GL Group

GL HullManager & GL Poseidon

27.09.2012

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2005 – Biuro Projektowe Stoczni Gdynia S.A.
- Dział obliczeń teoretycznych

2006 – dyplom – Katedra Teorii i Projektowania Okrętów
- Projekt wstępny kontenerowca komorowego dla Stoczni Gdynia S.A.

2006 – Germanischer Lloyd Polen, sp. z o.o.
- Emergency Response Service
- Teamleader of Engineering Services Gdansk

2007 – Politechnika Gdańska
- Katedra Teorii i Projektowania Okrętów - wykładowca

Headline

- GL Group
- GL HullManager
- GL Poseidon
- Inne zastosowania Poseidon-a
- Podsumowanie
- Pytania

GL Group

Business Segments of the GL Group

maritime services

Germanischer Lloyd

- Classification:
  - Fleet Service
  - Ship Newbuilding
  - Maritime Systems & Components
  - Research & Rule Development
- Maritime Solutions:
  - Consulting
  - Engineering
  - Certification
  - Maritime Software
  - Training

oil & gas

GL Noble Denton

- Technical Assurance
- Risk, Safety & Integrity Management
- Marine Consulting
- Engineering Consulting
- Technical Software

renewables

GL Garrad Hassan

- Engineering Consulting
- Marine Operations
- Measurements
- Software Products
- Training

GL Renewables Certification

- Component Certification
- Type Certification
- Project Certification
- Training & Seminars
- Guidelines

Segment origins

1867

Foundation meeting of Germanischer Lloyd at the Hamburg Stock Exchange.
The first GL Construction Rules for wooden ships were published.

1973

GL assesses the design of the “North Sea” research platform and is involved in the construction of the first German oil platform “Mittelplate” in the German Bight.

1977

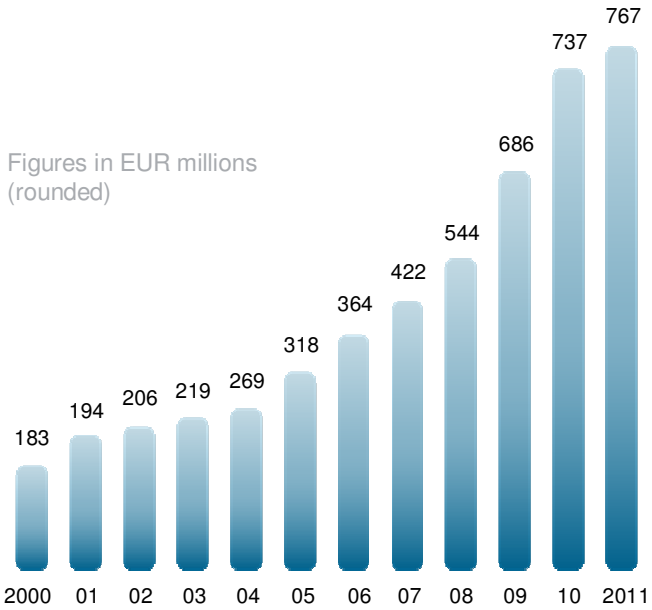
GL offers its first design approval for wind energy systems beginning its commitment to this fast growing business.

Facts & Figures

REVENUE

- 2011 showed a 4.2 per cent increase over 2010.

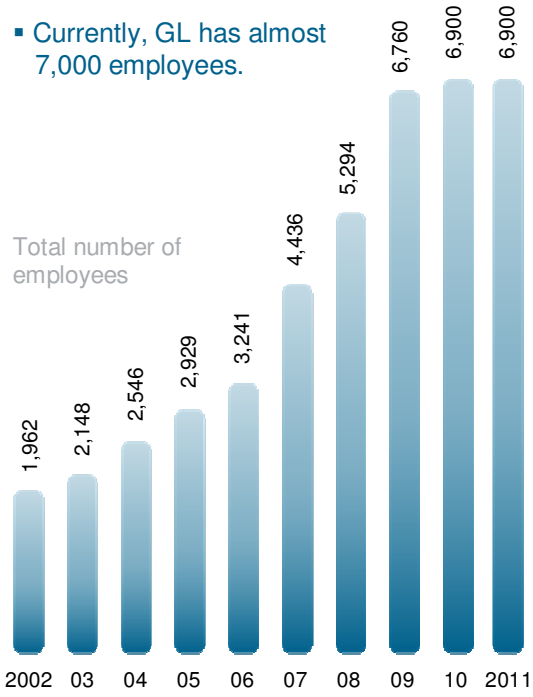
Figures in EUR millions (rounded)



STAFF

- Currently, GL has almost 7,000 employees.

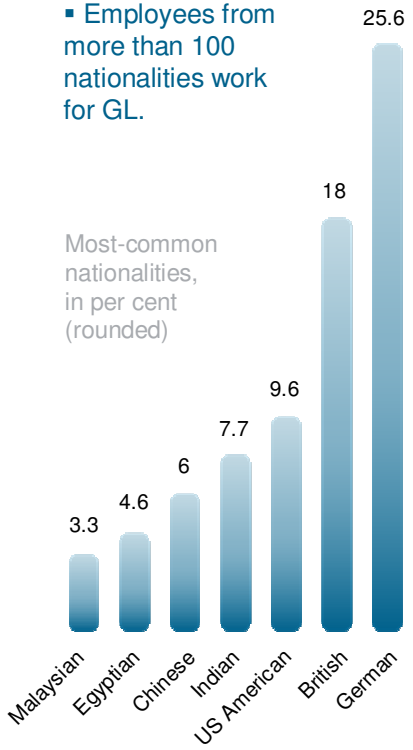
Total number of employees



GLOBAL MINDSET

- Employees from more than 100 nationalities work for GL.

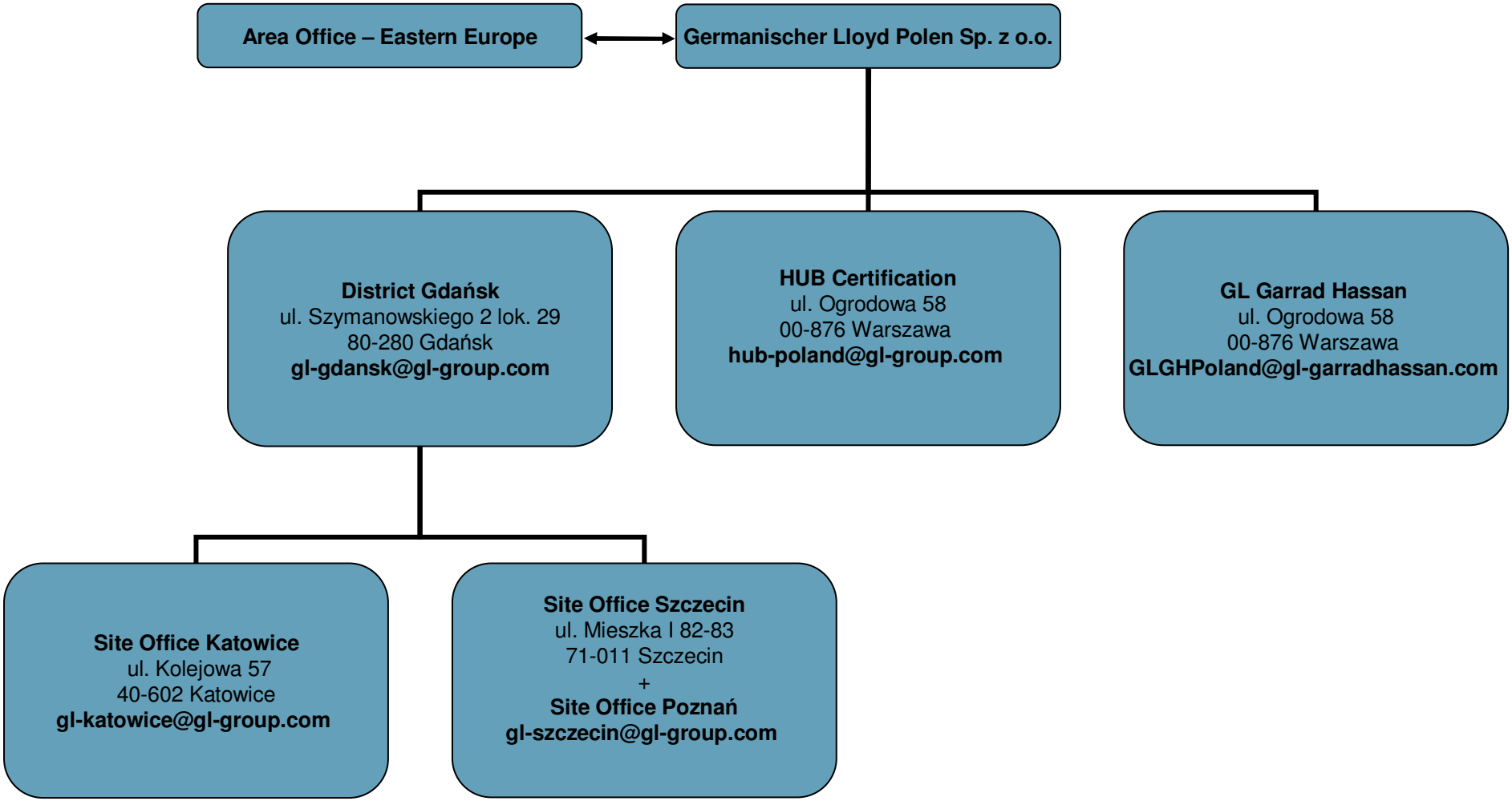
Most-common nationalities, in per cent (rounded)

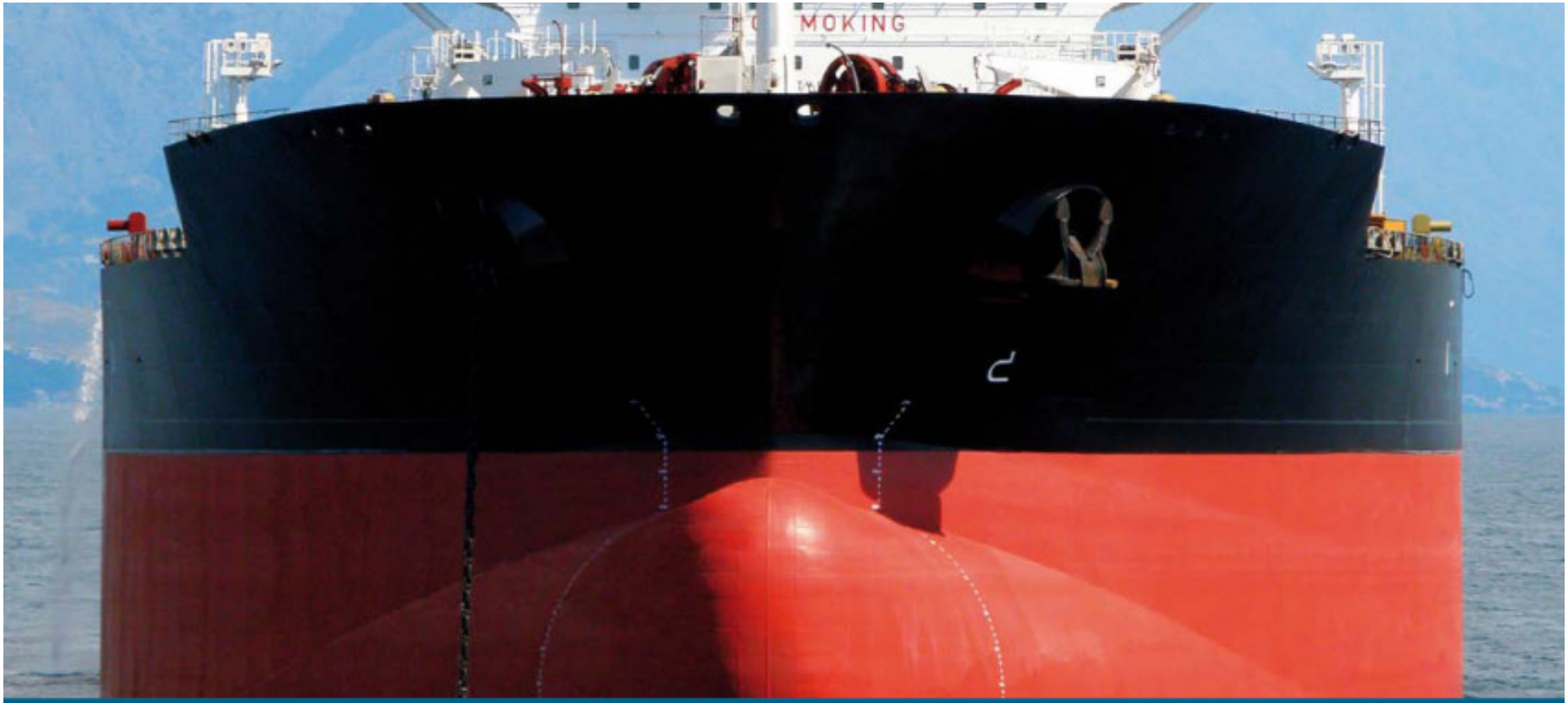


Know-how on a Global Scale

GL offers services on a global scale. Key locations serve as designated centres of expertise to support more than 200 GL offices in 80 countries.

Germanischer Lloyd w Polsce





GL HullManager

GL Hullmanager
monitorowanie stanu kadłuba

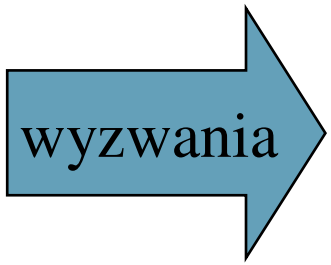
GL HullManager jest oprogramowaniem, przenoszącym zarządzanie kadłubem statku na kolejny poziom oferując rozszerzone możliwości nadzoru.

Ułatwia zapanowanie nad integralnością kadłuba, począwszy od inspekcji, poprzez ocenę i raportowanie stanu zbiorników, ładowni, powłok itp., i zapewnia, że statek jest utrzymany w dobrym stanie technicznym.

GL Hullmanager – why?

Shipping companies - charterers

Ograniczenie kosztów utrzymania statku



- wzrasta intensywność inspekcji
- problemy w jednoznaczej ocenie stanu kadłuba
- problemy w aktualności danych: onboard - onshore
- zbyt kosztowne porównywanie ze sobą np. statków siostrzanych

Owner's hull inspections today have challenges

Przykłady

- Często tylko opis tekstowy miejsca uszkodzenia
- → wątpliwości dotyczące aktualnego stanu np. zbiornika
- Wymagany jest standardowy formularz raportu
- Czasami brak ustandaryzowanej procedury
- Konieczne jest szkolenie załogi w celu przeprowadzenia inspekcji
- Wymagane jest systematyczne wprowadzanie zaleceń kolejnych kontroli

Name of space	Date	Results of inspection				Additional for void spaces		Remarks
		Condition of coating (% of coating defects)	Condition of steel internals (hull structure)	Condition of internal piping	Amount of sediments (Kind and average heigh)	Wet or Dry (W / D)	Reason of wet condition (condensation, leakage etc.)	
2UP S	06.03.2007	50-60 %, There are rusty spots	GOOD Condition of anodes bars on all "floors" are still GOOD	GOOD	Inspection had been carried out from bottom to up. "Ground floor" - looking like sand, height 2-3 mm average, no mud, no paint residues	D	-	Condition can be counted like SATISFACTORY
6 P	14.03.2007	40-50 %, There are rusty spots	GOOD Condition of anodes bars on all "floors" are still GOOD	GOOD	Inspection had been carried out from bottom to up. "Ground floor" - looking like sand, height 1-2 mm average, no mud, no paint residues	D	-	Condition can be counted like SATISFACTORY
6 S	17.03.2007	40-50 %, There are rusty spots	GOOD Condition of anodes bars on all "floors" are still GOOD	GOOD	Inspection had been carried out from bottom to up. "Ground floor" - looking like sand, height 1-2 mm average, no mud, no paint residues	D	-	Condition can be counted like SATISFACTORY

Cel GL HullManager-a

Wsparcie dla ‘wizualnej’ inspekcji stanu kadłuba oraz oceny jego stanu przez cały cykl jego życia.

Pełne wsparcie integralności kadłuba:

Definiowanie strategii inspekcji,

- przeprowadzanie inspekcji,
- ocena oraz dokumentowanie wyników

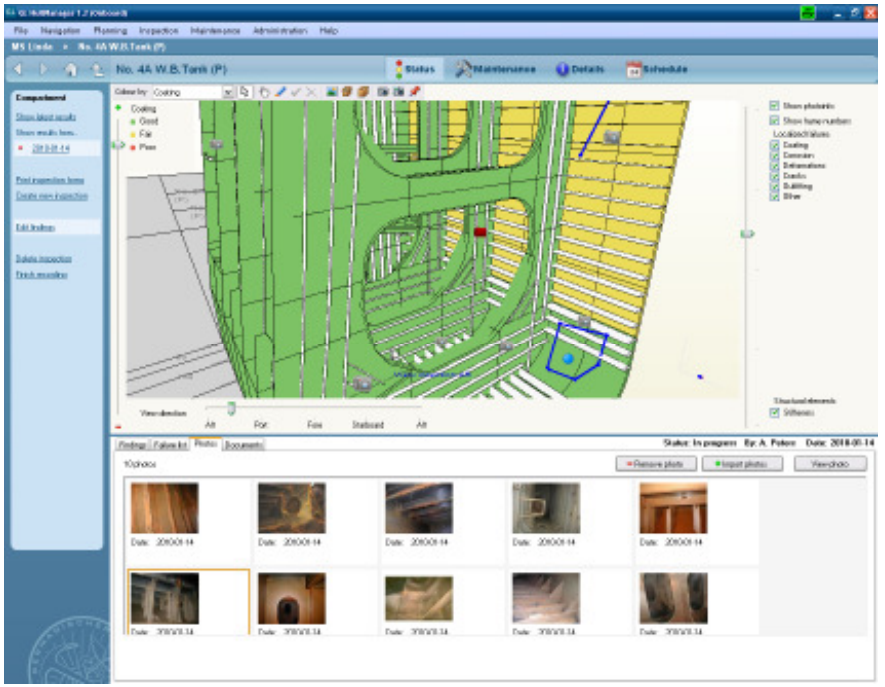
Indywidualny model 3D używany w sposób interaktywny

- oznaczanie „znalezisk”
- dodawanie zdjęć i opisów

Prezentacja wyników pomiarów grubości

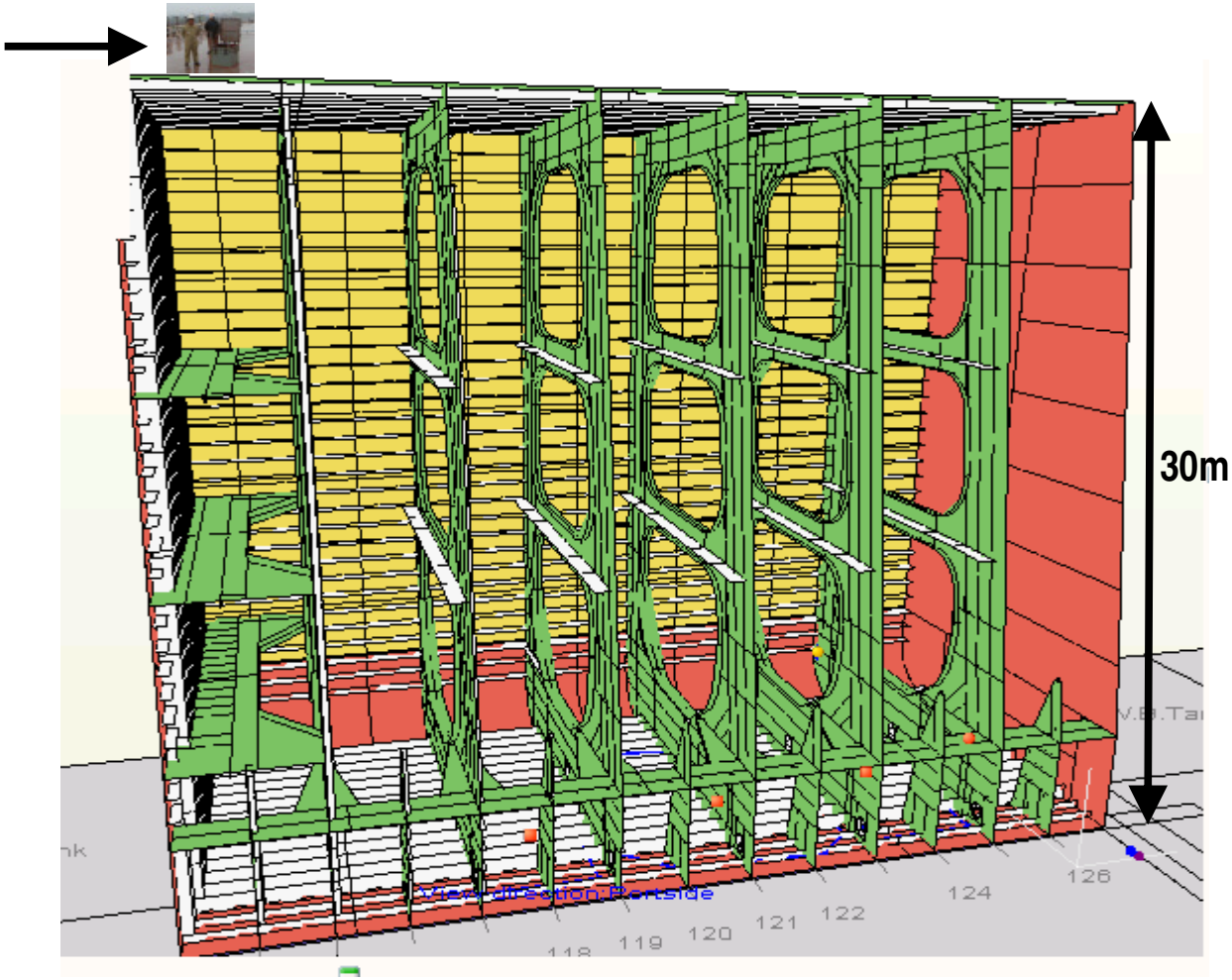
Kompleksowa obsługa i wsparcie

- „Hull Survey guideline”
- „Hull Monitoring seminar”



