WELCOME TO archnav.de

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Lise-Meitner-Straße 1-7
D-24223 Raisdorf
Phone +49 (0)43 07 / 82 50 29
Fax +49 (0)43 07 / 900 281

Company-philosophy and areas of activity

We are working with the software. (NAPA, Poseidon, Microsoft Office, AutoCAD, 3D-Schott-Systeme [a surface orientated 3D-Tool from the German car industry]. We know how to organise the data and software packages in respect of Virtual Prototyping (fly before buy), because we have been working for a long time in the project department from HDW (Howaldtswerke Deutsche Werft AG) and have done in that field national and international research.
Our main task is to develop 3D-ship models under NAPA and NAPA-Steel, to analyse the data (ship theory, calculation of weights etc.), to transfer the data to the classification societies tools via AP216 and AP218 (POSEIDON, NAUTICUS, SHIPS RIGHT) for necessary scantling and FE calculations, to make Steel drawings with AutoCAD by transferring the data via DXF from NAPA and to transfer the data, last but not least, for detail and outfitting design to TRIBON, NUPAS, CATIA etc. (In our case 3D-Schott-Systeme).
AP218 is the neutral interface for steel structures, developed by the classification societies. All software vendors working with ship steel structures have to offer for a long run an A218 interface. Archnav.de is, for the time being, the only engineering company, who has experience with AP218.
So far as we know NAPA is working on an interface to TRIBON . After the interface is installed most shipyards could work with the 3D-topdown-method from precontract to detail design.

We are able to carry out a 3D NAPA-Steel Model in 3-4 weeks (2500Teu Containership) on the level of classification drawings, if we are starting with the following information:

- Rough preliminary NAPA Hull Grid.
- Frame scale
- Longitudinal scale
- Vertical scale
- Location of bulkheads and decks
- Tank arrangement drawing

(All this could be altered in a certain range during the normal design process, without destroying the topological 3D Model).

From our experience 90 to 95% of the steel could be defined in that stage. The rest and the details (bevel codes and so on) have to be done during detail design.

Based on the 3D Model the following information could be carried out:

- Strength, vibration and noise calculation using classification (via AP218) or FE tools
- Lightweight calculation
- Design of machine technical areas of machinery arrangements
- Exhaust arrangements, piping systems
- Stability calculations
- Cost estimation
- All optimisations of the design

and **you can save last but not least a lot of disturbances, money and time in detail design.**

We are working in that field since 1993 (in national and international research and in cooperation with NAPA) and know, that it is not easy to establish a consistent 3D ship model, but we are able to do so.

Now the development has reached such a level, that you can save a lot of money, if you use a 3D model in the early design stage.

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In 1993 we (who are now at archnav.de) had the idea to establish a *3D product and production model* for the *Precontract* and *Basic Design* process.

Before Detail Design begins the following work has to be carried out:

- Ship design
- Loading conditions
- Intact and damage stability
- Manoeuvring and Sea keeping
- CFD analysis
- Powering and speed
- Steel scantling plan
- FE-Calculation
- Noise and vibration
- Calculation of weights
- Specification
- Cost estimation, budgets
- Bill of material and schedule
- Time schedule, budgets for work units
- Block assembly plan
- Machinery layout
- Piping diagrams
- Current one line diagram
- Equipment list
- Painting plan
- Outfitting plan
- Virtual prototyping and simulation

After delivery:

- Hull Condition Monitoring
- Ship Operation Monitoring

All these activities have to take *the same ship* and the specific conditions *at the shipyard* into account. These plans are often made too late, are incomplete, faulty, contradictory or too inaccurate. The reason for this is the fact, that everybody must work independently and there is no common product and production model to guarantee the transparency of the information. These partly incompatible plans finally lead to considerable disturbances and much higher costs than necessary. For this reason the idea has arisen to establish a simple 3-D product and production model for the Precontract and Basic Design process to avoid these difficulties.

Since 1993 the EDP development on most shipyards has gone in a completely different direction:

- The amount of different software packages has increased
- The number of data files has increased
- The number of inaccurate plans has increased.

To work together with archnav.de is the only way to get rid of inaccurate plans.

In 1993 we had the idea to establish a 3D Product and Production Model for the Precontract and Basic Design Process. Since 1995 we have been able to build 3D-Models in the Early Design Stage very rapidly.

In 2001 we, at *archnav.de*, will be able to establish a *3D-Model for Precontract and Basic Design* to avoid these problems.
The Shipbuilding- and Ship Operation Process could be streamlined by 3D-Models from archnav.de. Follow your ship from Precontract to the scrap yard.

Contact archnav.de

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Dipl.-Ing. Arch.Nav.
Bernd Klehn
b.klehn@archnav.de

archnav.de
Lise-Meitner-Straße 1-7
D-24223 Raisdorf
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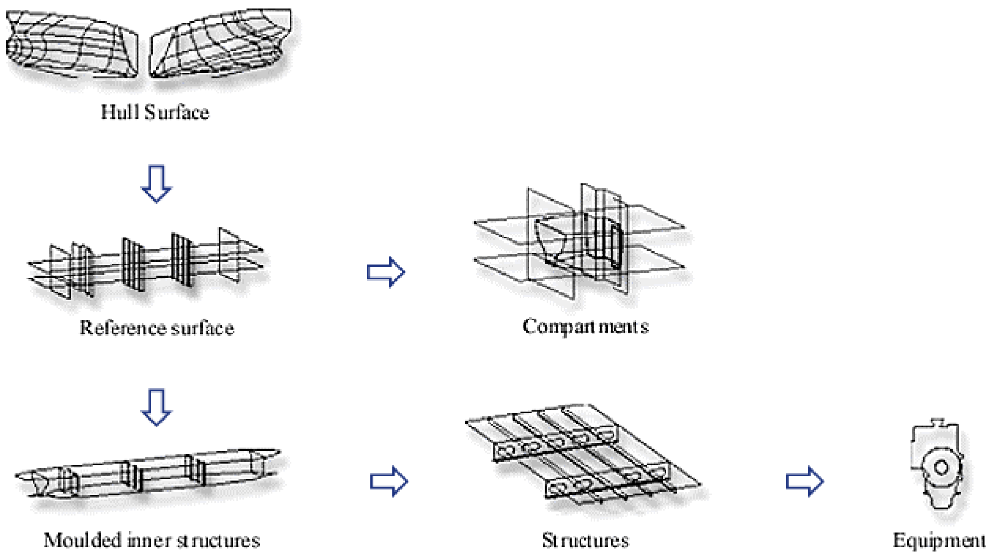
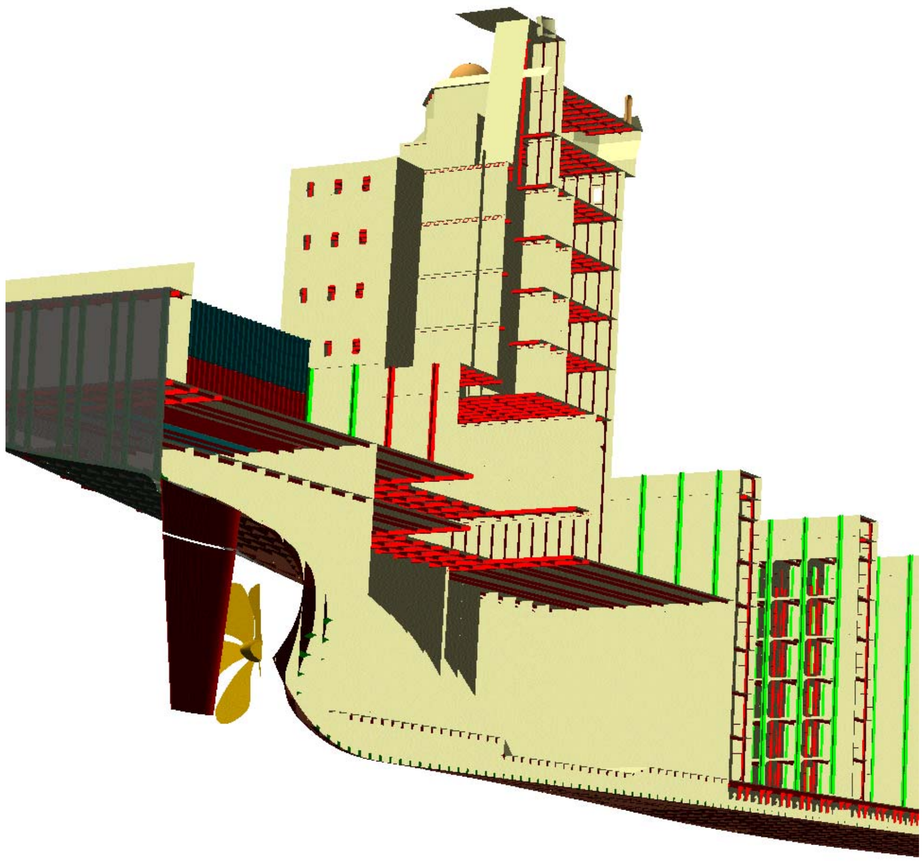
<u>On the following pages you can visualize the huge amount of information, you can get from a 3D data model in early design stage:</u>

