different case, the plan approval document from Class should be considered as the official document for use.



Calculation examples and 3-D FEM models

Geometry Representation for FEM Analysis

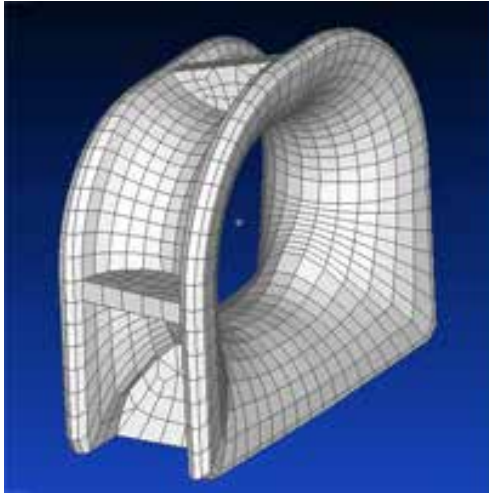


Figure 1: mesh analysis

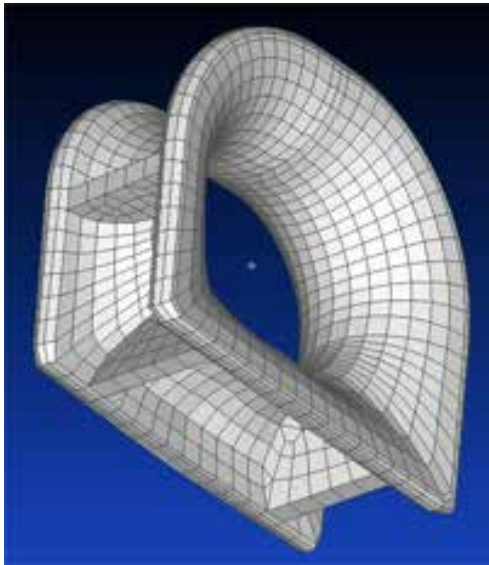


Figure 2

Resultant stresses of the applied loads

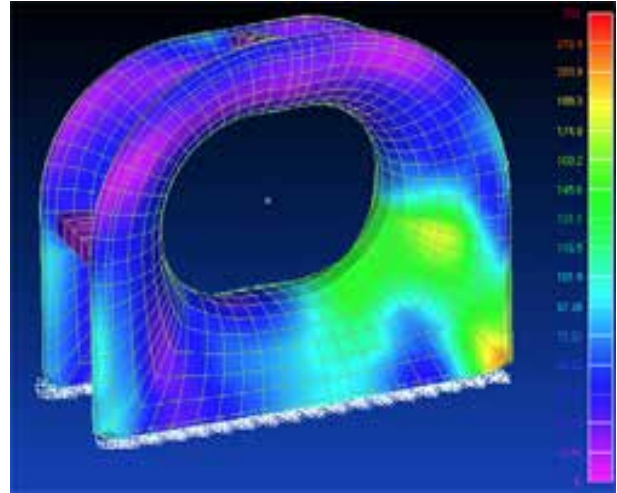


Figure 3: solid elements provide realistic stress values

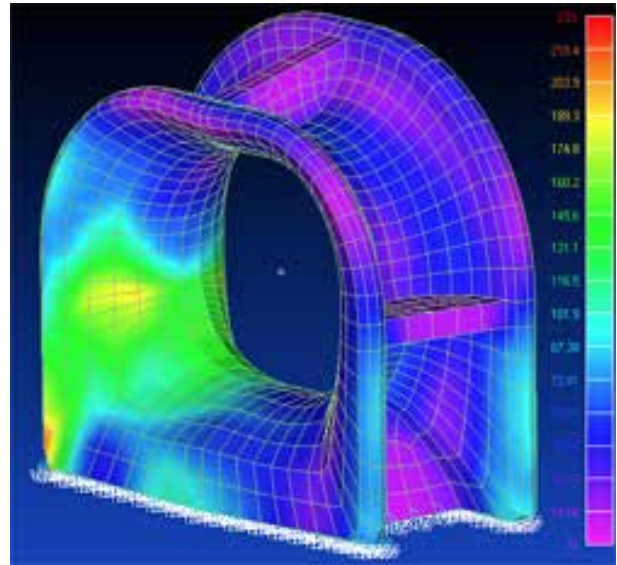


Figure 4: resultant stresses

Grillage Analysis 3-D Nauticus

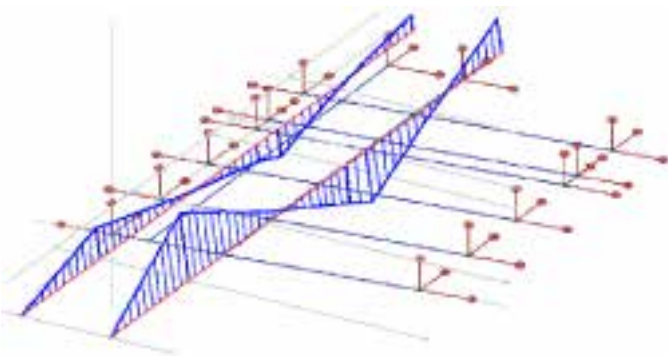


Figure 5

Boundary conditions and loads are applied while Von Mises stresses are evaluated in respect to the material yielding limits.

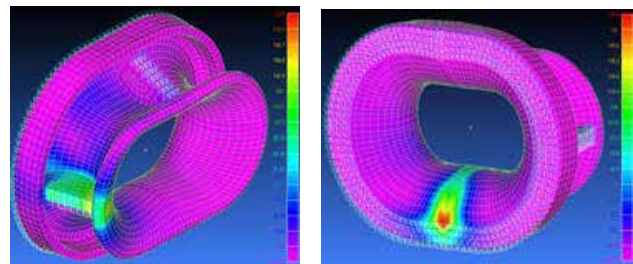


Figure 6