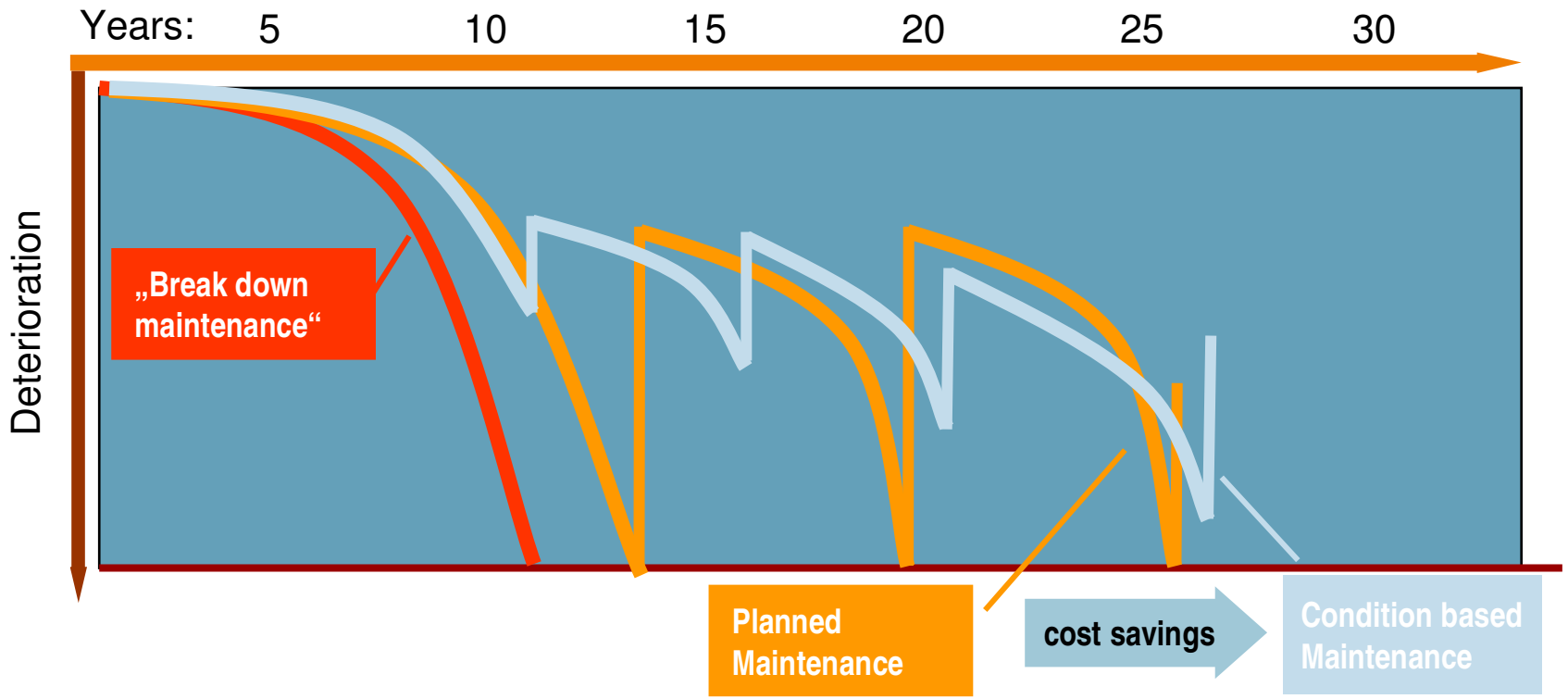
Czy wizualizacja inspekcji jest konieczna?

Jak zlokalizować pęknięcie wewnątrz zbiornika jeżeli jest opisane tylko słowami?



→ Graficzne wskazanie nieprawidłowości + zdjęcia i opis

Why maintenance: because you want your vessel to serve your clients



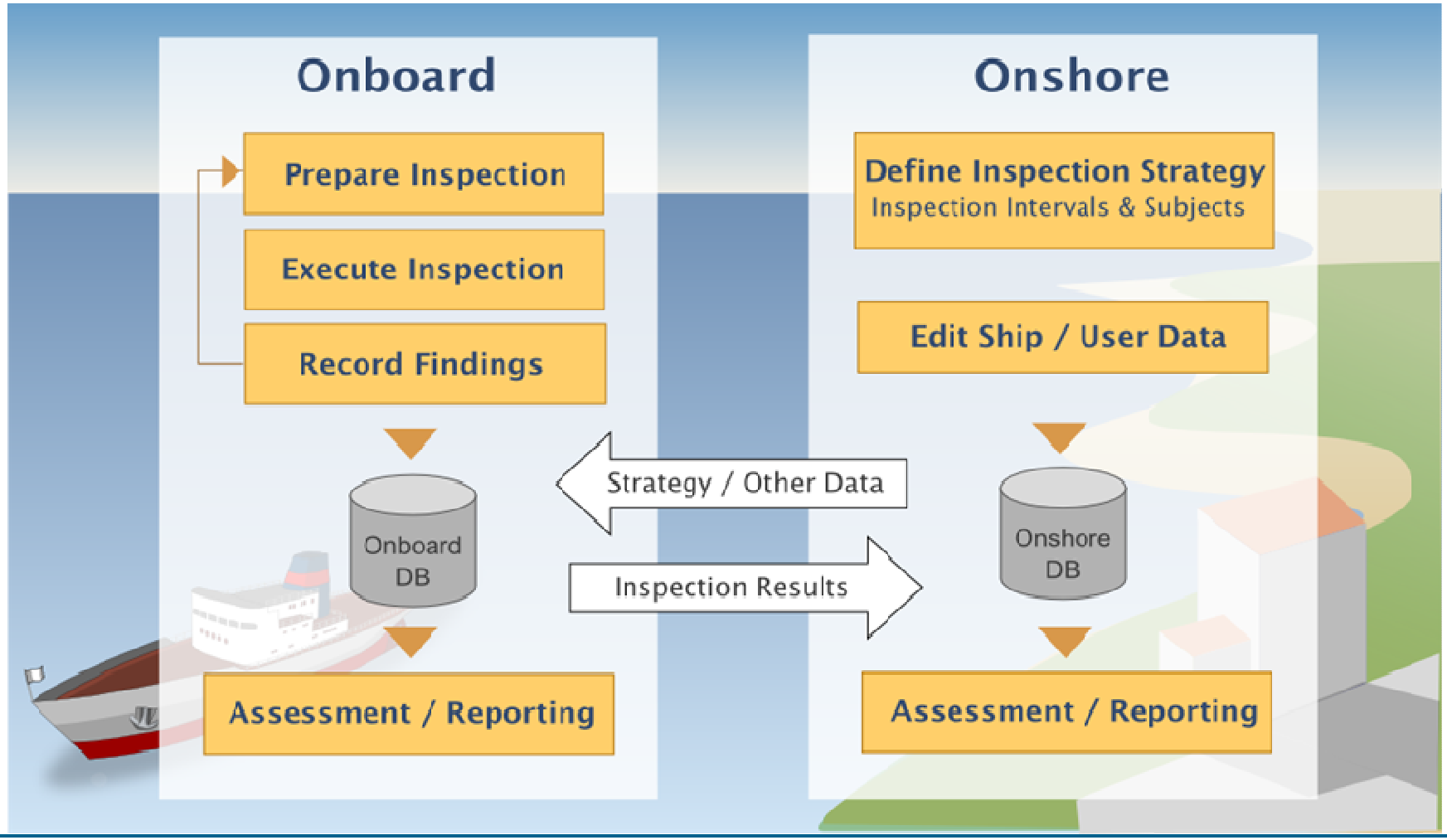
It’s all about money !!!

Przykładowe koszty ...

- 1 Day Off-Hire: USD 5.000 - USD 40.000

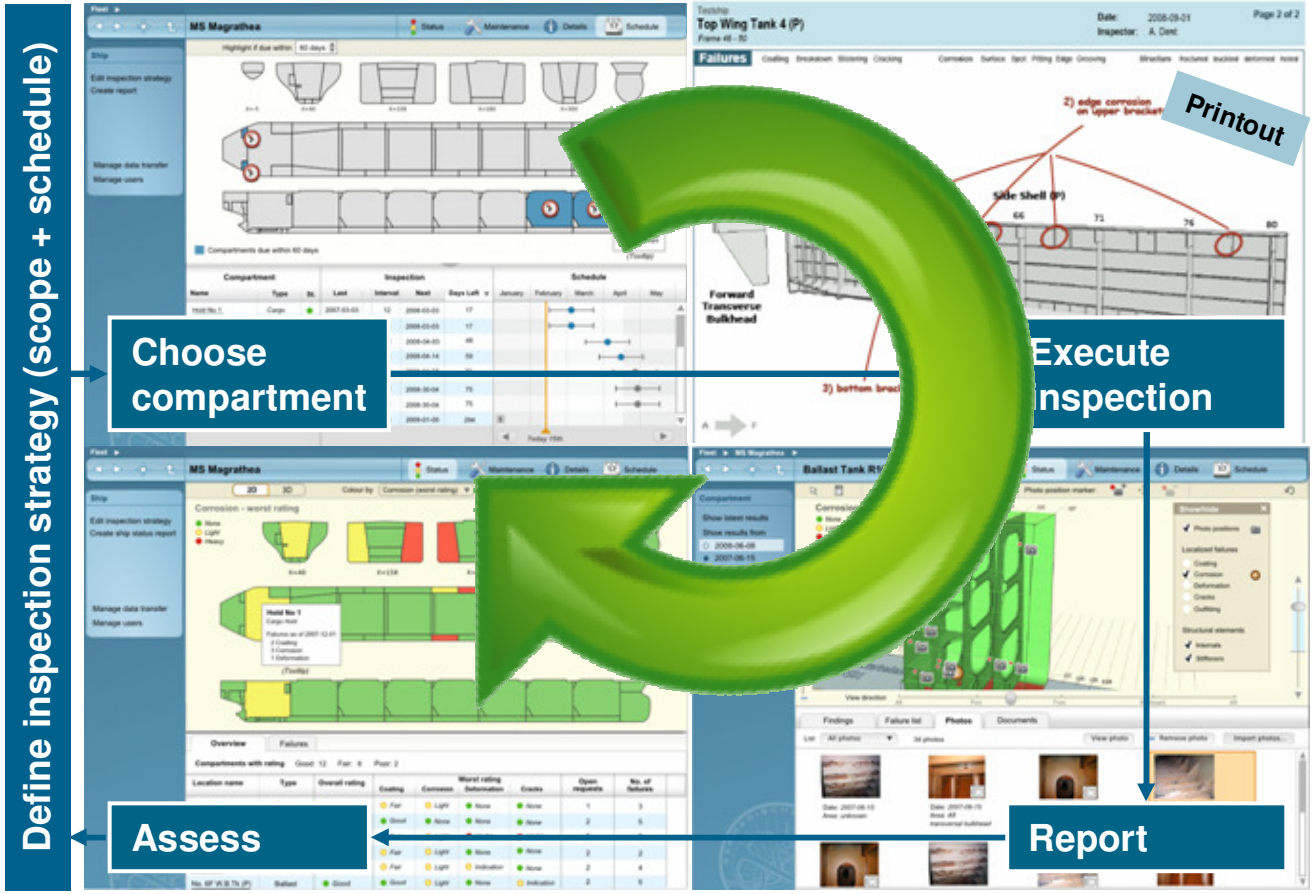
- 1 Average Steel Repair: USD 20.000 - USD 200.000

Jak GL HullManager działa? - Overview



Jak GL HullManager działa? - Detailed

- Asset integrity management for the ship hull
- Implement inspection strategy (schedule, scope)
- Mark and assess findings in 3D
- Attach photos to 3D model
- Synchronize onboard and onshore databases
- Plan repairs



Korzyści ze stosowania ciągłego nadzoru

Wczesne wykrywanie poprzez systematyczne monitorowanie i raportowanie przez załogę

Przykłady:

Wczesne wykrycie uszkodzeń wżerowych (pitting damages)

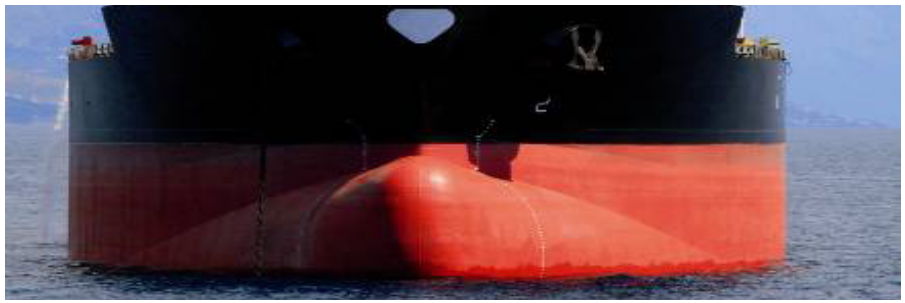
- Zastosowanie przez załogę wypełniacza zamiast spawania przez „reparing team”

Wczesne wykrycie zużycia anod

- Zapobieganie szybko postępującej korozji

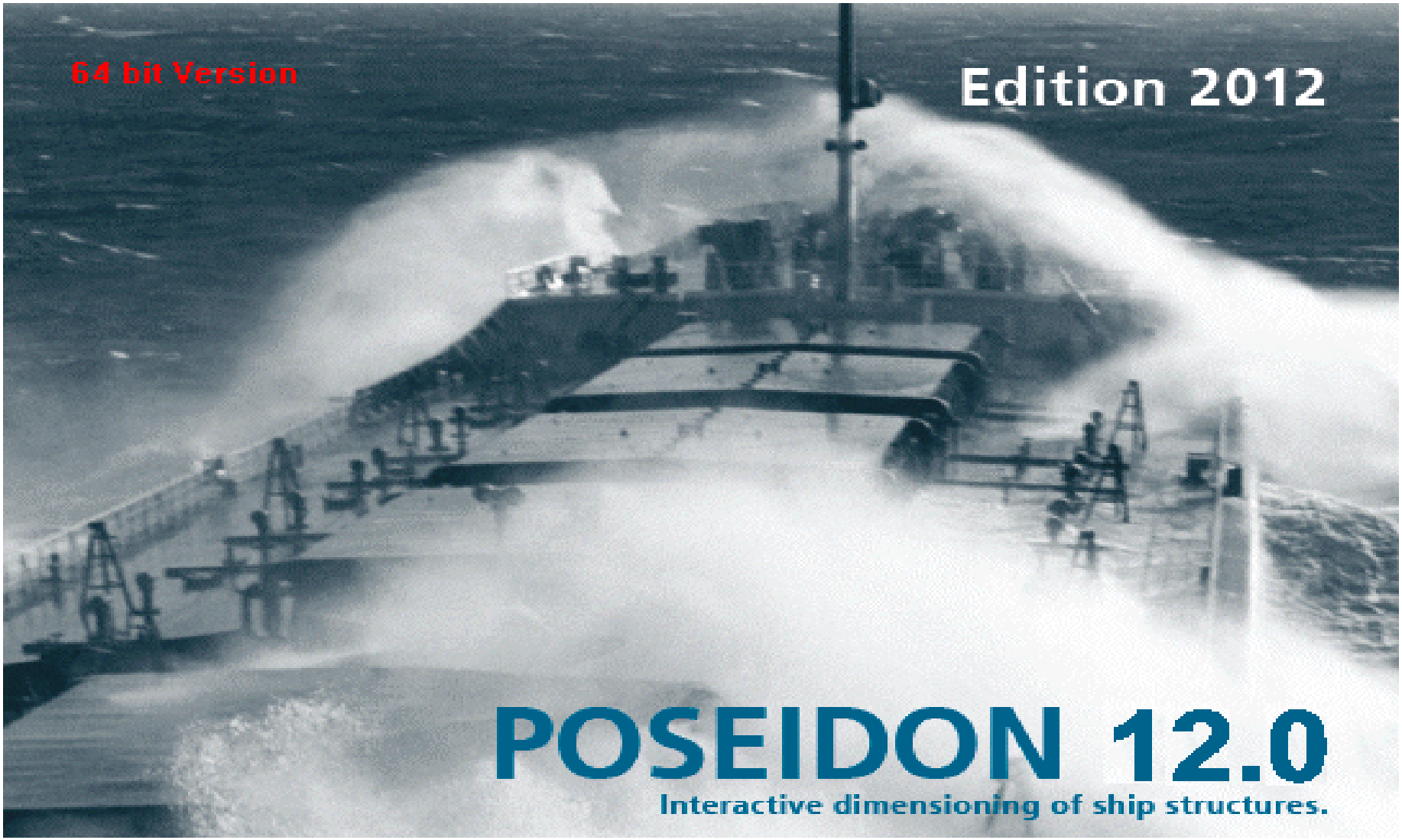
Wczesne wykrycie uszkodzenia powłoki (np. w zbiorniku)

- Brak konieczności piaskowania i pokrywania powłoką całego zbiornika na nowo



GL HullManager - podsumowanie

- Wczesne wykrywanie uszkodzeń kadłuba
- Unikanie drogich napraw poprzez ciągłą dbałość załogi o stan kadłuba
- Zwarta i aktualna informacja na temat stanu kadłuba z dostępem do archiwalnych informacji (inspekcji, napraw, problemów etc.)
- Szczegółowe i oparte na aktualnym stanie kadłuba plany inspekcji
- Redukcja ilości oraz czasu dokowania
- Szybkie porównanie statusu floty/statków siostrzanych aby uniknąć częstych problemów
- Identyczny model „on shore ” i „on board”
- Zintegrowanie wyników obliczeń z przeglądami klasowymi GL


64 bit Version
Edition 2012
POSEIDON 12.0
Interactive dimensioning of ship structures.

GL HullManager – GL Poseidon

GL Poseidon to narzędzie stworzone do projektowania i analizy konstrukcji statku, **przeznaczone dla stoczni, biur projektowych oraz właścicieli i operatorów statków.** Cechuje go przejrzysty interfejs, bogatośc funkcji i intuicyjny układ pozwalający na szybką pracę.

GL POSEIDON został opracowany **przez projektantów statków dla projektantów statków**. Jego logiczna, intuicyjna struktura i przyjazny interfejs użytkownika mogą być używane przez każdego obeznanego z PC i projektowaniem statków. POSEIDON jest doskonałym narzędziem do redukcji planowanych kosztów utrzymania i minimalizacji niezaplanowanych prac remontowych.

Structural Design Software of other Classification Societies

Name of Software	Class
GL POSEIDON	**GL**
NAUTICUS – HULL	DNV
SAFE HULL	ABS
SHIP RIGHT	LR
VERISTAR	BV

Nauticus – Hull (DNV)

- Podstawowy pakiet pokrywa tylko sprawdzenie z wymaganiami klasyfikacyjnymi (Rule check)
- Brak własnego modułu FE
- Kilka innych programów (3D Ship Modeller, FE Analysis, Wave) jest niezbędnych co podwyższa koszt dla klienta
- Spora ilość danych musi być wprowadzona aby uzyskać miarodajne wyniki

SAFE HULL (ABS)

- ABS sprzedaje program wraz ze znakiem klasy, co oznacza konieczność płacenia za każdy statek
- Struktura modułowa
- „Inny” program dla każdego typu statku!