The way the 3D product and production model is established



Images of Napa steel structure of our test container vessel:



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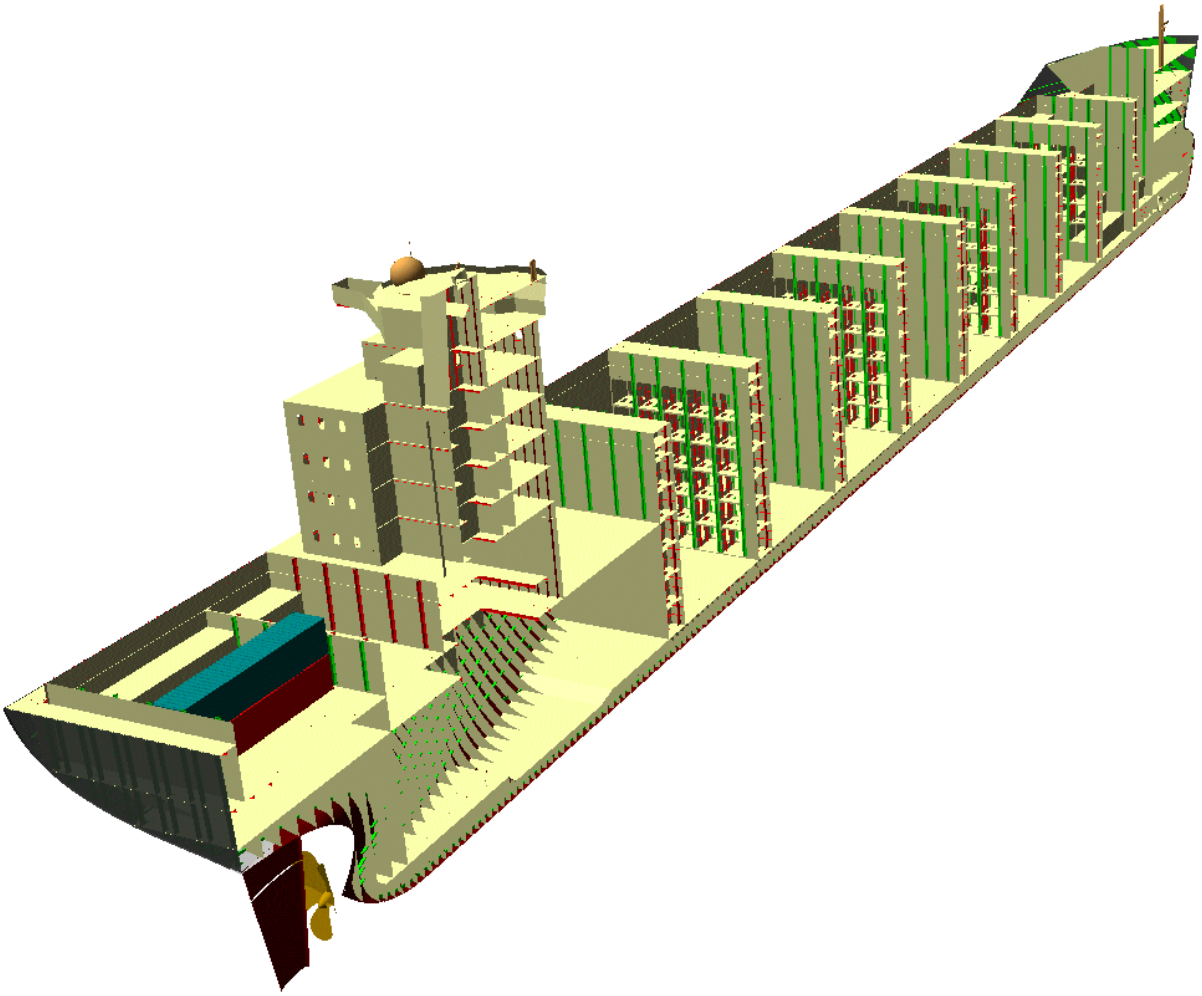
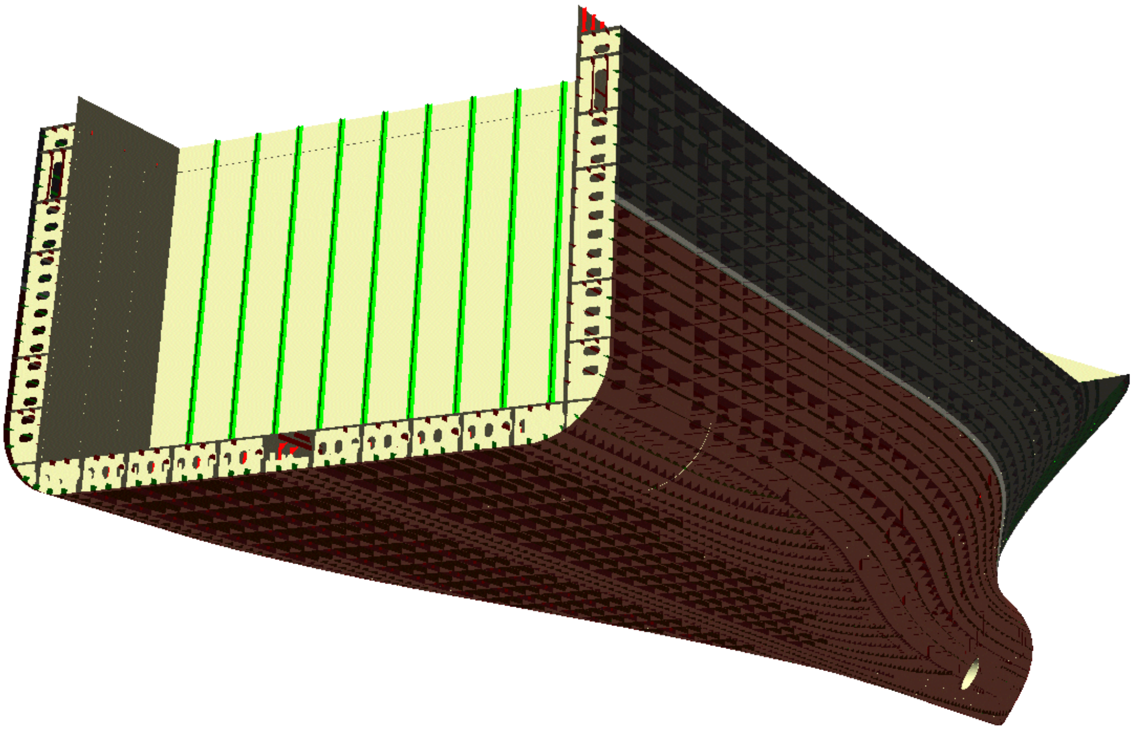
NAPA steel structure in Pictures by PC, transferred by VDAFS interface