GL Poseidon

Computer Supported Ship Hull Assessment

Rule Based Structural Design

First Principle Structural Design

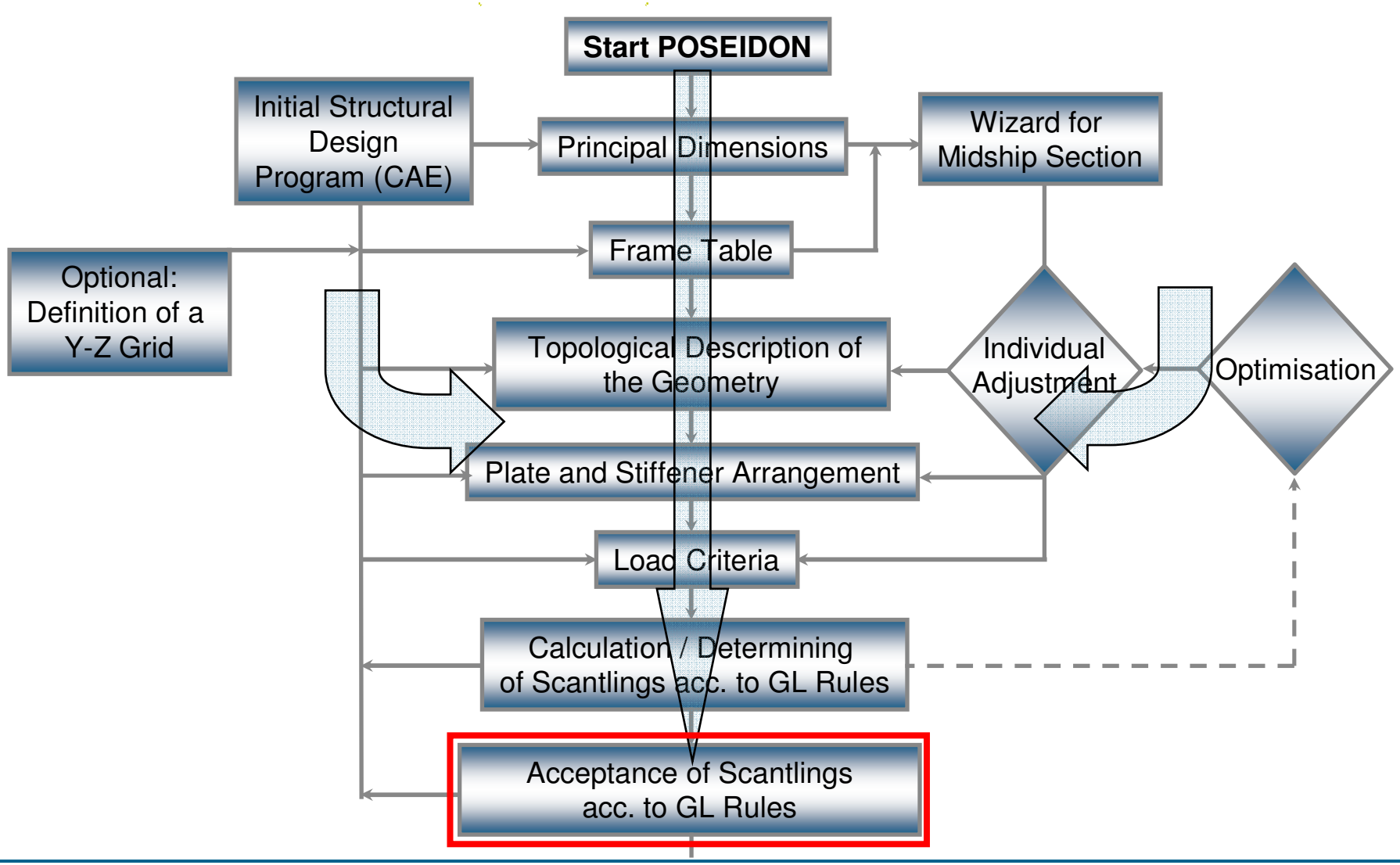
Condition Assessment

--- for all types of vessels ! ---

Filozofia POSEIDON-a

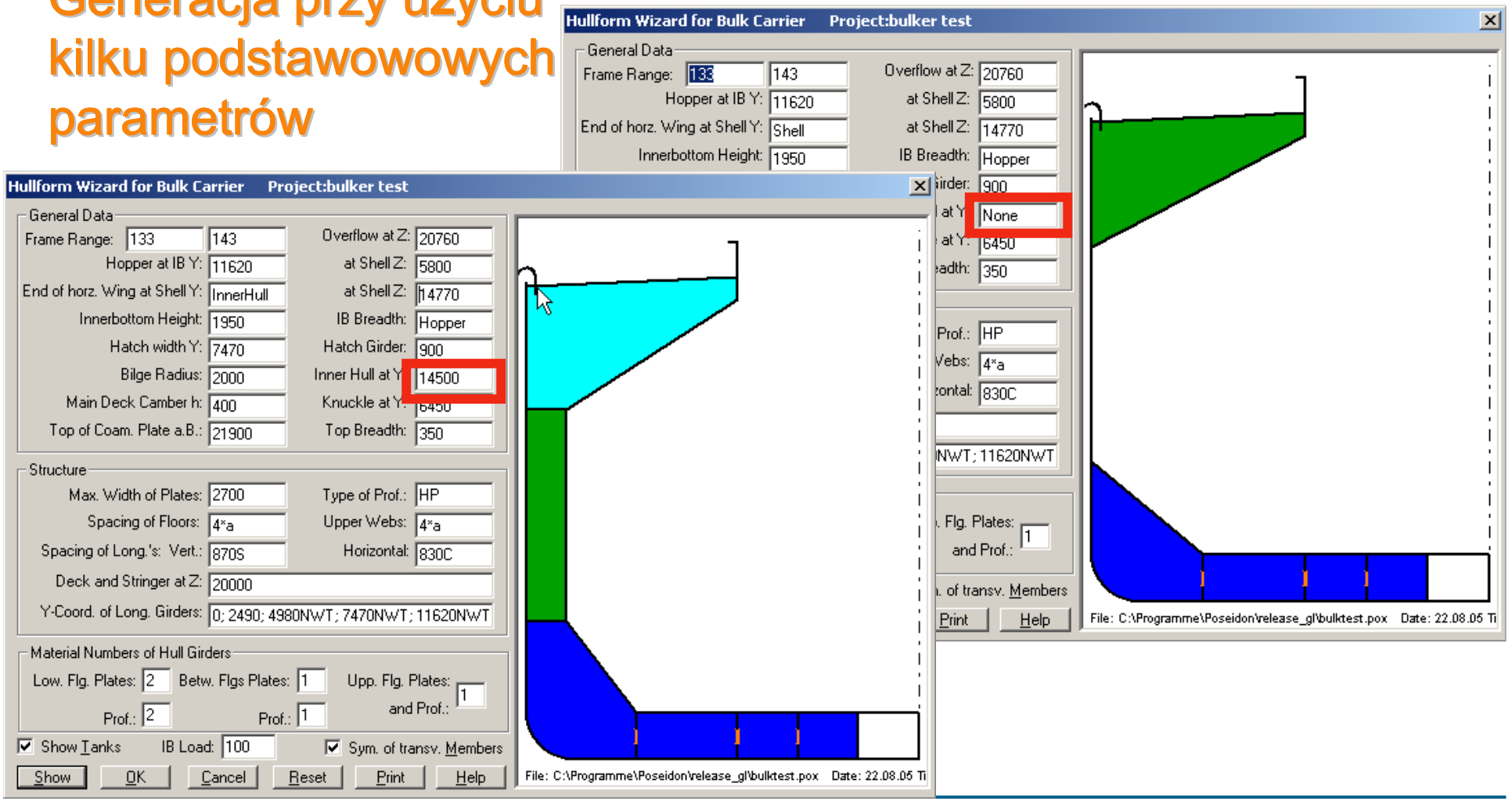
- GL POSEIDON został stworzony i jest rozwijany głownie w kierunku spełnienia wymagań stoczni oraz biur projektowych
- intuicyjny i przejrzysty interface (user friendly)
- pierwsze rezultaty możliwe do uzyskania przy niewielkim wkładzie pracy
- wyznaczanie wymiarów elementów konstrukcyjnych w oparciu o przepisy klasyfikacyjne GL

Scantlings according to GL-Rules



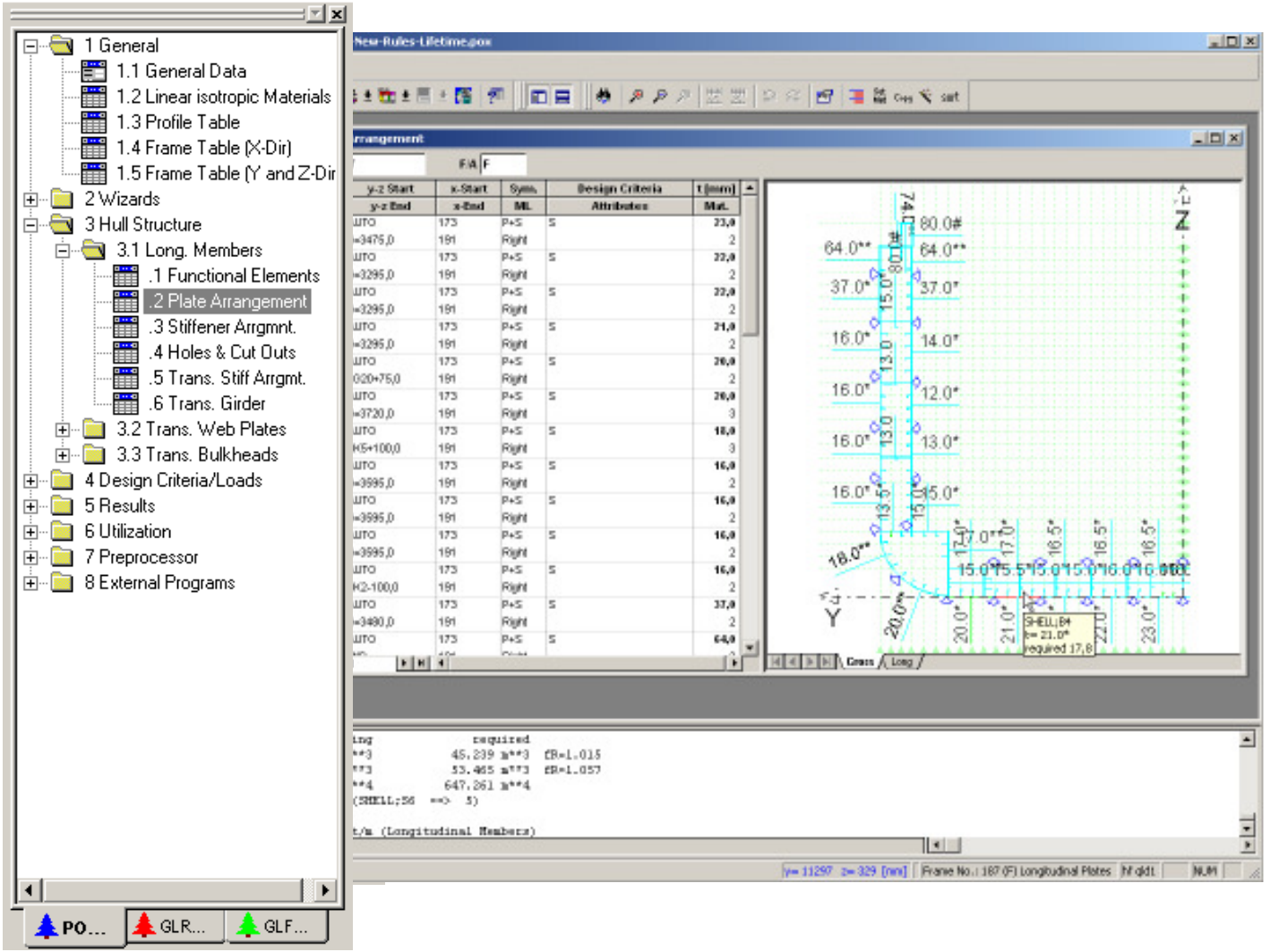
Generator dla typowego owręża

Generacja przy użyciu kilku podstawowowych parametrów



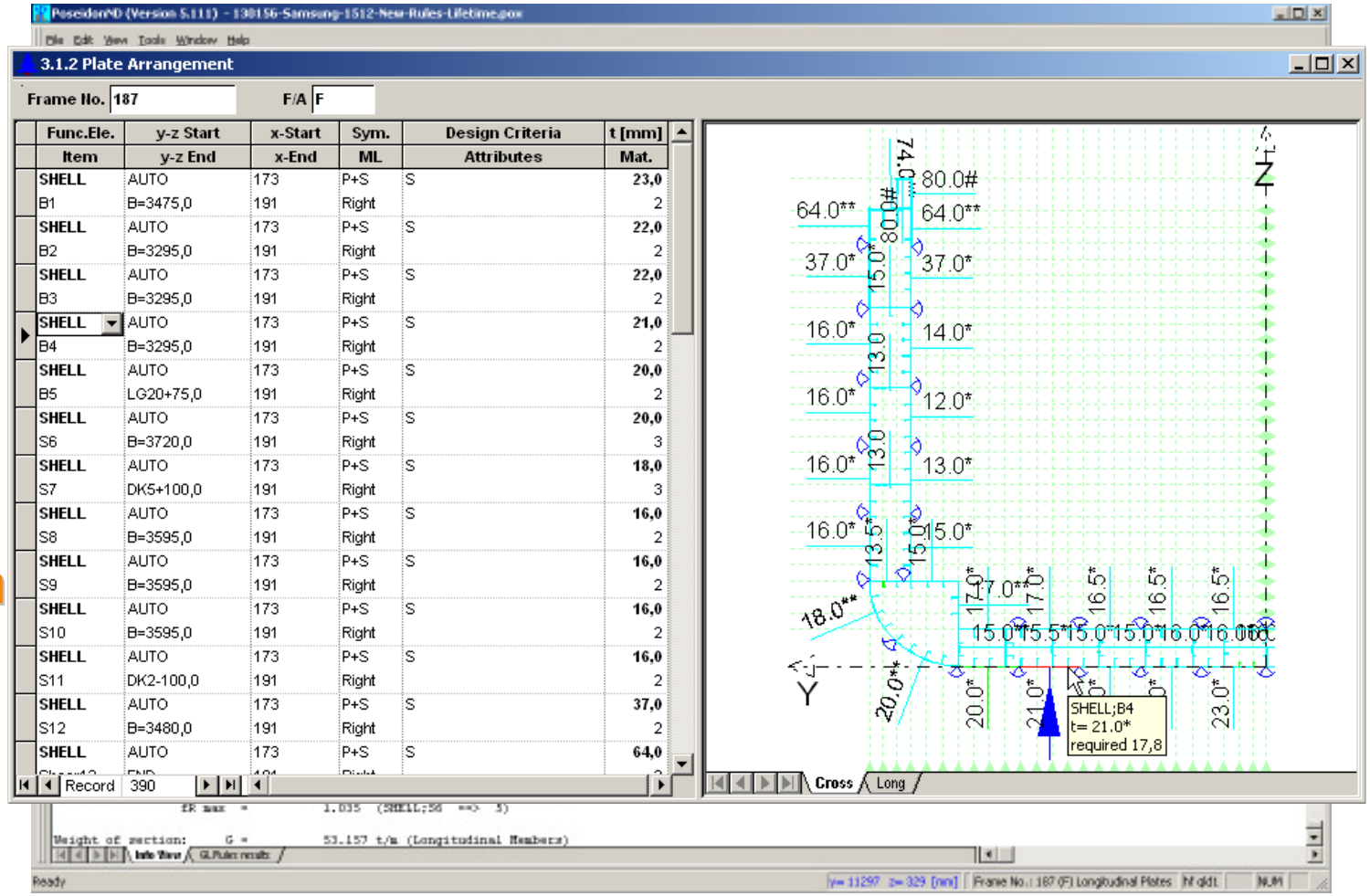
The Graphical User Interface

Hierarchiczny układ (tree view) pozwala na szybki przegląd i nawigacje pomiędzy poszczególnymi modułami programu



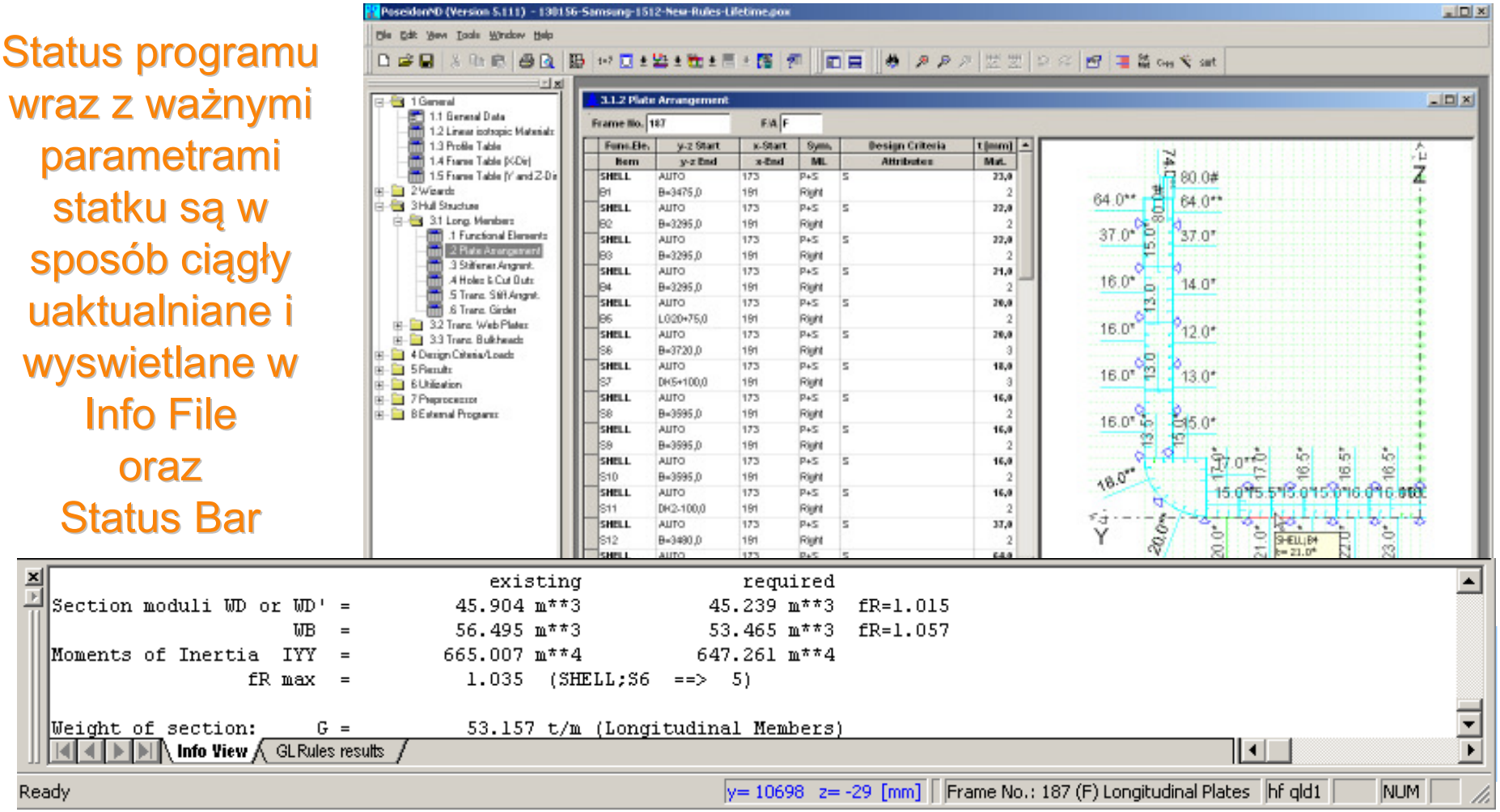
The Graphical User Interface

Zwarte dane tabelaryczne połączone są z interaktywnym oknem graficznym



The Graphical User Interface

Status programu wraz z ważnymi parametrami statku są w sposób ciągły uaktualniane i wyswietlane w Info File oraz Status Bar



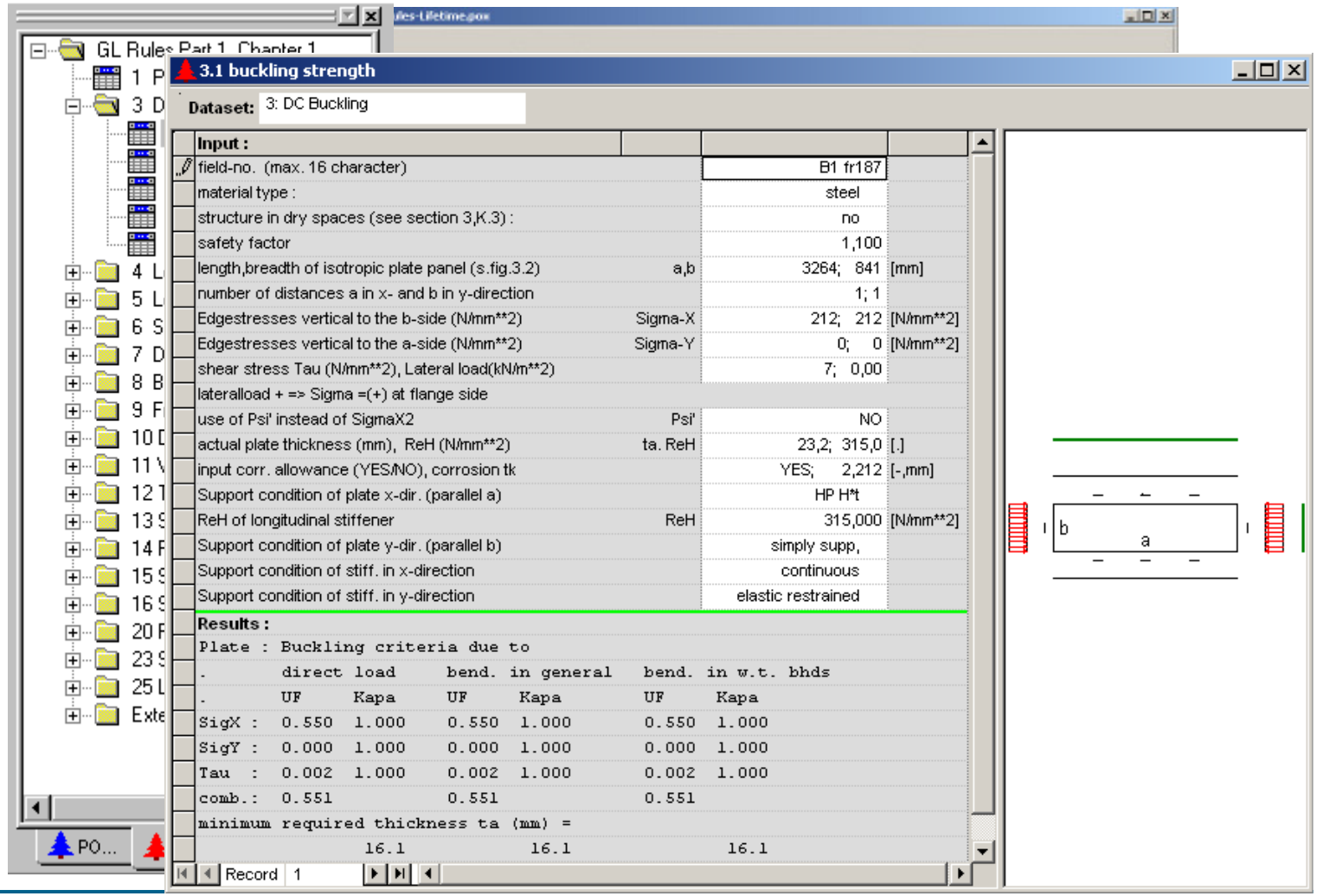

```
                                    existing              required
Section moduli WD or WD' =          45.904 m**3           45.239 m**3   fR=1.015
                       WB =         56.495 m**3           53.465 m**3   fR=1.057
Moments of Inertia  IYY  =        665.007 m**4          647.261 m**4
                  fR max =          1.035   (SHELL;S6   ==>   5)

Weight of section:     G =          53.157 t/m (Longitudinal Members)
```

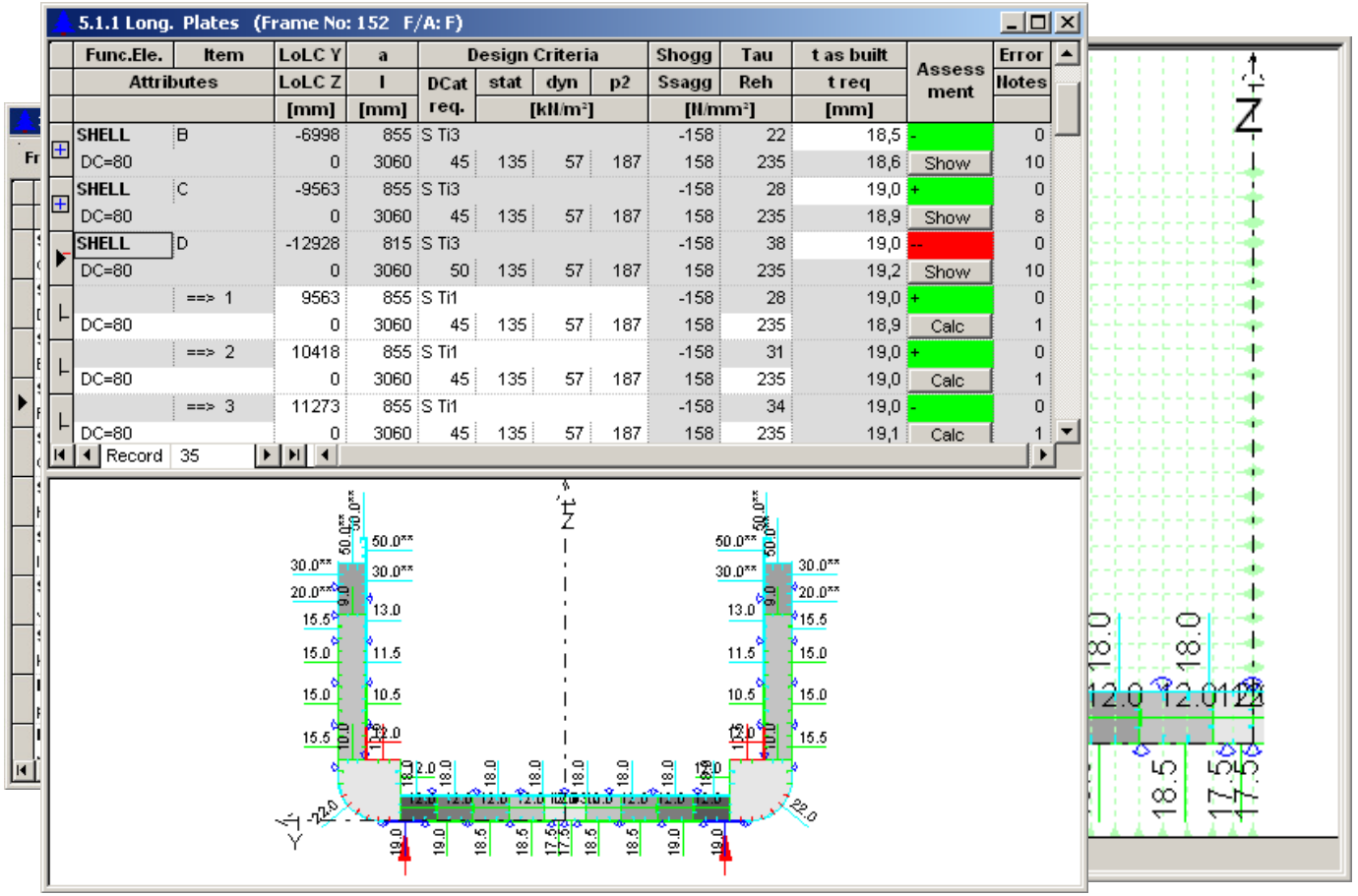

GL Group

The Graphical User Interface

Aktualne przepisy GL są zintegrowane

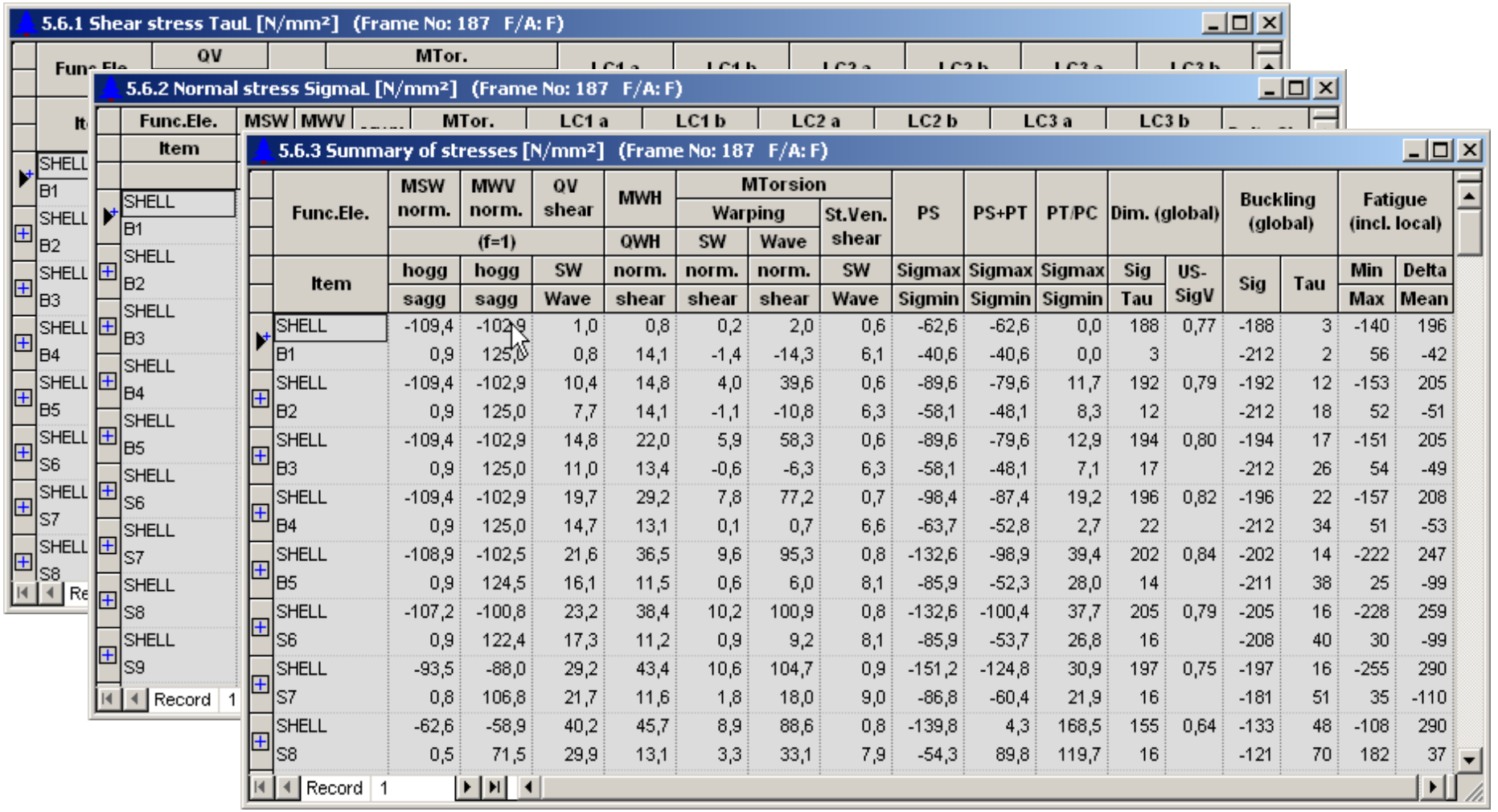


Pierwsze rezultaty wymiarowania w GL Poseidon



Dodatkowo szczegółowe informacje w formie tabelarczynej dla wszystkich elementów

Stress tabulars for all structural members



5.6.1 Shear stress TauL [N/mm²] (Frame No: 187 F/A: F)

Func.Ele.	QV	MTor.	LC1 a	LC1 b	LC2 a	LC2 b	LC3 a	LC3 b
Item								
SHELL								
B1								
SHELL								
B2								
SHELL								
B3								
SHELL								
B4								
SHELL								
B5								
SHELL								
S6								
SHELL								
S7								
SHELL								
S8								

5.6.2 Normal stress SigmaL [N/mm²] (Frame No: 187 F/A: F)

Func.Ele.	MSW	MWV	MTor.	LC1 a	LC1 b	LC2 a	LC2 b	LC3 a	LC3 b
Item									
SHELL									
B1									
SHELL									
B2									
SHELL									
B3									
SHELL									
B4									
SHELL									
B5									
SHELL									
S6									
SHELL									
S7									
SHELL									
S8									
SHELL									
S9									

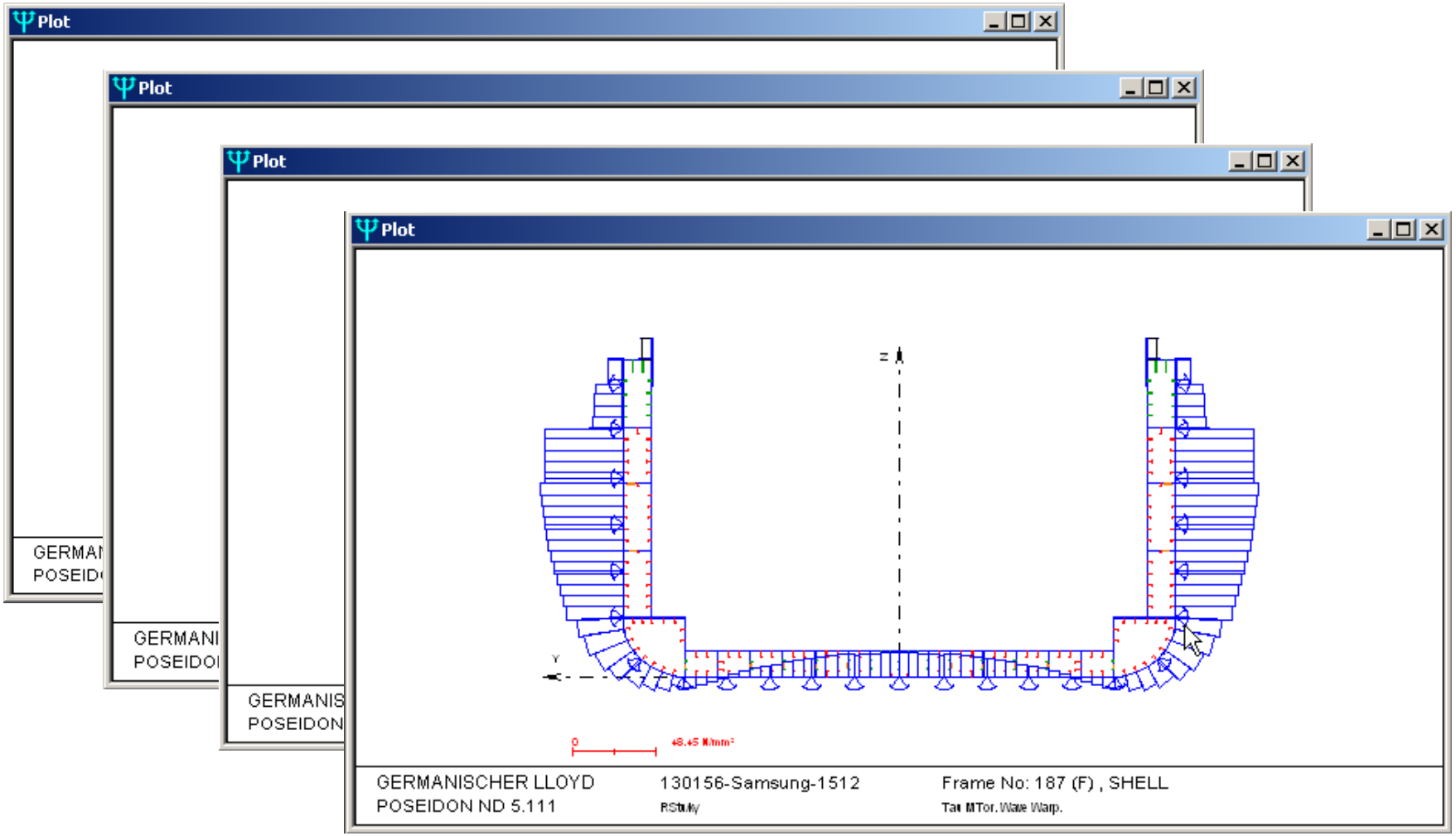
Record 1

5.6.3 Summary of stresses [N/mm²] (Frame No: 187 F/A: F)

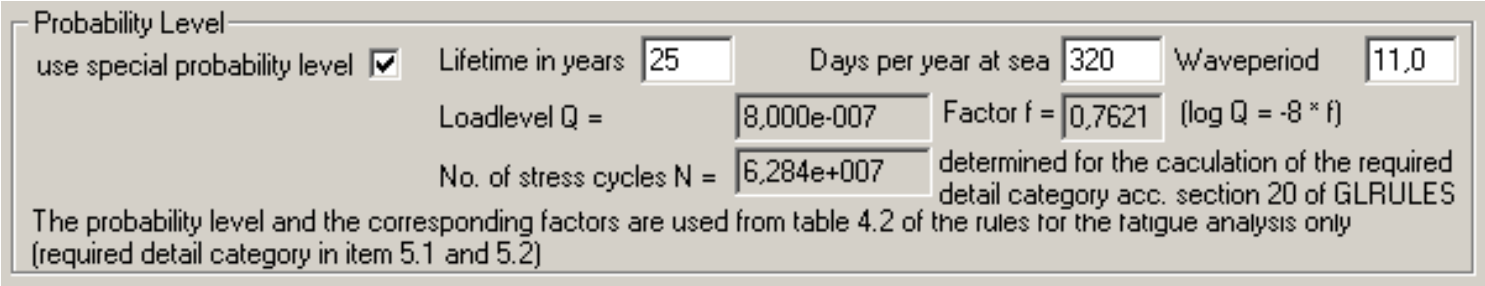
Func.Ele.	MSW norm.	MWV norm.	QV shear	MWH	MTorsion			PS	PS+PT	PT/PC	Dim. (global)		Buckling (global)		Fatigue (incl. local)	
	(f=1)			QWH	Warping		St.Ven. shear									
Item	hogg / sagg	hogg / sagg	SW / Wave	norm. / shear	norm. / shear	norm. / shear	SW / Wave	Sigmax / Sigmin	Sigmax / Sigmin	Sigmax / Sigmin	Sig / Tau	US-SigV	Sig	Tau	Min / Max	Delta / Mean
SHELL	-109,4	-102,9	1,0	0,8	0,2	2,0	0,6	-62,6	-62,6	0,0	188	0,77	-188	3	-140	196
B1	0,9	125,0	0,8	14,1	-1,4	-14,3	6,1	-40,6	-40,6	0,0	3		-212	2	56	-42
SHELL	-109,4	-102,9	10,4	14,8	4,0	39,6	0,6	-89,6	-79,6	11,7	192	0,79	-192	12	-153	205
B2	0,9	125,0	7,7	14,1	-1,1	-10,8	6,3	-58,1	-48,1	8,3	12		-212	18	52	-51
SHELL	-109,4	-102,9	14,8	22,0	5,9	58,3	0,6	-89,6	-79,6	12,9	194	0,80	-194	17	-151	205
B3	0,9	125,0	11,0	13,4	-0,6	-6,3	6,3	-58,1	-48,1	7,1	17		-212	26	54	-49
SHELL	-109,4	-102,9	19,7	29,2	7,8	77,2	0,7	-98,4	-87,4	19,2	196	0,82	-196	22	-157	208
B4	0,9	125,0	14,7	13,1	0,1	0,7	6,6	-63,7	-52,8	2,7	22		-212	34	51	-53
SHELL	-108,9	-102,5	21,6	36,5	9,6	95,3	0,8	-132,6	-98,9	39,4	202	0,84	-202	14	-222	247
B5	0,9	124,5	16,1	11,5	0,6	6,0	8,1	-85,9	-52,3	28,0	14		-211	38	25	-99
SHELL	-107,2	-100,8	23,2	38,4	10,2	100,9	0,8	-132,6	-100,4	37,7	205	0,79	-205	16	-228	259
S6	0,9	122,4	17,3	11,2	0,9	9,2	8,1	-85,9	-53,7	26,8	16		-208	40	30	-99
SHELL	-93,5	-88,0	29,2	43,4	10,6	104,7	0,9	-151,2	-124,8	30,9	197	0,75	-197	16	-255	290
S7	0,8	106,8	21,7	11,6	1,8	18,0	9,0	-86,8	-60,4	21,9	16		-181	51	35	-110
SHELL	-62,6	-58,9	40,2	45,7	8,9	88,6	0,8	-139,8	4,3	168,5	155	0,64	-133	48	-108	290
S8	0,5	71,5	29,9	13,1	3,3	33,1	7,9	-54,3	89,8	119,7	16		-121	70	182	37