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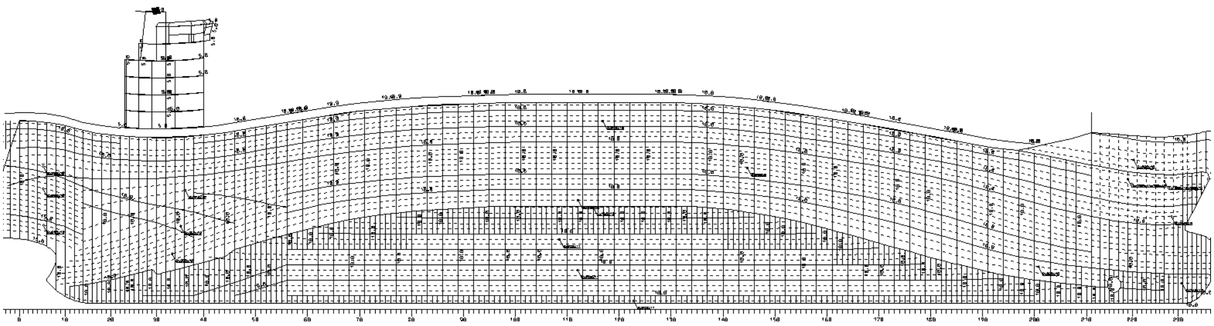
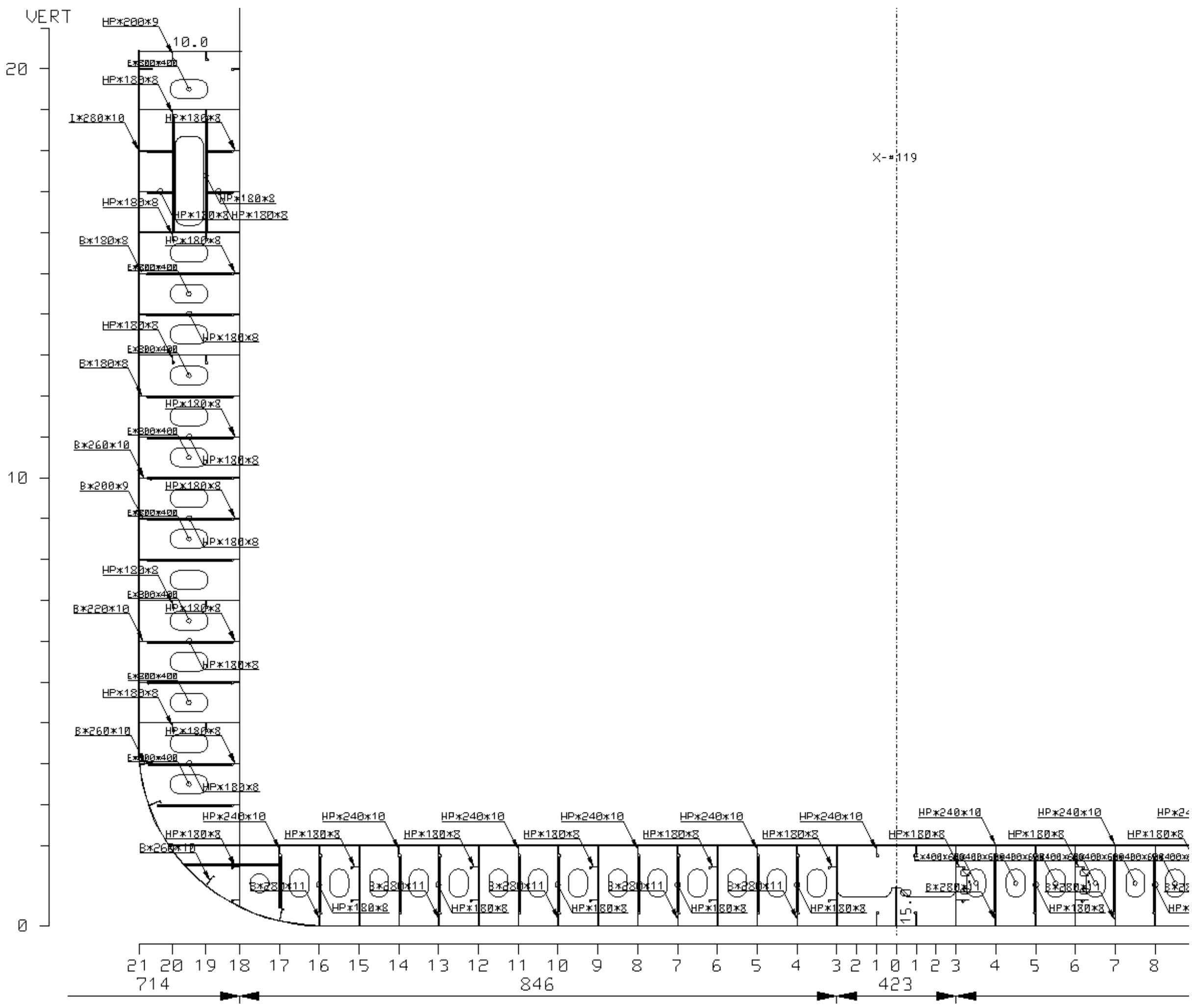
Ship design drawings from 3-D Model

Automatic generated steel scantling plans from NAPA (DXF- export possible) :





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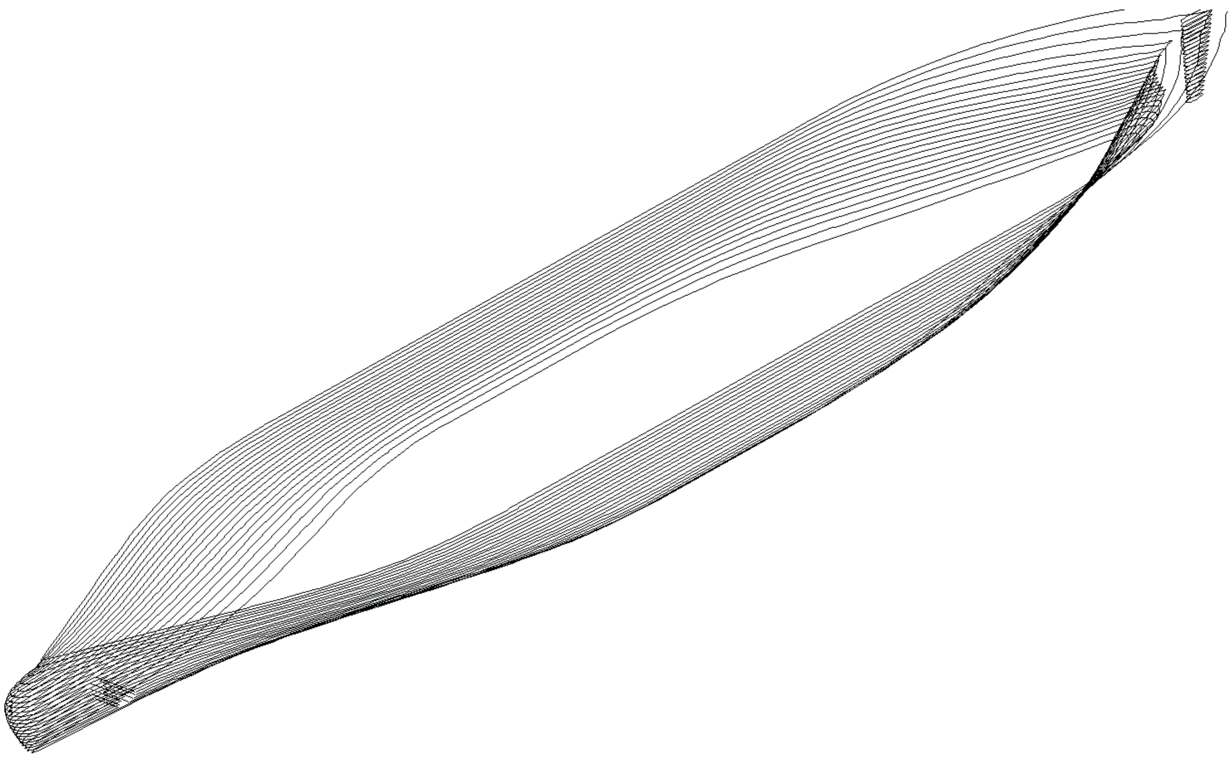
Hydrostatics