Record 1

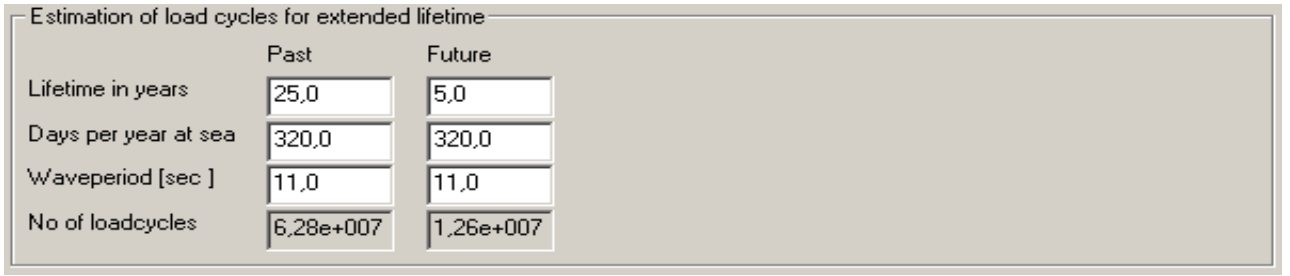
Examples for plotted stresses



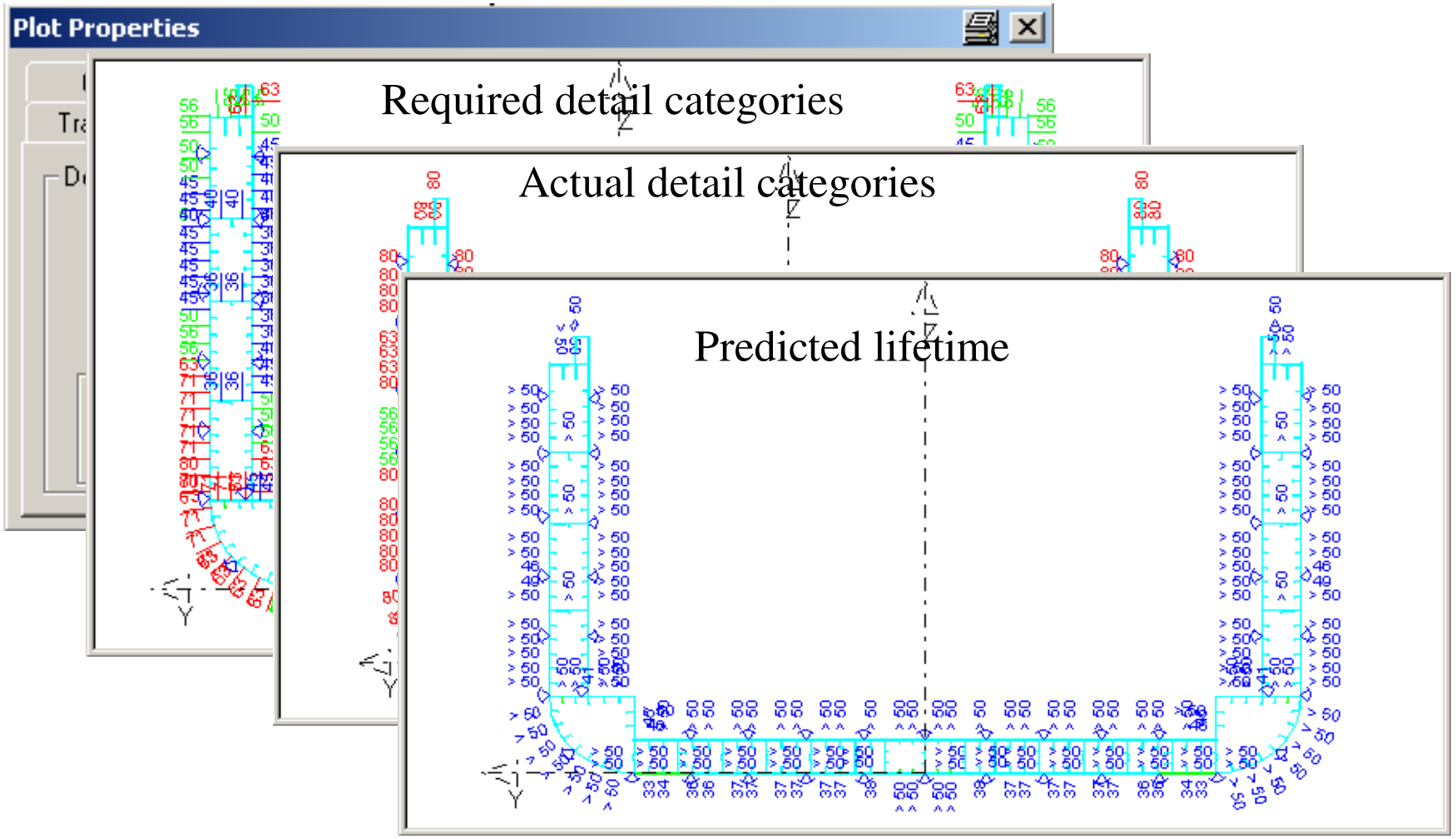
Base for lifetime evaluation



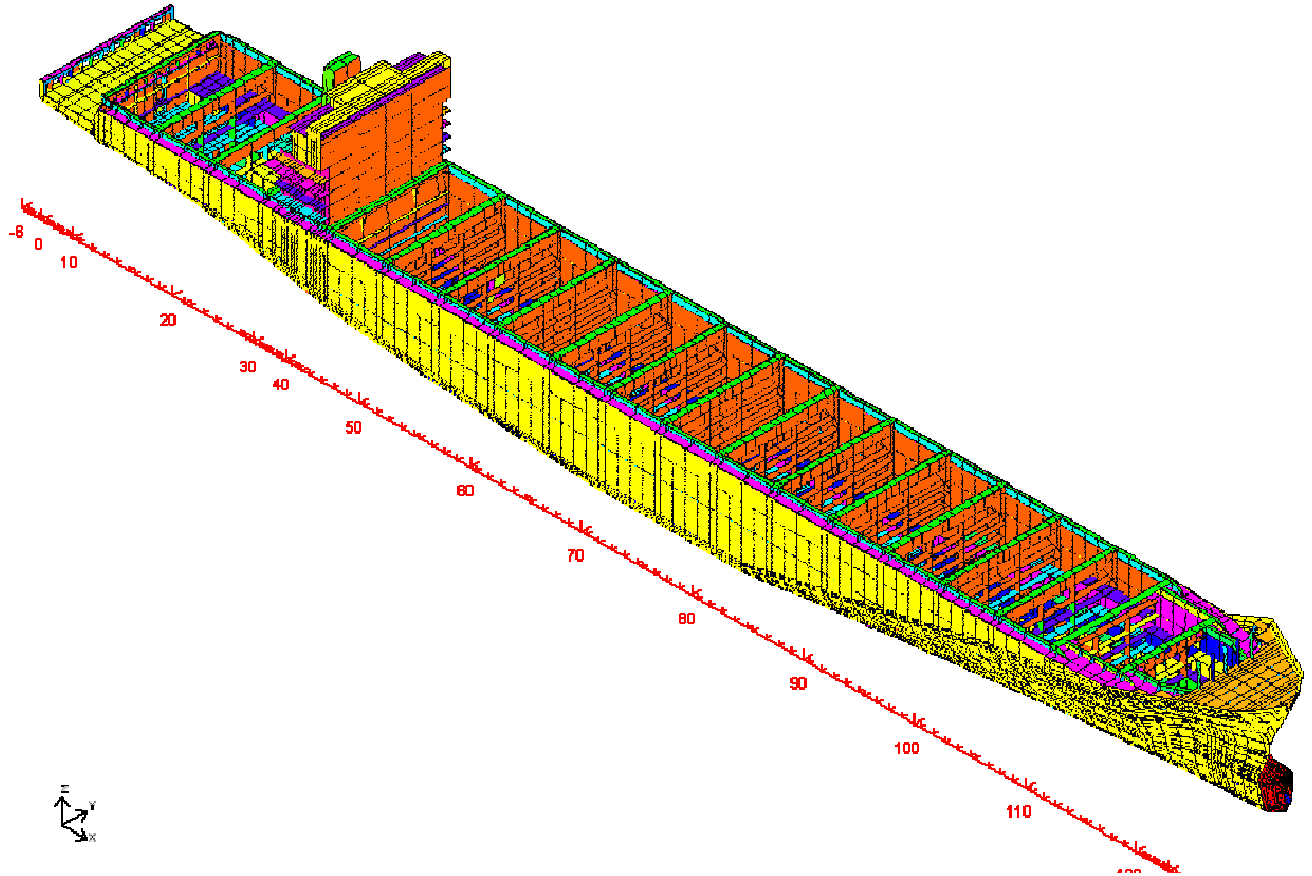
or extended lifetime analysis



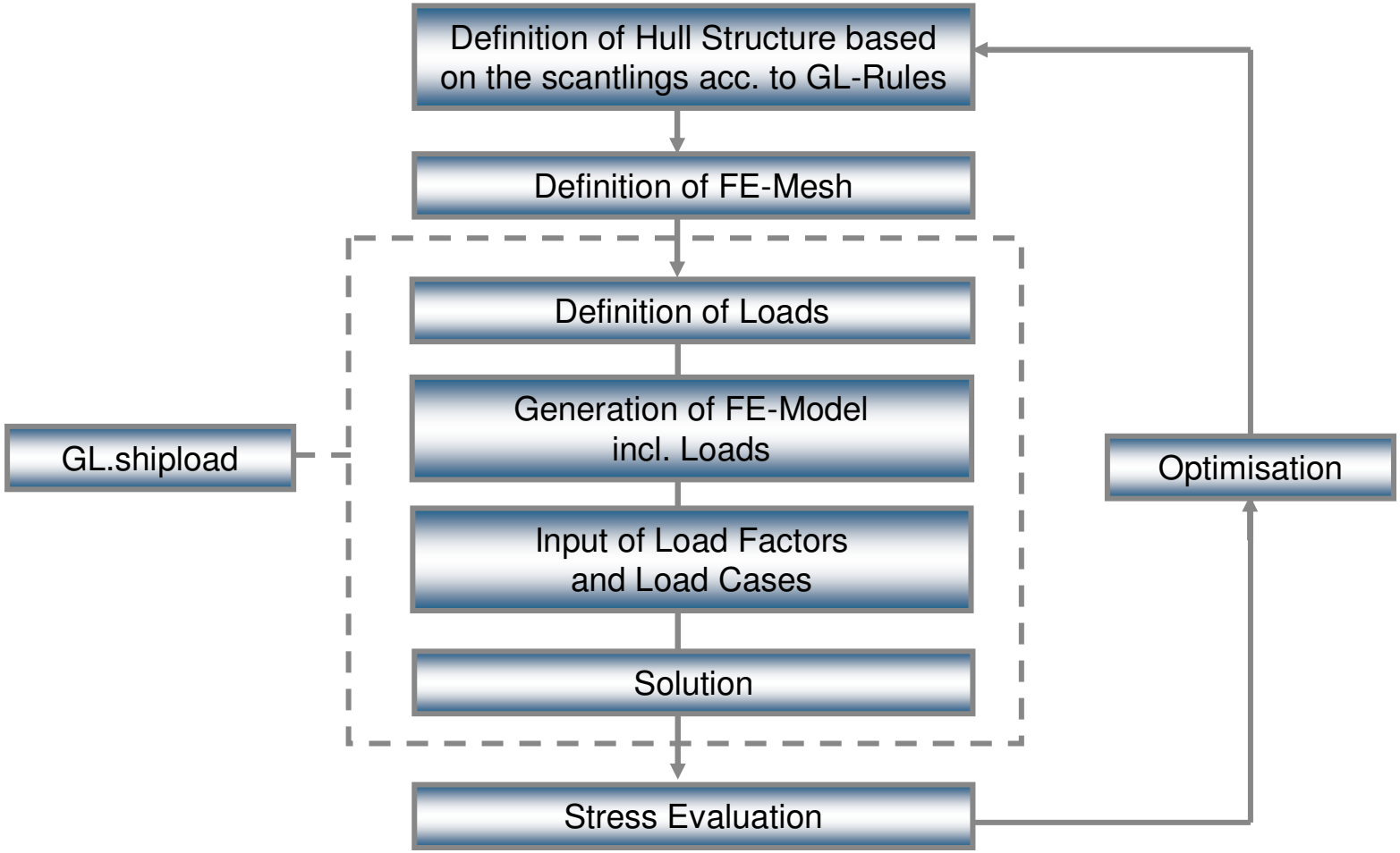
Lifetime evaluation



Example for a complete 3D-model



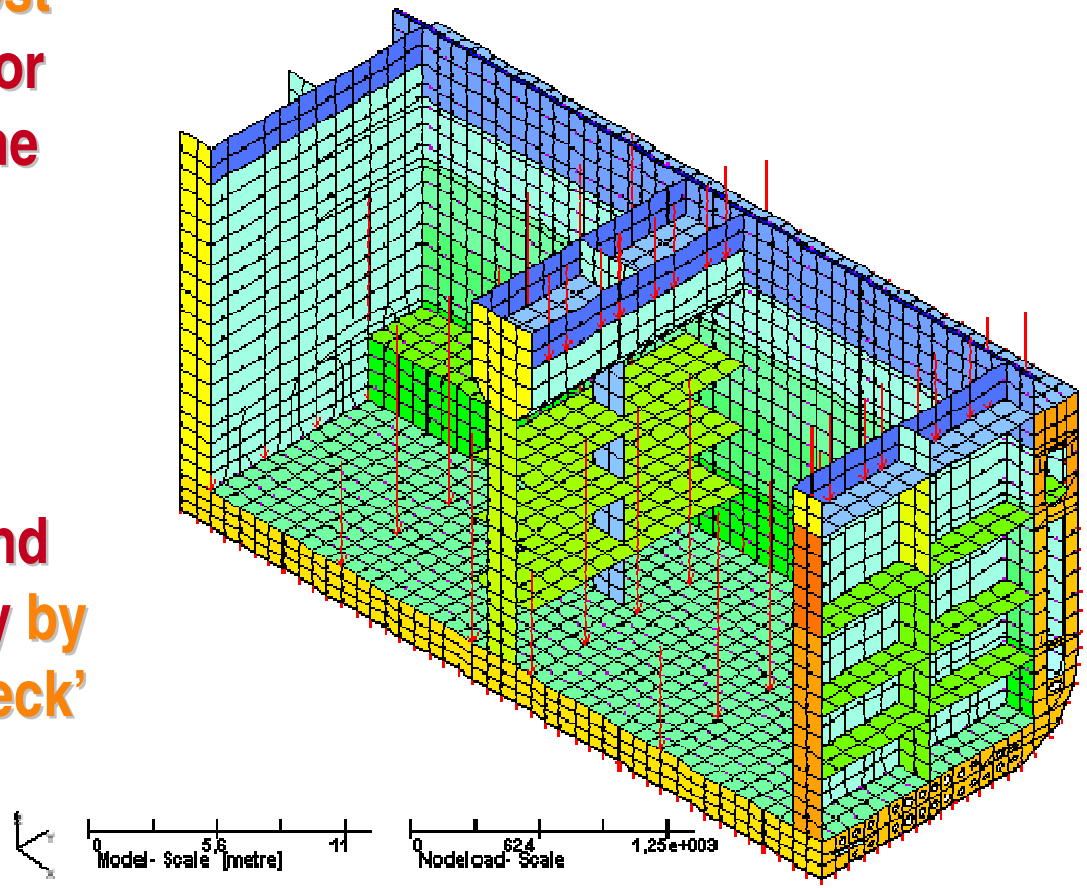
FE-Modelling



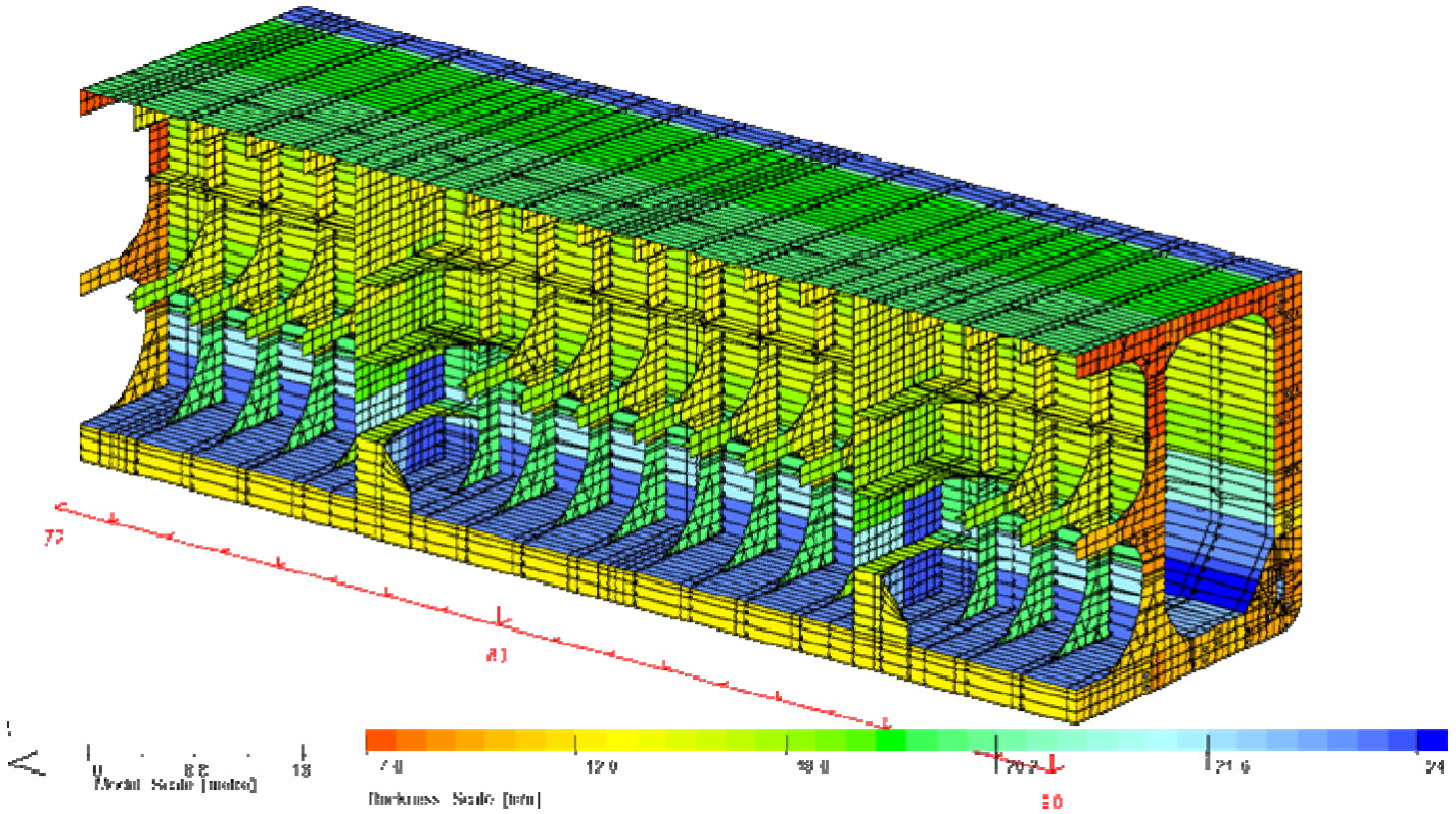
Finite Element Cargo Hold Analysis

Required by the most important classes for the calculation of the bottom structure