T m	DISP t	LCB m	KMT m	CB	WLA m2	MCT tm/cm	TPC t/cm
0.500	1421.3	90.657	101.563	0.4212	2993.8	198.8	30.7
1.000	3040.5	90.912	58.528	0.4553	3304.4	239.0	33.9
1.500	4794.6	91.158	42.984	0.4804	3530.0	269.8	36.2
2.000	6650.8	91.420	34.709	0.5007	3707.5	295.4	38.0
2.500	8588.6	91.678	29.422	0.5178	3848.6	316.9	39.4
3.000	10591.8	91.935	25.793	0.5325	3964.2	334.5	40.6
3.500	12648.9	92.184	23.093	0.5454	4059.3	349.7	41.6
4.000	14750.8	92.425	21.050	0.5567	4139.8	362.8	42.4
4.500	16889.6	92.649	19.454	0.5668	4210.0	374.8	43.2
5.000	19062.6	92.878	18.214	0.5759	4275.1	386.8	43.8
5.500	21267.8	93.091	17.244	0.5842	4335.5	397.7	44.4
6.000	23507.4	93.269	16.461	0.5920	4392.7	408.6	45.0
6.500	25772.3	93.441	15.837	0.5992	4447.0	419.0	45.6
7.000	28065.0	93.592	15.340	0.6060	4500.0	429.3	46.1
7.500	30380.3	93.729	14.949	0.6123	4552.1	439.5	46.7
8.000	32728.6	93.822	14.643	0.6185	4606.9	450.7	47.2
8.500	35106.5	93.883	14.420	0.6244	4666.0	463.2	47.8
9.000	37517.2	93.914	14.266	0.6303	4732.8	478.6	48.5
9.500	39961.5	93.898	14.190	0.6360	4817.3	500.1	49.4
10.000	42449.8	93.815	14.177	0.6419	4924.1	529.9	50.5
10.500	45008.2	93.689	14.206	0.6482	5048.7	568.3	51.7
11.000	47629.9	93.494	14.262	0.6548	5171.1	607.2	53.0



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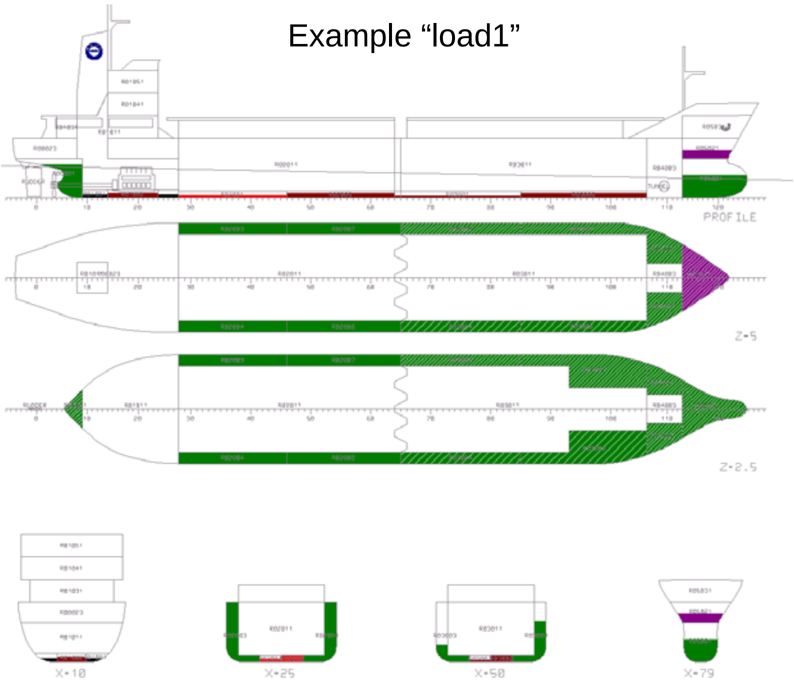
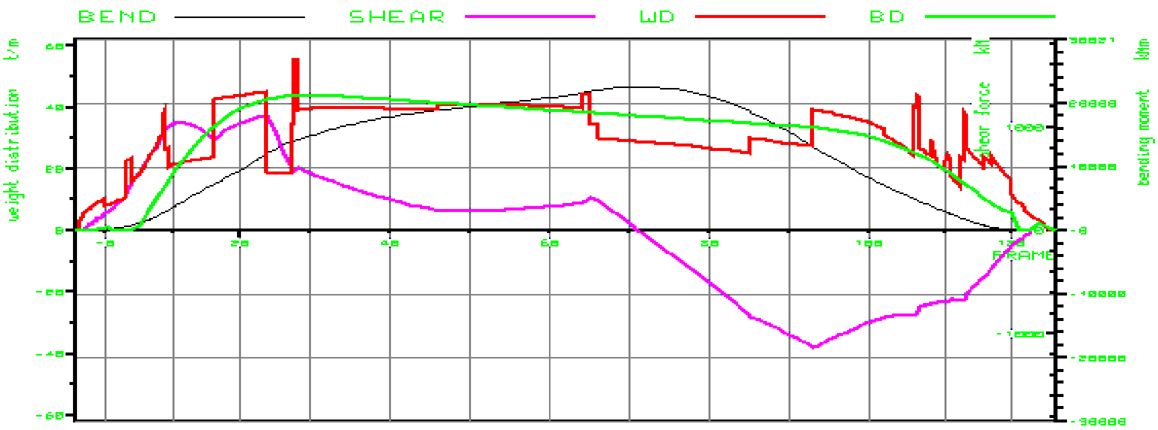
Loading condition

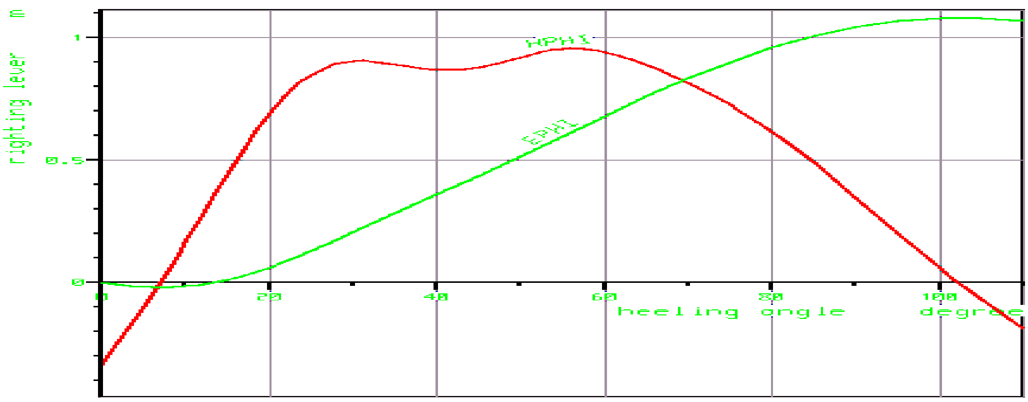
Example “load1”



bending moments & shear forces



righting leaver



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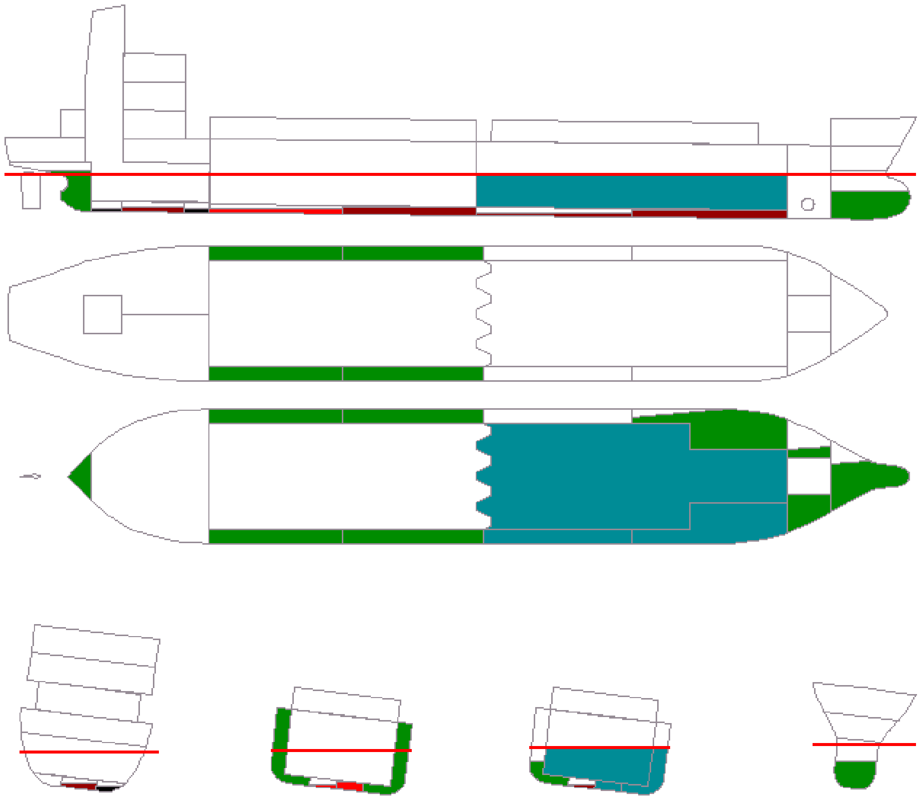
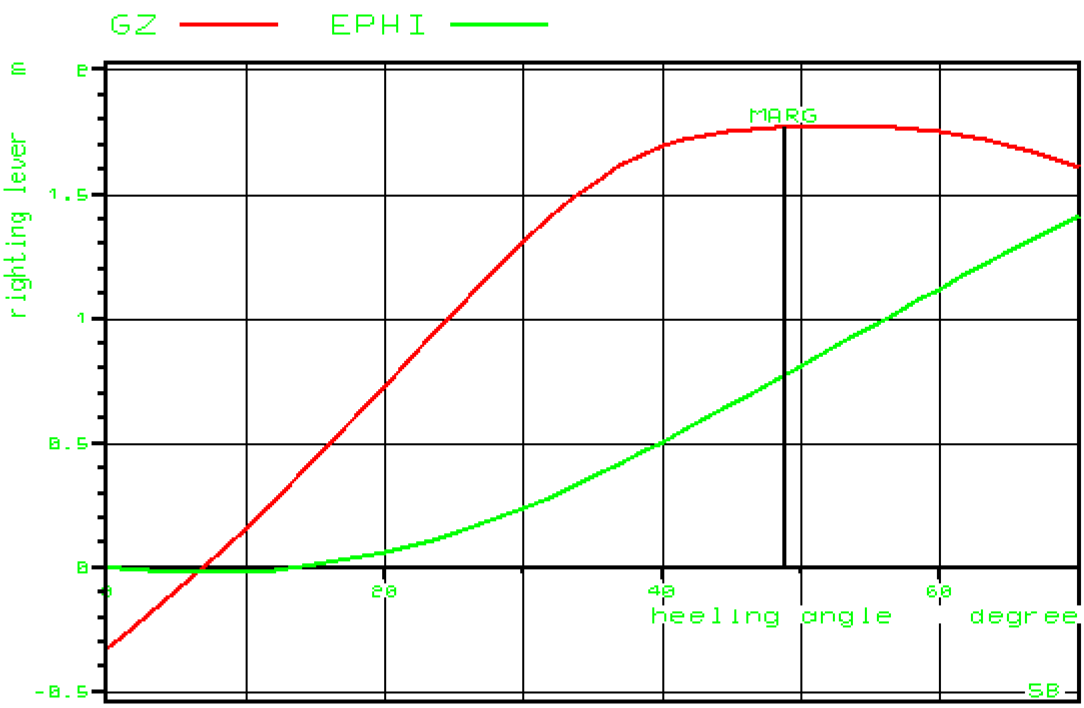
Damage Case



damage stability



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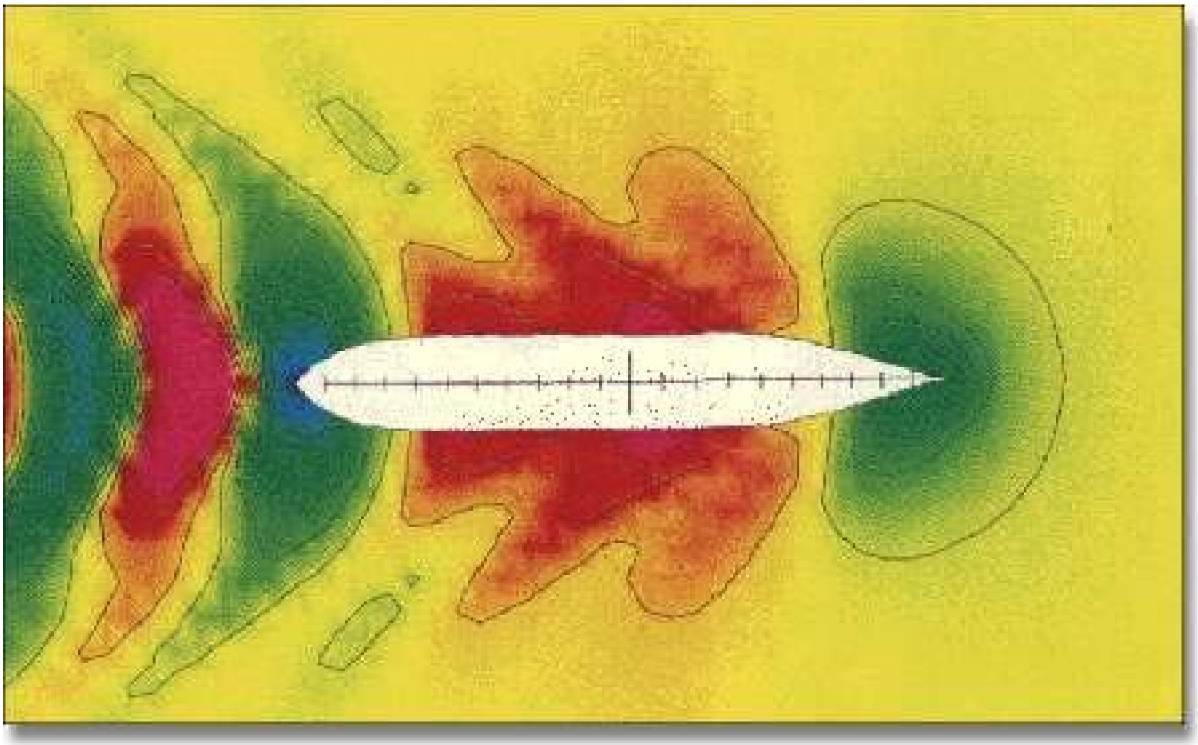
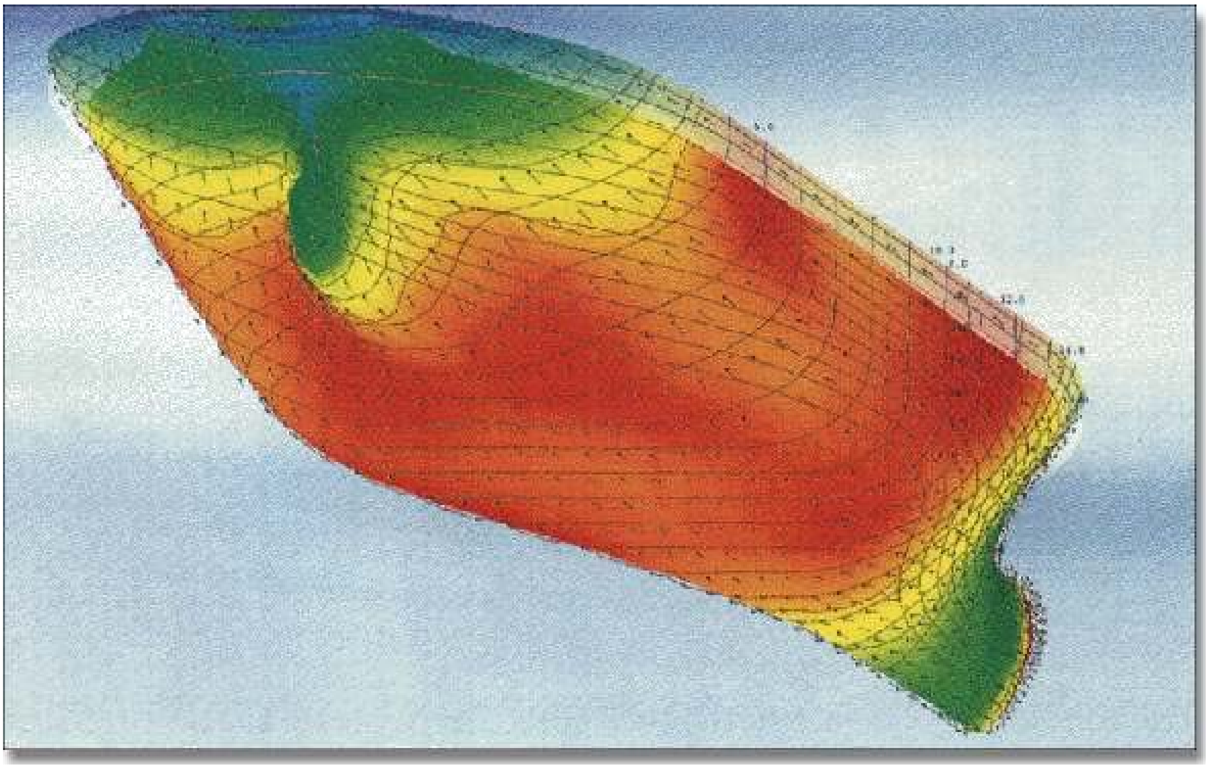
CFD analysis