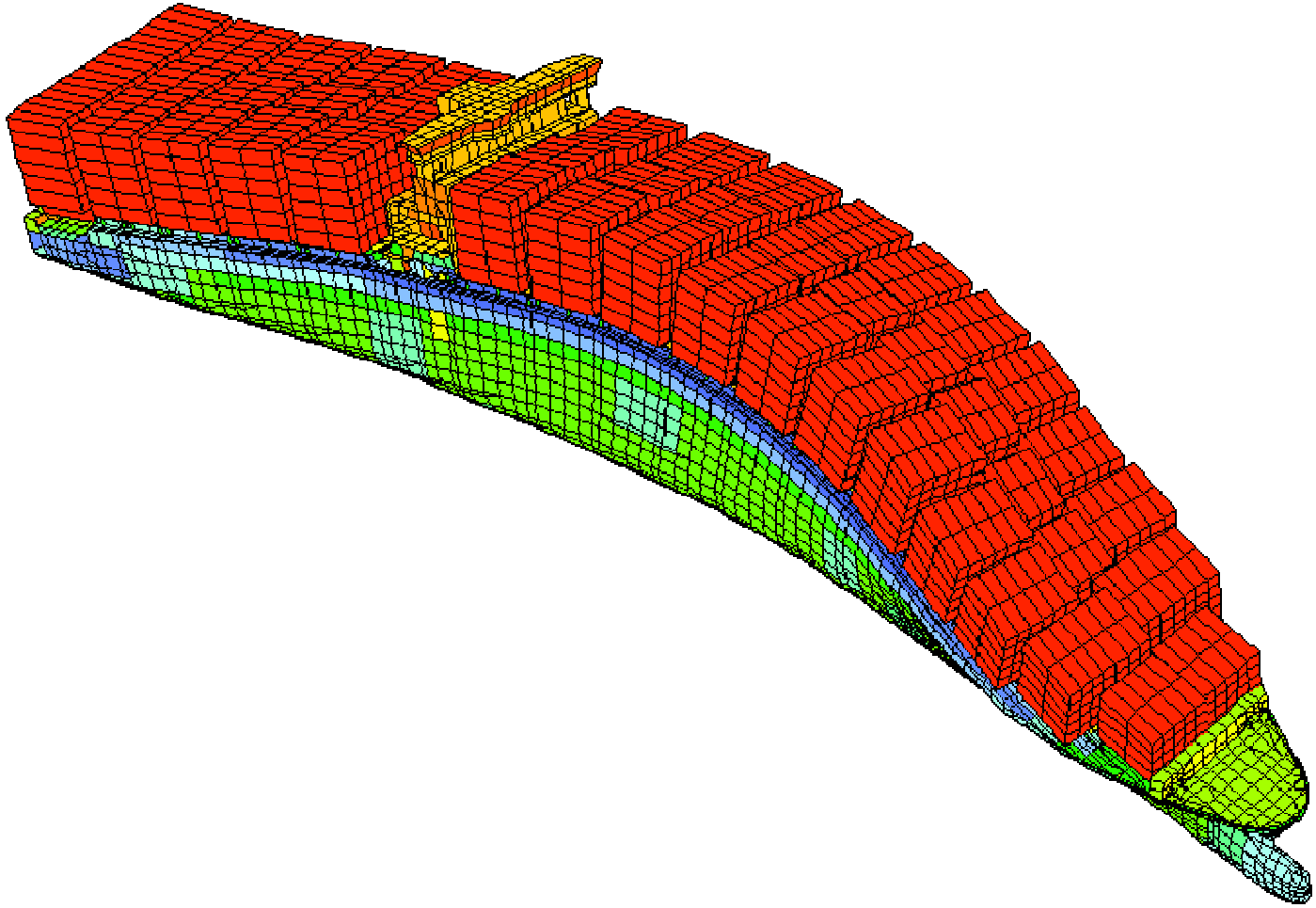
POSEIDON ND generates model and loads automatically by using the 'Rule Check' input data



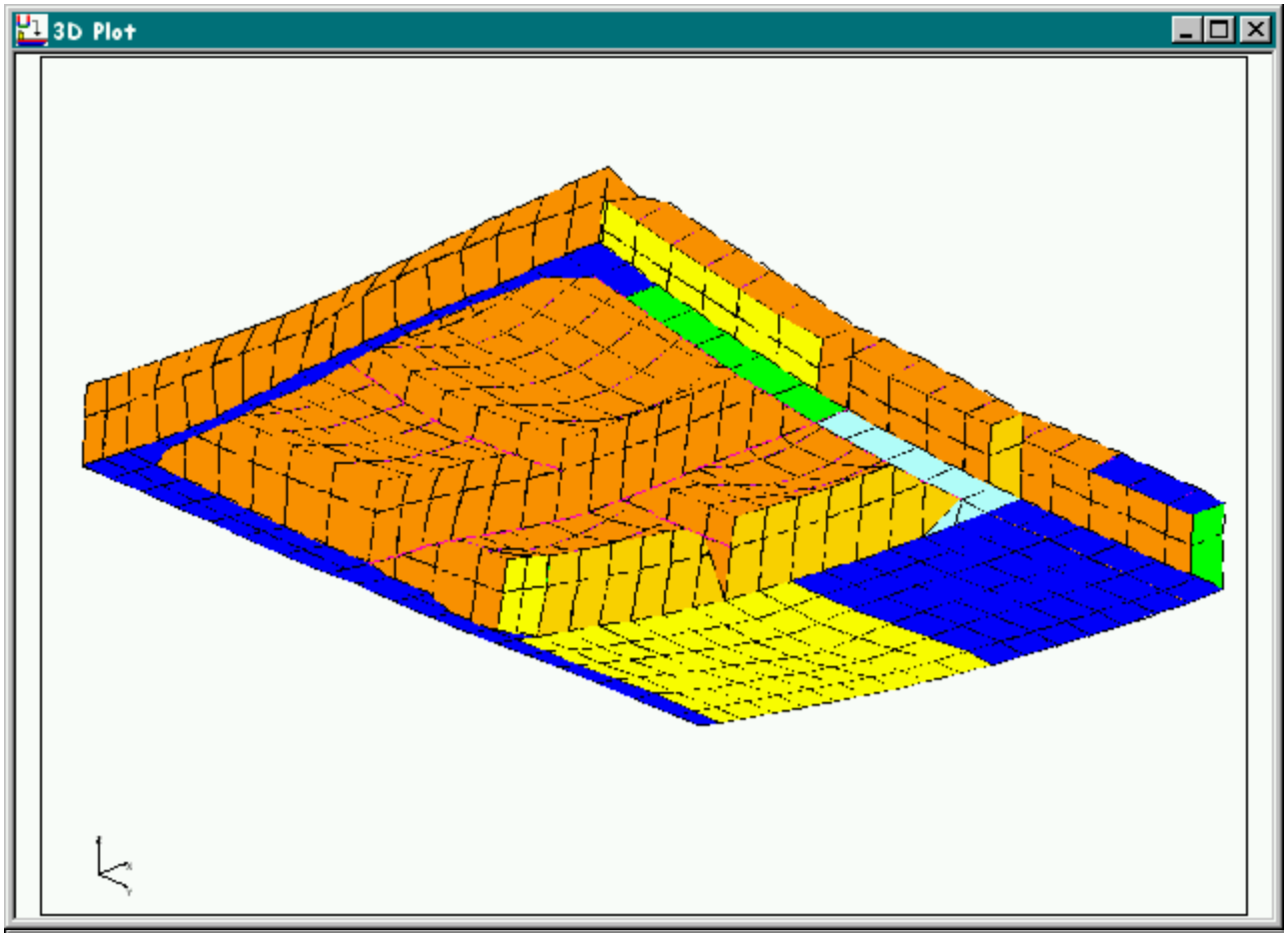
Finite Element Cargo Hold Analysis



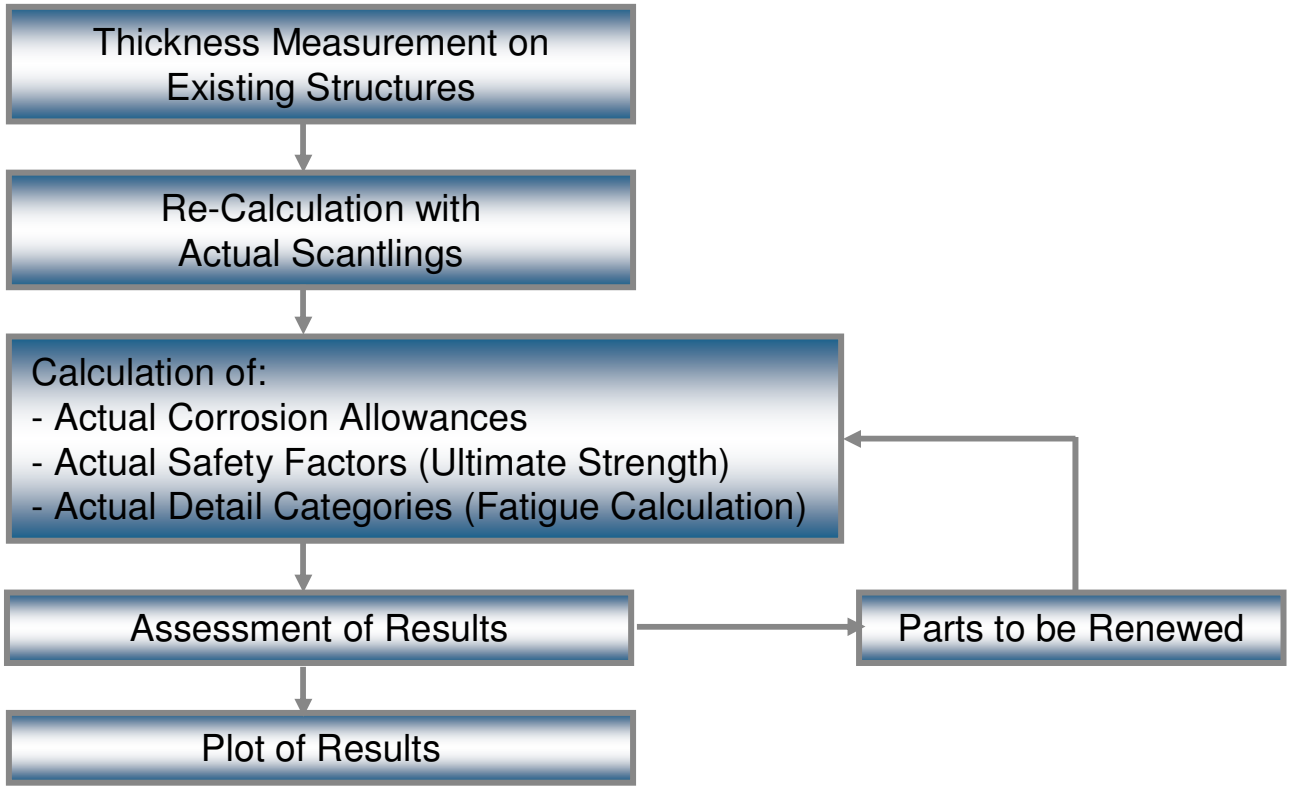
Deformation Plot of a 5500 TEU Container Vessel



Deformation of a partially closed Hatch Cover



Hull Condition Assessment



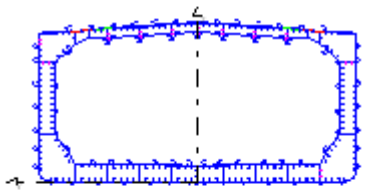
Hull Condition Assessment
Assessment of Measured Thickness

6.1.1 Long. Plates

Frame No. 68 Measure Date 02.08.2002

		as built		measured			
Func.Ele.	Sym	t	tk[mm]	t	tk[mm]	Usage Ult.Str.	Remarks
Item	DCat	min Req.	tk[%]	min Req.	Delta tk	Usage Fatigue	
Pl4	80	13,0	31	13,4	0,21	0,70	
DK_1	S	17,0	4,0	16,5	3,1	0,90	m
Pl4	80	13,0	31	13,4	0,23	0,70	
DK_1	P	17,0	3,2	15,4	1,6	0,95	m
pl5	80	13,8	23	13,8	0,51	0,79	
DK_1	S	17,0	3,2	15,6	1,3	0,96	m
pl5	80	13,8	23	14,3	0,59	0,79	
DK_1	P	17,0	3,2	15,0	0,7	0,98	m
Pl6	80	13,8	23	14,3	0,78	0,89	
DK_1	S	17,0	3,2	15,1	0,8	0,97	m
Pl6	80	13,8	23	14,3	0,74	0,89	
DK_1	P	17,0	4,5	15,8	2,8	0,91	m
Pl7	80	12,5	36	13,0	0,38	0,63	

Record 1



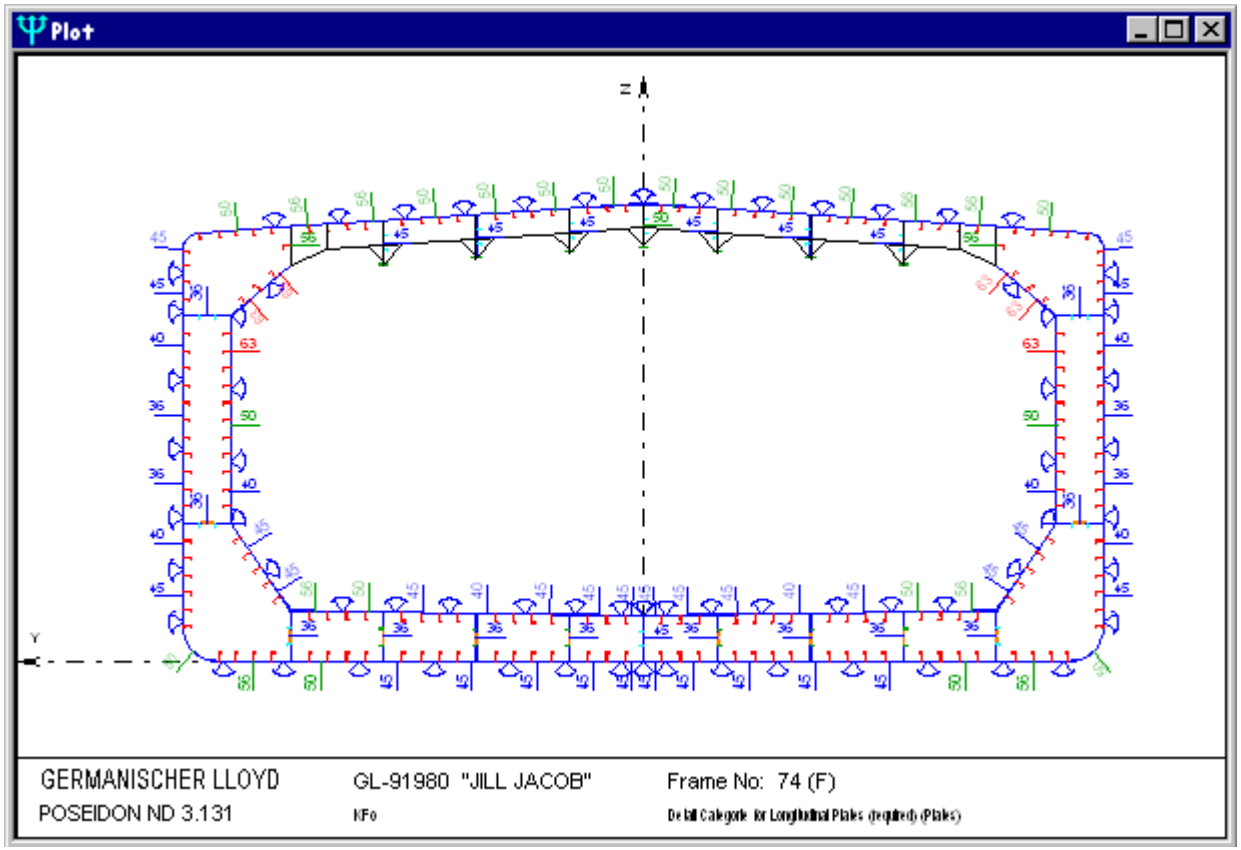
Corrosion Allowances

Fatigue Calculation
min. Detail Category

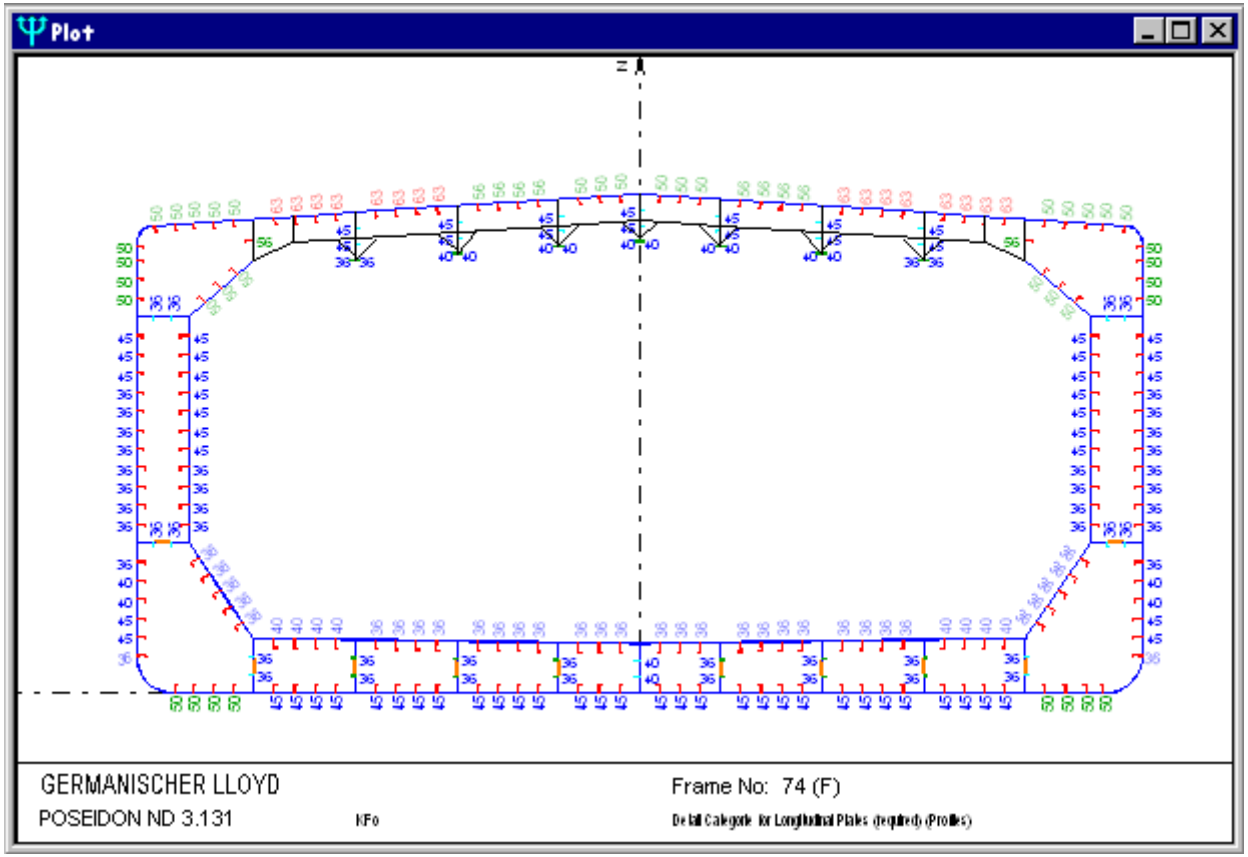
Safety Factors
Ultimate Strength

Extended Life Time

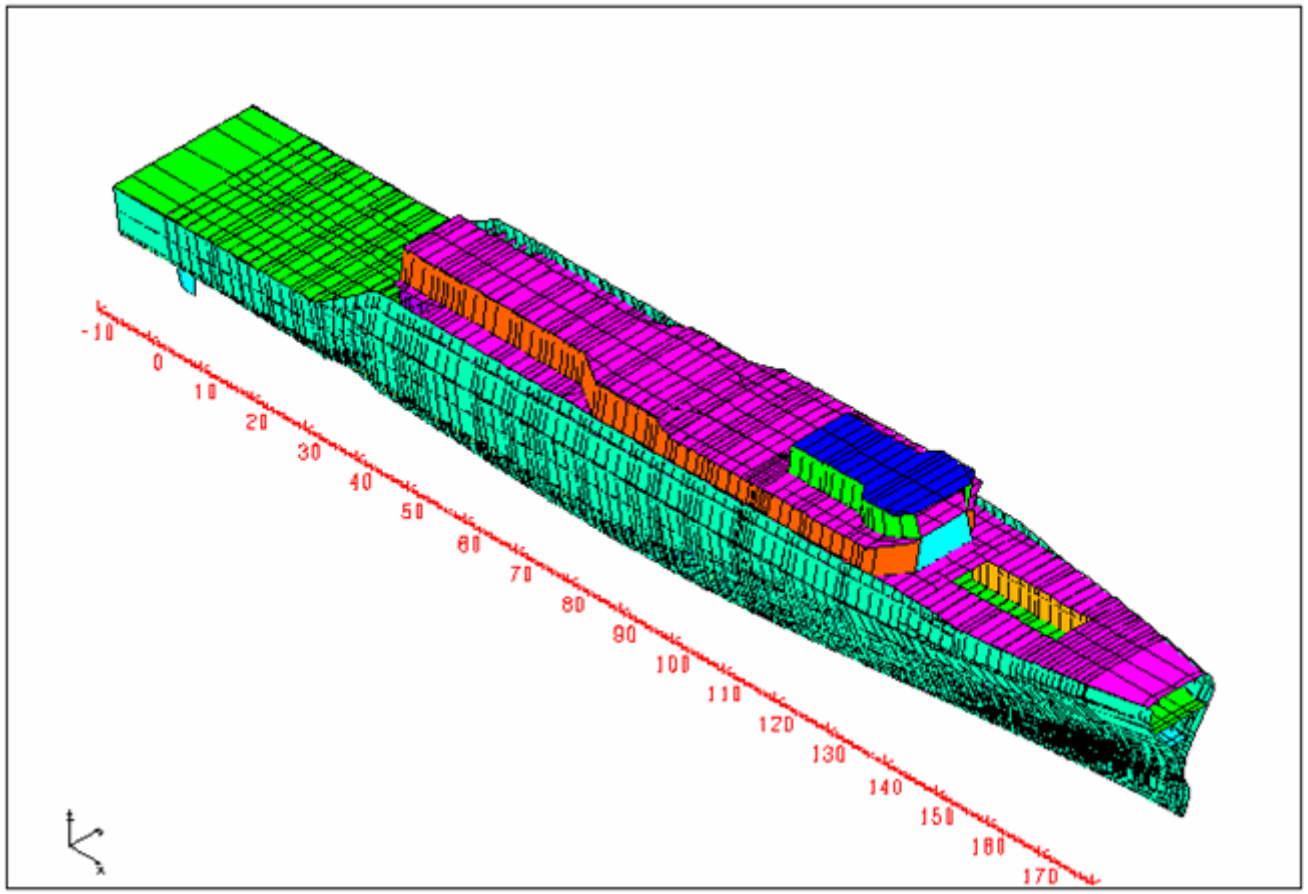
Fatigue Calculation:
Detail Categories for Plates