It is possible to export the hull from NAPA to CFD calculation tools





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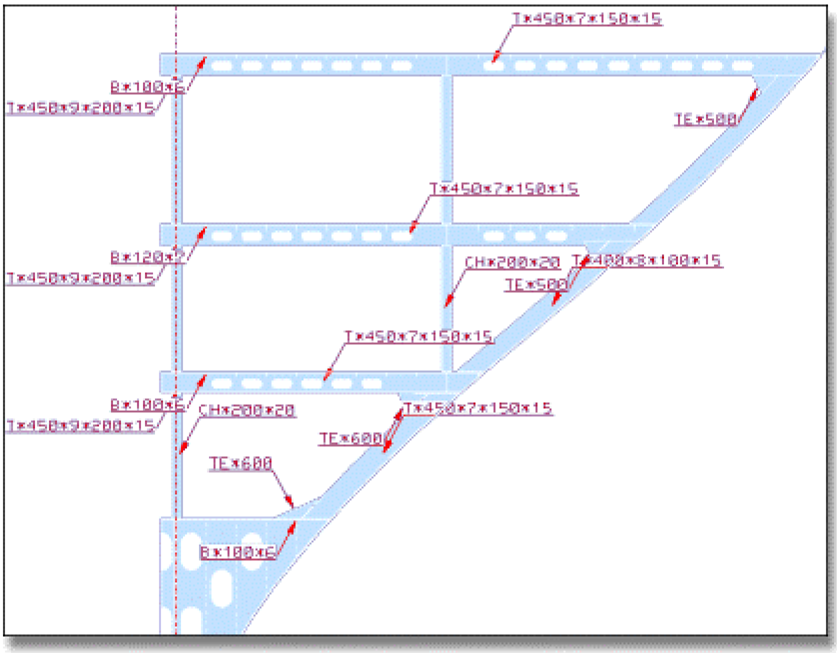
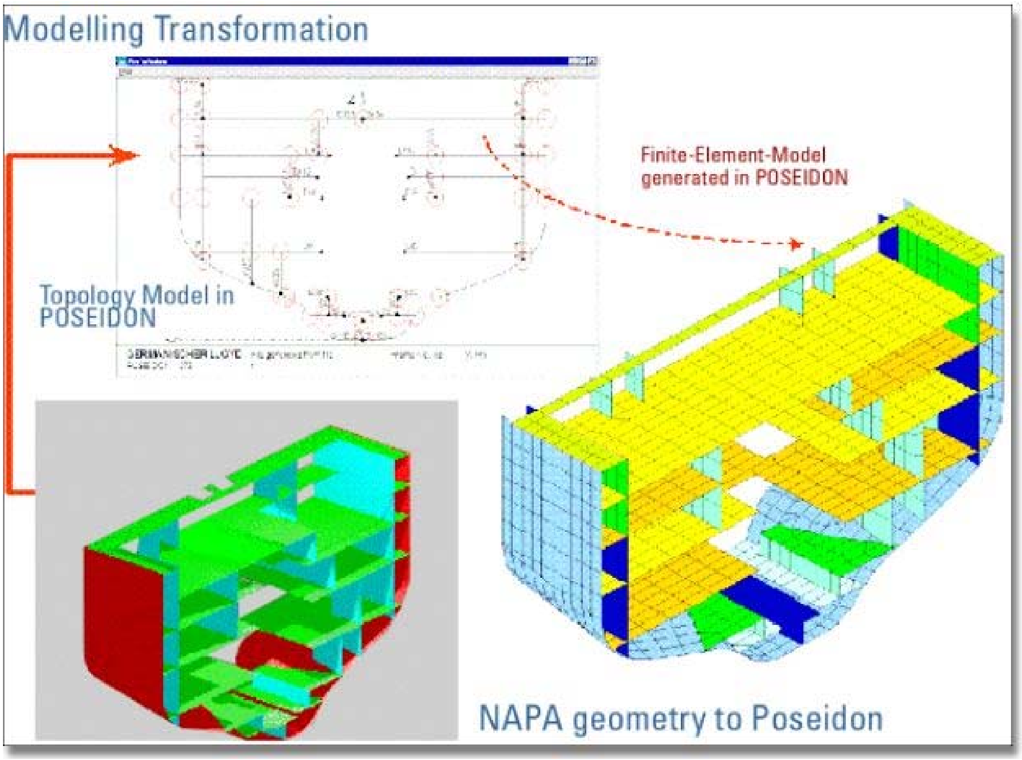
steel scantling plan

steel scantling output from NAPA



It's also Possible to export the NAPA STEEL model to scantling tools of the following classification societies:

Modelling Transformation to Poseidon, Nauticus or ShipsRight



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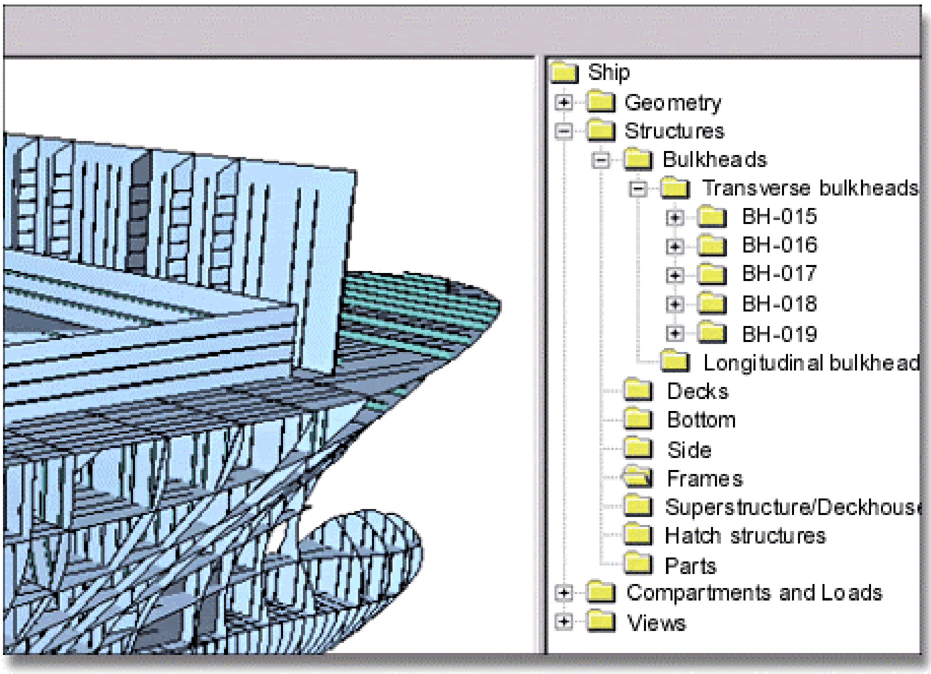
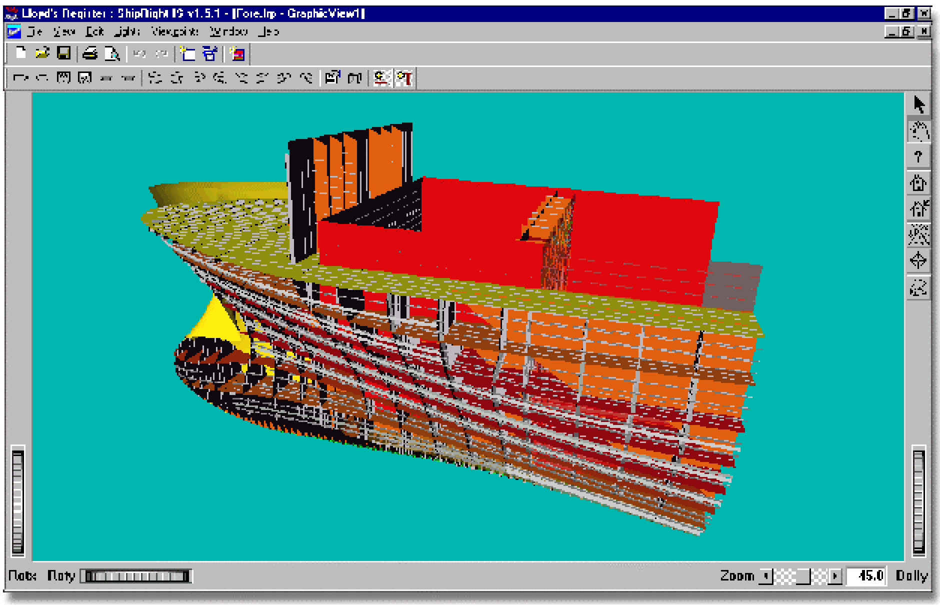
Napa Steel data to Nauticus (Important is the transfer of the functional elements)



NAPA-STEEL DATA to LR ShipRight via AP218



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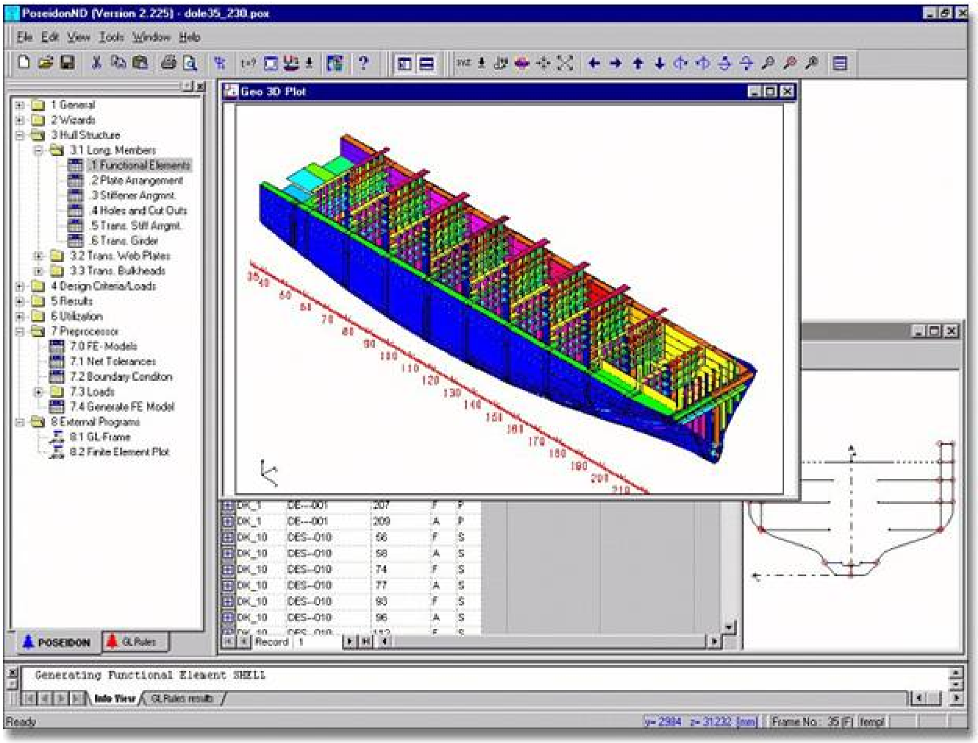
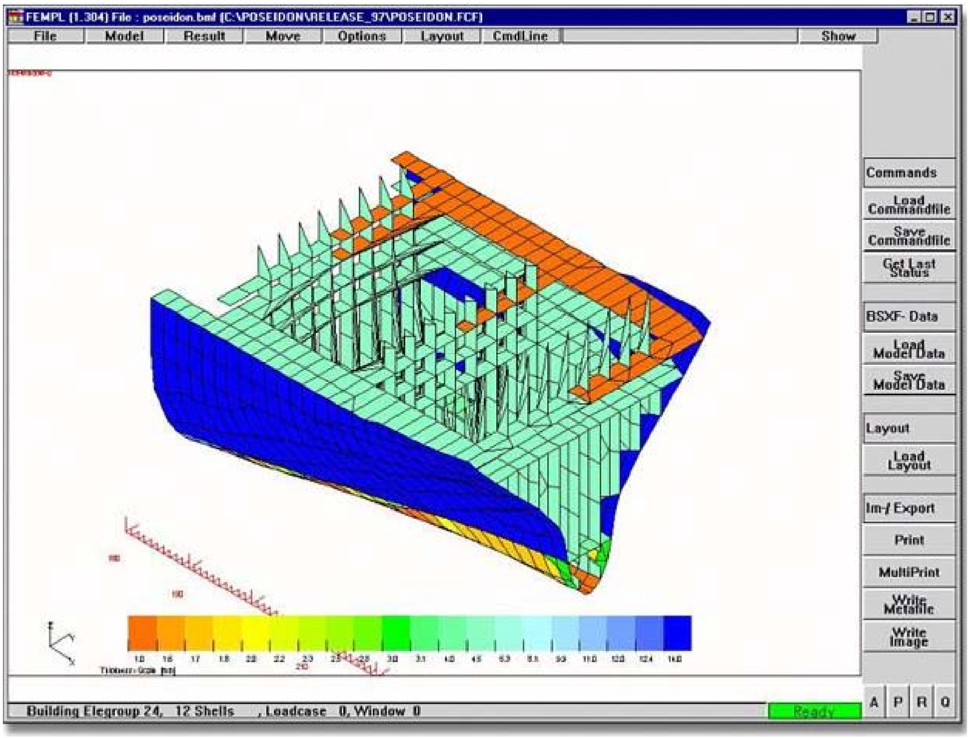
FE-calculation

NAPA-STEEL DATA to GL POSEIDON FE via AP216





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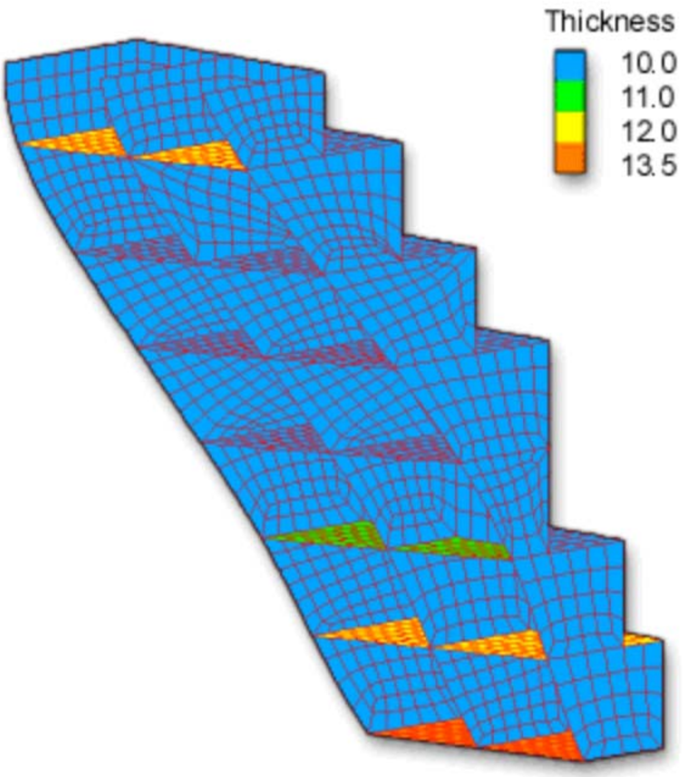
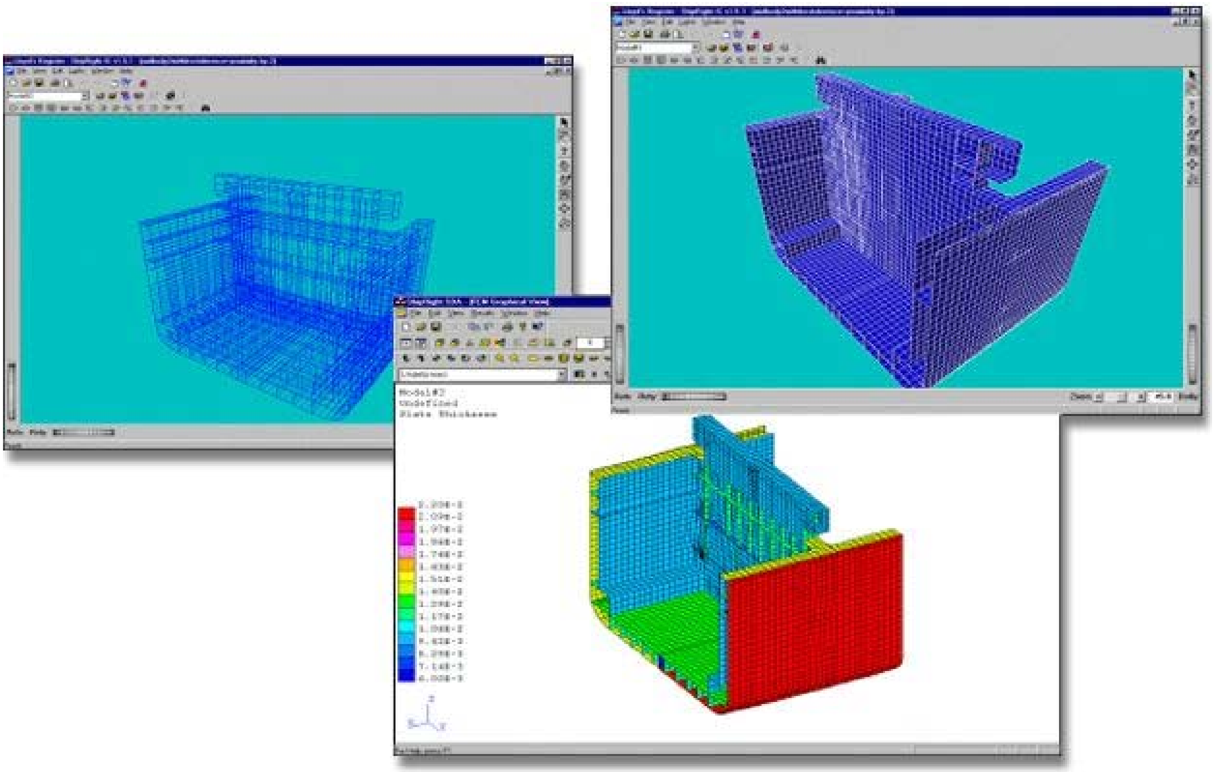
NAPA-STEEL DATA to DNV NAUTICUS FE via AP218