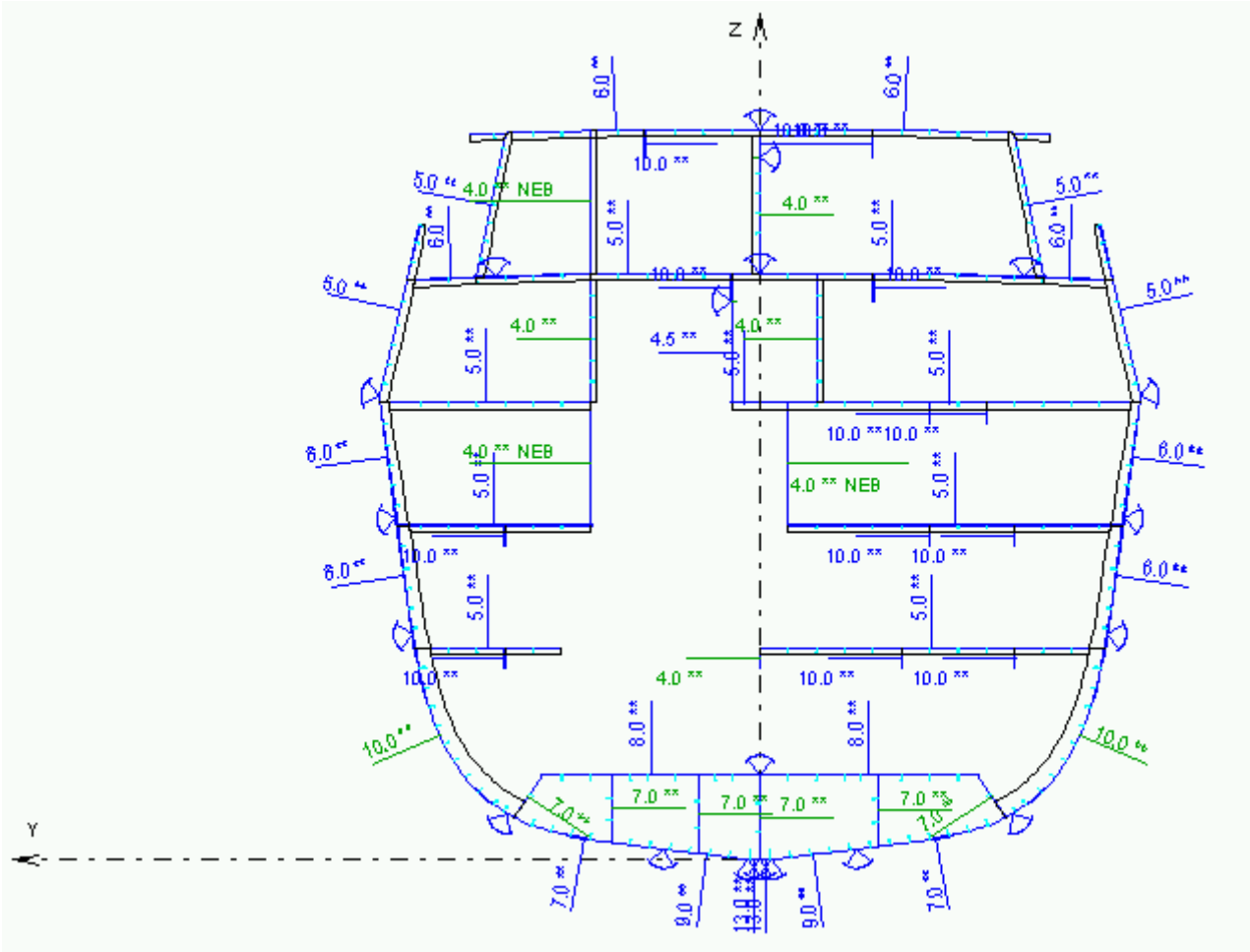
Fatigue Calculation:
Detail Categories for Profiles



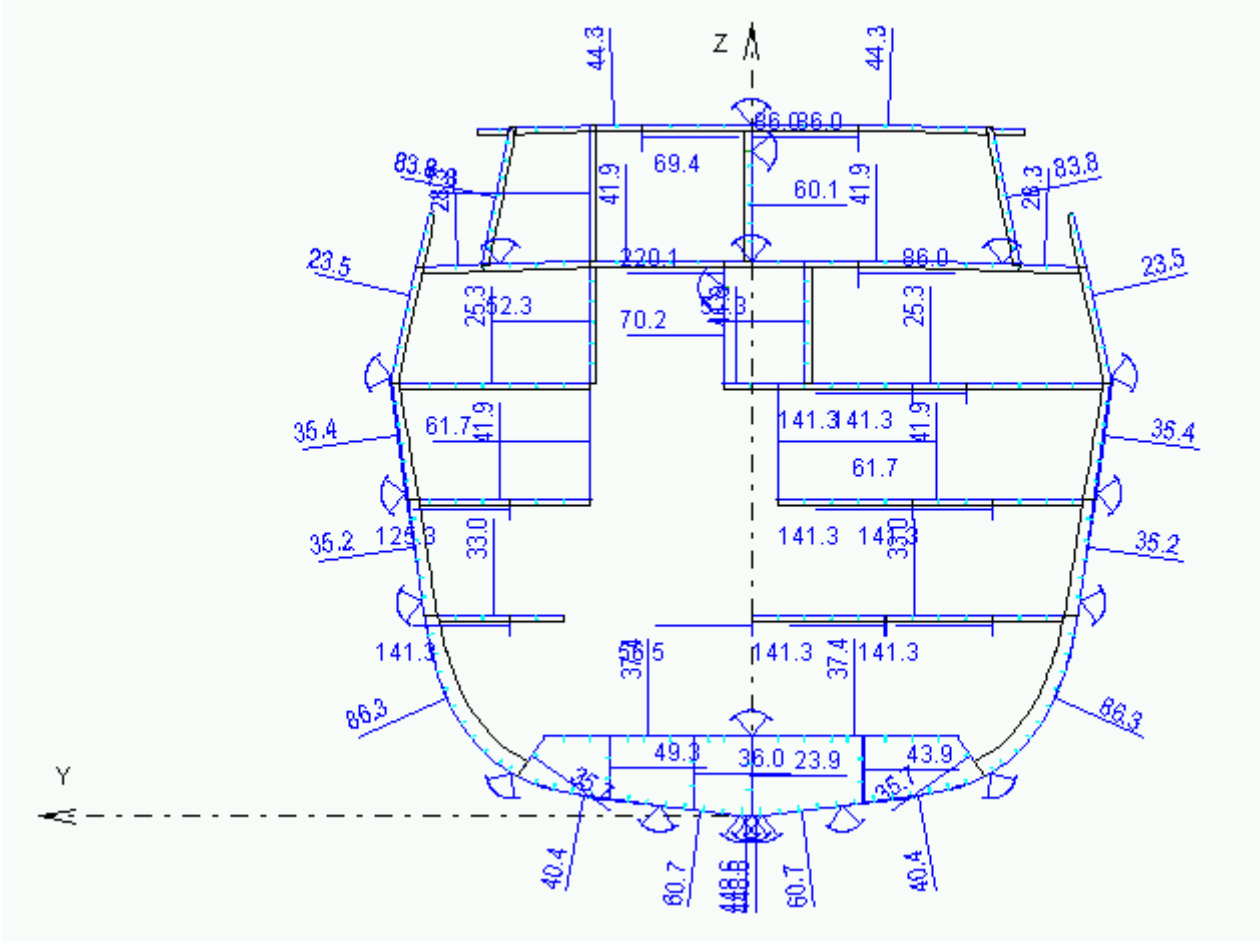
Calculation of Navy Vessels



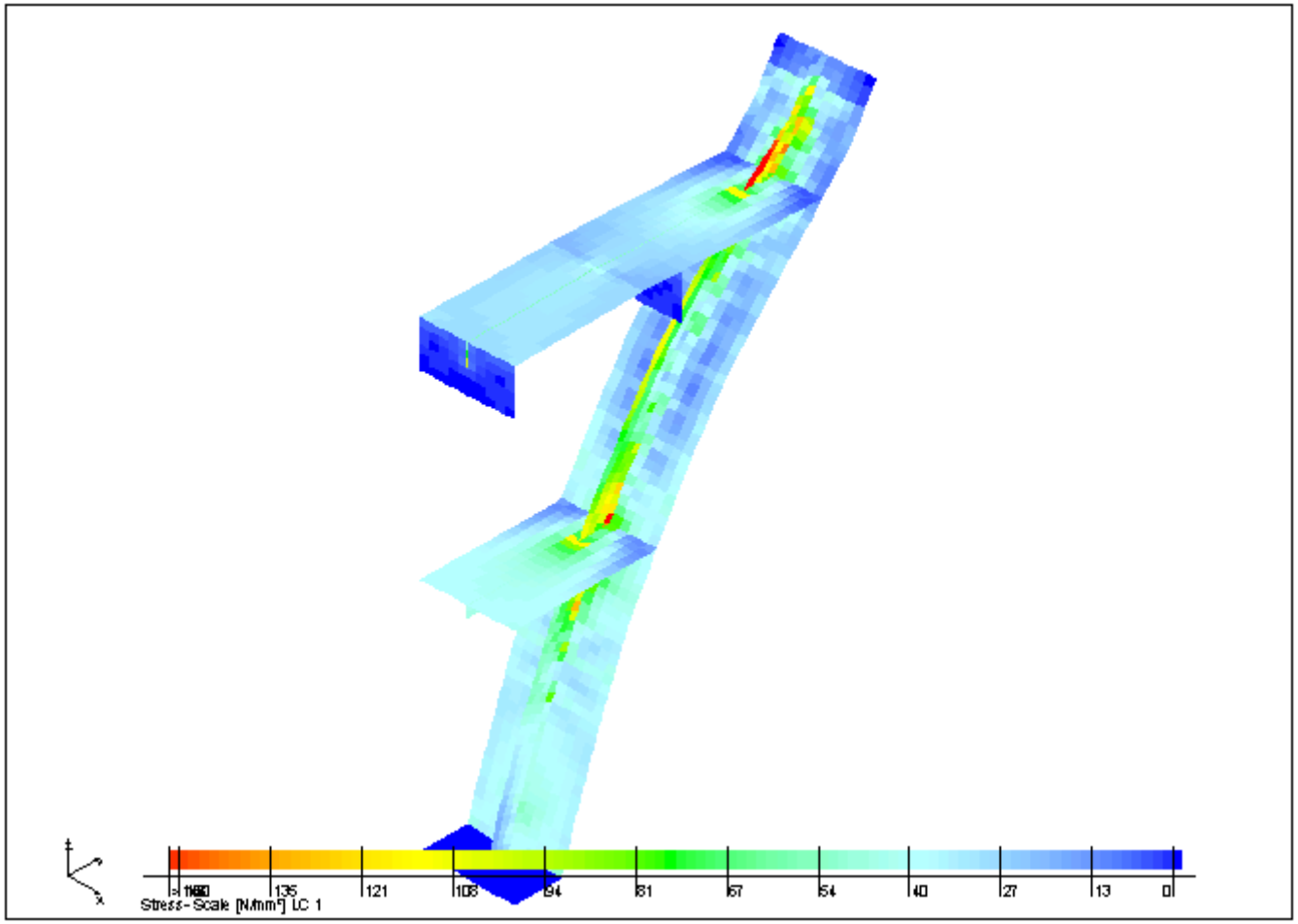
Calculated Scantlings of a Navy Frigate



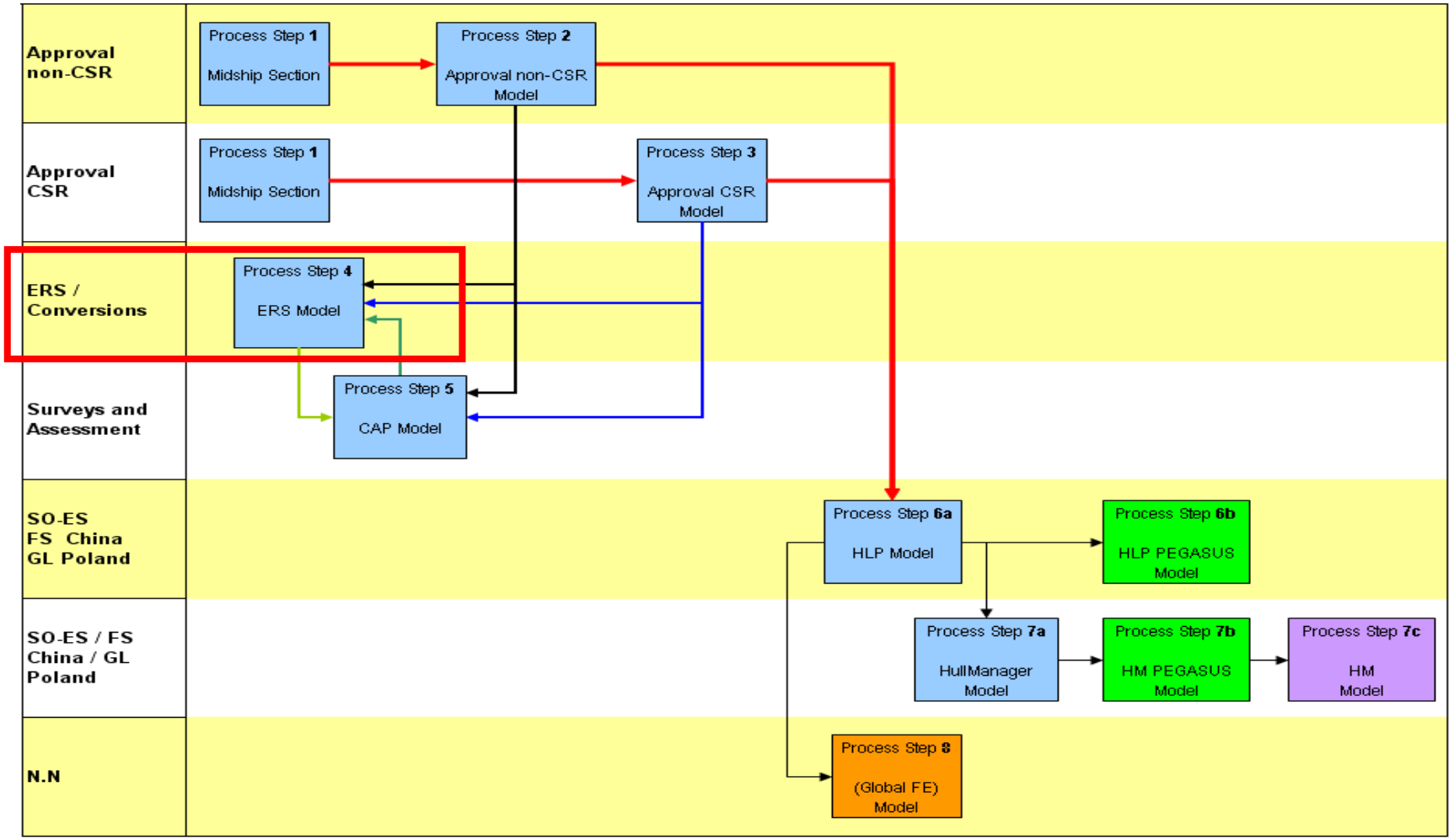
Calculation of Natural Frequencies



FE Analysis of a Web Frame

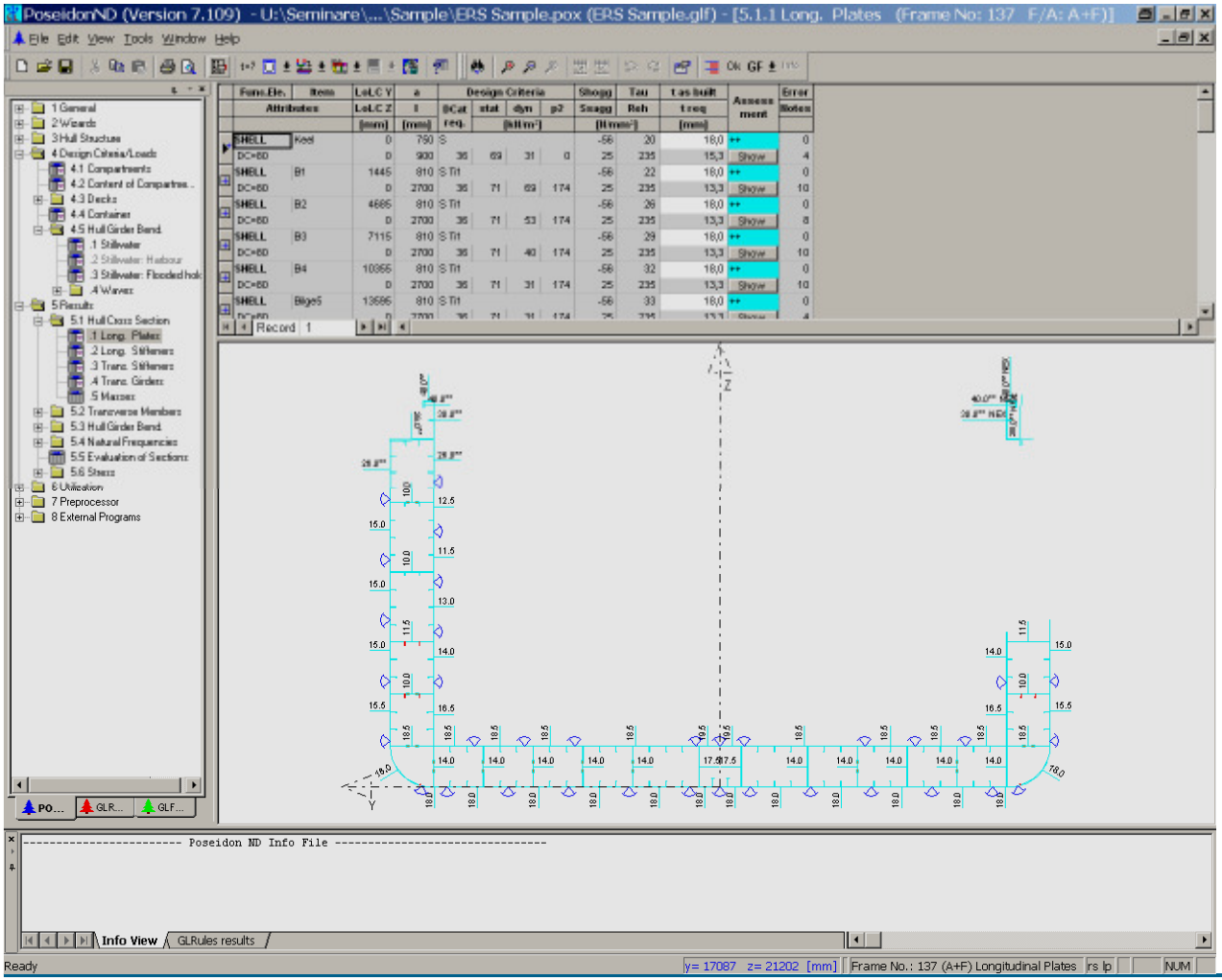


Process Map for Poseidon modelling



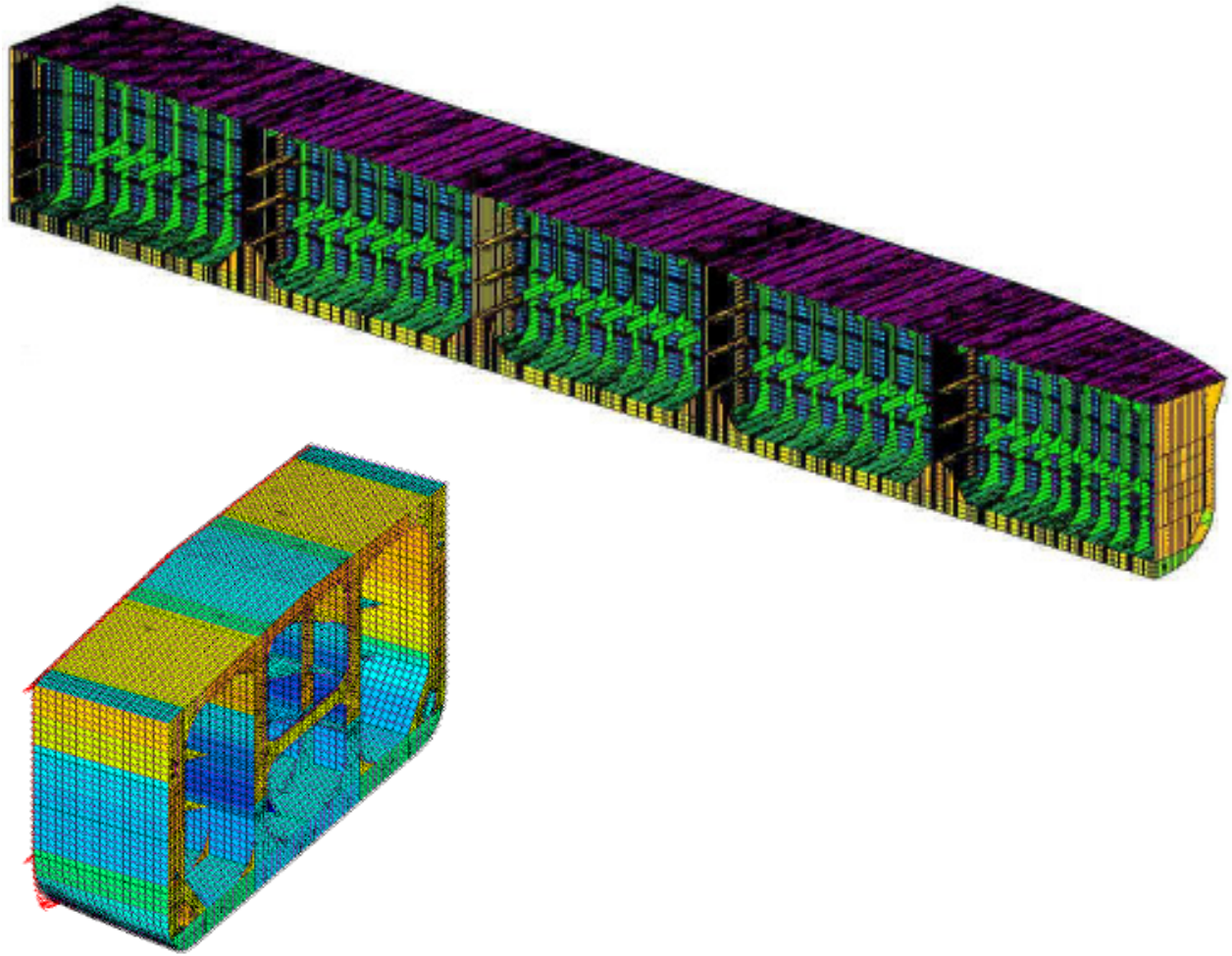
Grounding
Hull initially intact
Load >> Load (oper)
at Low Tide
Fire / Explosion
Hull damaged
Load > Load (oper)
Stability reduced
WHO can assess damage stability and strength ?
Collision
Hull damaged
Load > Load (oper)
Stability reduced
Free Floating after Grounding
Hull damaged
Load > Load (oper)
Critical Floating Position

ERS - Poseidon



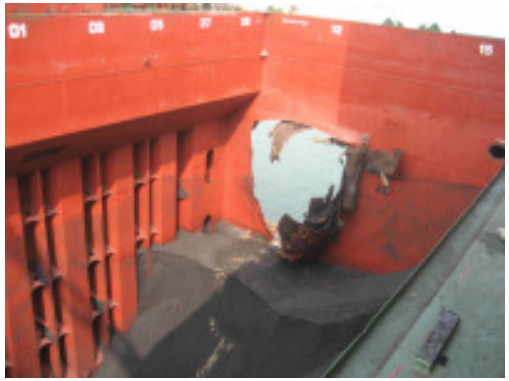
- Longitudinal strength
- Local Strength (Buckling)
- Reduced section modulus
- Ultimate strength

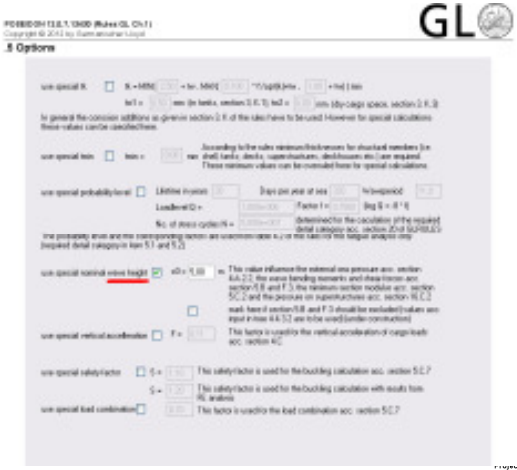
ERS – structural model

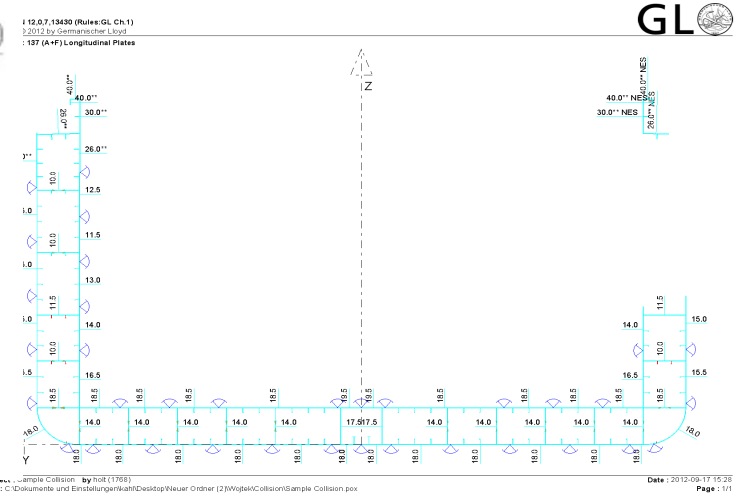


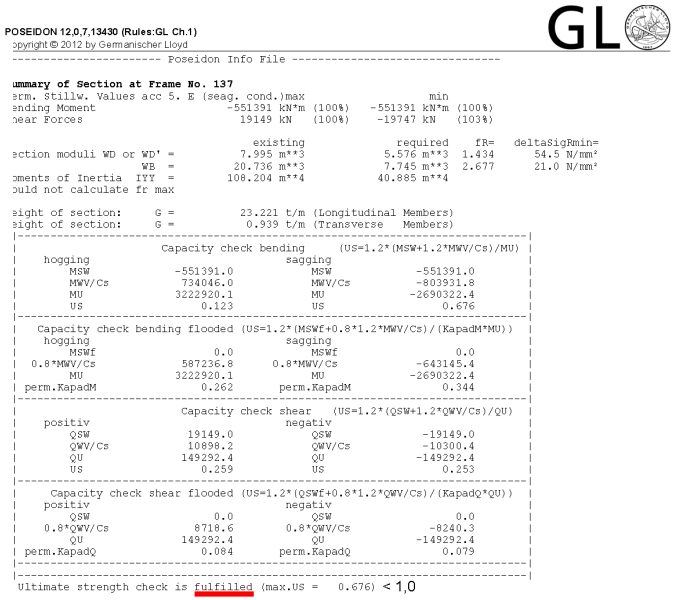
- Detailed data model
- Longitudinal and transverse structures
- 2D calculations acc. to class rules
- 3D model used to quickly generate FE model

ERS Real Case - COLLISION









POSEIDON 12,0,7,13430 (Rules:GL Ch.1)
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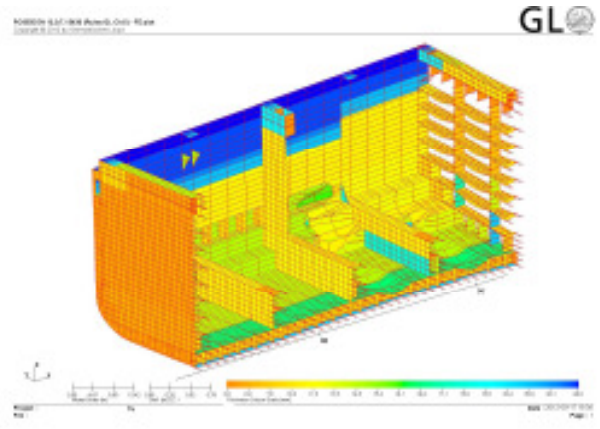
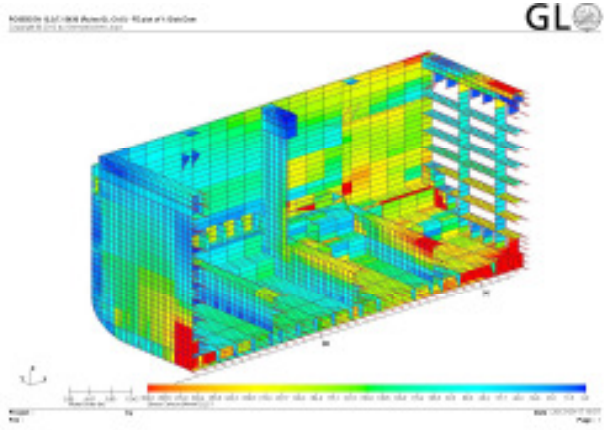
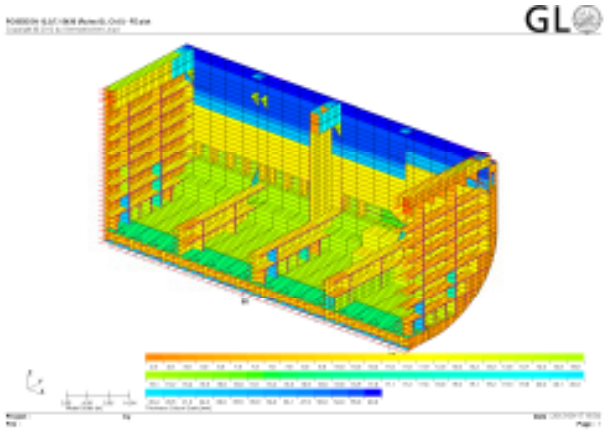
```
---------------------- Poseidon Info File ------------------------------

ummary of Section at Frame No. 137
erm. Stillw. Values acc 5. E (seag. cond.)max                    min
ending Moment                   -551391 kN*m (100%)   -551391 kN*m (100%)
near Forces                       19149 kN   (100%)    -19747 kN   (103%)

                                   existing              required    fR=   deltaSigRmin=
ection moduli WD or WD' =          7.995 m**3            5.576 m**3  1.434      54.5 N/mm²
                   WB  =          20.736 m**3            7.745 m**3  2.677      21.0 N/mm²
oments of Inertia  IYY  =        108.204 m**4           40.885 m**4
ould not calculate fr max

eight of section:     G =          23.221 t/m (Longitudinal Members)
eight of section:     G =           0.939 t/m (Transverse   Members)
|-----------------------------------------------------------------------|
|                    Capacity check bending     (US=1.2*(MSW+1.2*MWV/Cs)/MU) |
|    hogging                                sagging                     |
|        MSW              -551391.0            MSW              -551391.0 |
|        MWV/Cs            734046.0            MWV/Cs           -803931.8 |
|        MU               3222920.1            MU              -2690322.4 |
|        US                   0.123            US                   0.676 |
|-----------------------------------------------------------------------|
|   Capacity check bending flooded (US=1.2*(MSWf+0.8*1.2*MWV/Cs)/(KapadM*MU)) |
|    hogging                                sagging                     |
|        MSWf                  0.0            MSWf                  0.0 |
|  0.8*MWV/Cs              587236.8      0.8*MWV/Cs            -643145.4 |
|        MU               3222920.1            MU              -2690322.4 |
| perm.KapadM                 0.262       perm.KapadM               0.344 |
|-----------------------------------------------------------------------|
|                    Capacity check shear   (US=1.2*(QSW+1.2*QWV/Cs)/QU) |
|    positiv                                negativ                     |
|        QSW                19149.0            QSW               -19149.0 |
|        QWV/Cs             10898.2            QWV/Cs            -10300.4 |
|        QU                149292.4            QU               -149292.4 |
|        US                   0.259            US                   0.253 |
|-----------------------------------------------------------------------|
|     Capacity check shear flooded (US=1.2*(QSWf+0.8*1.2*QWV/Cs)/(KapadQ*QU)) |
|    positiv                                negativ                     |
|        QSW                   0.0            QSW                   0.0 |
|    0.8*QWV/Cs              8718.6      0.8*QWV/Cs             -8240.3 |
|        QU                149292.4            QU               -149292.4 |
| perm.KapadQ                 0.084       perm.KapadQ               0.079 |
|-----------------------------------------------------------------------|
|-----------------------------------------------------------------------|
 Ultimate strength check is fulfilled (max.US =    0.676) < 1,0
```

ERS Real Case - EXPLOSION







Benefits of POSEIDON

- Tylko kilka minut jest potrzebnych aby uzyskać wyniki obliczeń stosując wbudowane narzędzia
- Łatwa i szybka definicja elementów w widoku 2D
- Automatyczne wymiarowanie elementów bez podawania wymiarów!
- Pełna trójwymiarowa struktura może być od podstaw zamodelowana przy użyciu Poseidon-a

Benefits of POSEIDON

- Wszytskie typy statków mogą być modelowane/projektowane przy użyciu Poseidon-a, z uwzględnieniem ich specyficznych wymagań
- Niska cena, która tylko w części pokrywa koszty utrzymania i rozwijania systemu
- Environment: Standard PC, Windows NT, 2000, XP, Vista, Windows 7

POSEIDON is available on the GL Internet Homepage www.gl-group.com

- A minimum of six week trial period will be made available by a temporary licence key, which will be submitted via e-mail

GL OPERATING 24/7

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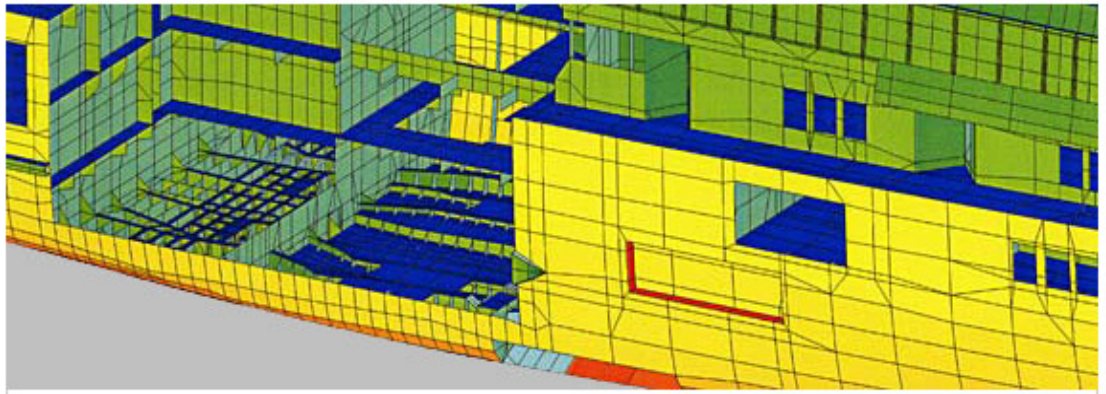
Maritime Components
Maritime Solutions
FutureShip
GL Software Solutions
Flag State
Oil & Gas
Renewables
Industrial Inspection
More Industries



POSEIDON

Overview & Download

POSEIDON is GL's computer based structural design and analysis tool for shipyards, design offices, owners and operators. It's user friendly interface, it's rich features and intuitive processes facilitates the rapid development and analysis of hull structures.

Who needs POSEIDON?

POSEIDON was developed by ship builders for ship builders. Its logical, intuitive structure and user friendly interface can be used by anyone familiar with PC's and ship design. POSEIDON is a great tool for reducing planned maintenance costs and minimizing unscheduled structural repairs.

How do you benefit from using POSEIDON?

Concentrate on designing - not obtuse operating instructions. Obtain the results of the FE analysis early in the design stage. Start saving design hours by getting the POSEIDON advantage for your design office. Improve your life cycle costs and specify POSEIDON for your newbuildings. POSEIDON improves productivity and lowers costs of structural design. POSEIDON improves ship quality and yard productivity by promoting the optimised distribution and weight of structural material and speeds approval time through electronic transfer and processing. POSEIDON cuts cost of planned maintenance and helps Shipyards and Design Offices to avoid unscheduled repairs.

The features of POSEIDON

- A design tool that can be used throughout the engineering process
- Minimal training - no specialised knowledge of FE techniques needed
- Modelling and analysis of complex midship sections in less than a day
- Rapid changes in structural layout promote the optimization of the design
- GL scantling rules based on first principle design methods

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    - GL MachineryManager
    - GL CrewManager
    - GL FleetAnalyzer
    - GL FleetManager
    - GL Pegasus
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- Flag State
- Materials & Failure Analysis
- GL-Tools

GL HullManager

GL HullManager advances our ship management software offering for enhanced maintenance support. It facilitates the complete Hull Integrity process, starting from inspections, via reporting and assessment of the conditions of tanks, cargo holds, coatings etc.

The GL HullManager ensures that your ship is well maintained and that your charterers know it. Thickness measurement results recorded by thickness measurement companies using GL Pegasus software can be easily integrated.

The GL HullManager is a service package that GL Maritime Software offers to ship owners, managers and operators. This service focuses on monitoring and assessing the condition of a ship's hull, e.g. its tanks, cargo holds, coatings, throughout its entire lifecycle by means of crew inspections and thickness measurements.

Shipping companies that build new vessels with GL will be offered the chance to implement "GL HullManager", its industry-wide recognised Hull Integrity solution, on these vessels at no extra cost.

The GL HullManager uses a specific 3-D computer model of the vessel and supports the complete hull condition inspection and assessment process. It provides full support for systematic and comprehensive data collection as well as visualisation and assessment of the hull's structural condition:

- Software: GL HullManager is an intuitive and easy-to-use software for crews and onshore technical inspectors. Crews benefit from graphical support for the inspection process. Inspections are performed using customised standard forms that are identically structured throughout your fleet. Recordings are easily transferred to the central database onshore. The GL Pegasus Viewer gives you a complete and even more detailed view on thickness measurement results, which are also available in the GL HullManager in an aggregated form. You avoid additional effort to assess thickness measurement results.
- Graphics: A specific 3D computer model is prepared from the individual vessel concerned that allows interactive use: a specific marking of the individual finding, add a photo and descriptions. This increases the intuitive usability of the software and reduces room for interpretation of any defects.
- Guidance: A Hull Survey Guideline features illustrations highlighting not only the most relevant areas where special attention has to be paid (hotspots). It also helps to standardise assessments throughout your fleet and reduces the level of subjectivity.
- Know-how: A Hull Monitoring seminar has been designed to enhance the participants' ability to carry out safe and efficient hull inspections and document the results in a suitable manner. In addition, extensive software-user-trainings, implementation and installation support are offered to the crews and office staff to ensure smooth handling of the software and compliance to the companies inspection processes and policies.
- Support: Software maintenance & support for the GL HullManager and GL Pegasus Viewer as well as for the 3D computer ship model ensure a smooth software usage over the lifetime and regular updates

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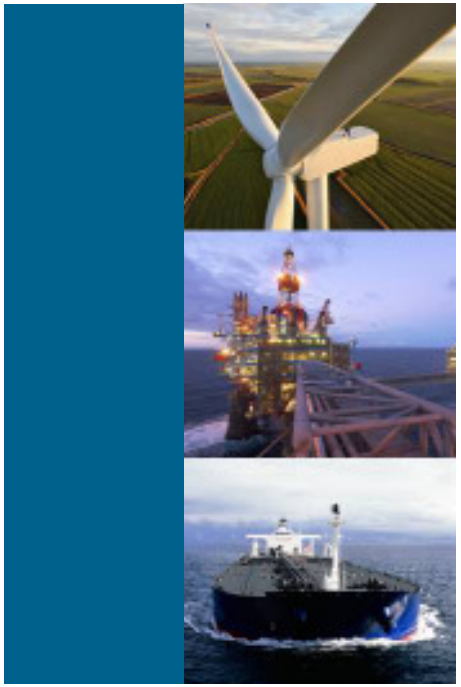
Further Information

- GL HullManager product flyer

Related Links

- GL Cargo
- GL PROTOS
- Friendship Systems

GL Group



Dziękuję za uwagę

Pytania?

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