FE in ShipsRight



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Calculation of steel weights

Information about surfaces

NAME	STDEF	MAT	PLTH [mm]	areasti [m²]	areapla [m²]	areatot [m²]	Wsti [t]	Wpla [t]	Wtot [t]	xcg [m]	YCG [m]	ZCG [m]
XX0043	BW_01	A	10.00	1.0	14.2	15.2	0.1	1.1	1.2	32.75	0.00	0.66
XX0044	BW_01	A	10.00	1.3	14.7	16.0	0.2	1.2	1.3	33.60	0.00	0.65
XX0045	BW_01	A	10.00	2.5	16.4	18.9	0.3	1.3	1.6	34.45	-0.00	0.79
XX0046	BW_01	A	10.00	3.0	21.2	24.2	0.4	1.7	2.0	35.30	0.00	0.93
XX0047	BW_01	A	10.00	3.1	22.0	25.0	0.4	1.7	2.1	36.15	0.00	0.93
XX0048	BW_01	A	10.00	2.9	22.7	25.6	0.4	1.8	2.1	37.00	0.00	0.93
XX0049	BW_01	A	10.00	3.0	23.0	26.0	0.4	1.8	2.2	37.85	-0.00	0.92
XX0050	BW_01	A	10.00	3.1	23.8	26.9	0.4	1.9	2.3	38.70	-0.00	0.92
XX0051	BW_01	A	10.00	3.3	24.5	27.8	0.4	1.9	2.3	39.55	0.00	0.92
XX0052	BW_01	A	12.00	3.4	25.3	28.7	0.4	2.0	2.4	40.40	0.00	0.92
XX0053	BW_01	A	12.00	3.5	25.6	29.2	0.4	2.0	2.5	41.25	-0.00	0.92
XX0054	BW_01	A	12.00	3.7	26.4	30.1	0.5	2.1	2.5	42.10	0.00	0.92
XX0055	BW_01	A	12.00	3.8	27.2	30.9	0.5	2.1	2.6	42.95	-0.00	0.92
XX0056	BW_01	A	10.00	0.0	4.2	4.2	0.0	0.3	0.3	43.80	-0.00	0.93
XX0057	BW_01	A	12.00	0.0	4.7	4.7	0.0	0.4	0.4	44.65	-0.00	0.95
XX0058	BW_01	A	12.00	0.0	5.2	5.2	0.0	0.4	0.4	45.50	-0.00	0.97
XX0059	BW_01	A	12.00	3.9	27.2	31.2	0.5	2.1	2.6	46.35	0.00	0.89
XX0060	BW_01	A	12.00	0.9	6.4	7.2	0.1	0.5	0.6	47.20	-0.00	0.98
XX0061	BW_01	A	12.00	1.0	6.6	7.5	0.1	0.5	0.6	48.05	-0.00	0.98
XX0062	BW_01	A	12.00	4.3	29.0	33.3	0.5	2.3	2.8	48.90	-0.00	0.89
XX0063	BW_01	A	12.00	1.2	7.8	9.0	0.1	0.6	0.8	49.75	0.00	0.98
XX0064	BW_01	A	10.00	1.3	8.0	9.3	0.2	0.6	0.8	50.60	-0.00	0.97
XX0065	BW_01	A	10.00	4.6	30.7	35.4	0.6	2.4	3.0	51.45	0.00	0.88
XX0066	BW_01	A	10.00	1.5	9.3	10.8	0.2	0.7	0.9	52.30	0.00	0.96
XX0067	BW_01	A	10.00	1.6	9.9	11.5	0.2	0.8	1.0	53.15	0.00	0.96
XX0068	BW_01	A	10.00	5.0	32.7	37.6	0.6	2.6	3.2	54.00	0.00	0.88
XX0069	BW_01	A	10.00	1.8	10.7	12.5	0.2	0.8	1.1	54.85	0.00	0.95
XX0070	BW_01	A	9.00	1.9	11.2	13.1	0.2	0.9	1.1	55.70	-0.00	0.94
XX0071	BW_01	A	9.00	5.2	34.0	39.2	0.6	2.7	3.3	56.55	-0.00	0.88
XX0072	BW_01	A	9.00	2.0	12.3	14.3	0.3	1.0	1.2	57.40	0.00	0.93
XX0073	BW_01	A	9.00	1.8	12.8	14.6	0.2	1.0	1.2	58.25	0.00	0.92
XX0075	BW_01	A	9.00	2.0	13.3	15.3	0.2	1.0	1.3	59.95	-0.00	0.92
XX0076	BW_01	A	9.00	2.0	13.8	15.8	0.3	1.1	1.3	60.80	-0.00	0.91
XX0077	BW_01	A	10.00	5.3	36.4	41.7	0.7	2.9	3.5	61.65	0.00	0.87
XX0078	BW_01	A	10.00	2.1	14.6	16.7	0.3	1.1	1.4	62.50	-0.00	0.90
.												
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XX0091	BW_01	A	10.00	1.6	9.9	11.6	0.2	0.8	1.0	73.55	0.00	0.89
XX0093	BW_01	A	10.00	1.7	10.3	12.0	0.2	0.8	1.0	75.25	0.00	0.89
XX0094	BW_01	A	10.00	1.7	10.4	12.1	0.2	0.8	1.0	76.10	-0.00	0.89
XX0095	BW_01	A	10.00	6.0	40.2	46.2	0.7	3.2	3.9	76.95	-0.00	0.86
XX0096	BW_01	A	10.00	1.7	10.7	12.4	0.2	0.8	1.1	77.80	-0.00	0.88
XX0097	BW_01	A	10.00	1.7	10.8	12.5	0.2	0.8	1.1	78.65	-0.00	0.88
XX0098	BW_01	A	10.00	6.1	40.4	46.5	0.8	3.2	3.9	79.50	0.00	0.86
XX0099	BW_01	A	10.00	1.8	10.9	12.7	0.2	0.9	1.1	80.35	-0.00	0.88
XX0102	DH_X01F	A	20.00	51.2	207.6	258.8	7.8	16.3	24.2	30.20	-0.00	15.37
XX050001		A	10.00	0.0	157.8	157.8	0.0	12.4	12.4	-2.25	-0.00	17.39
YY0001		A	10.00	0.0	28.9	28.9	0.0	2.3	2.3	179.17	-0.00	2.37
YY0002		A	10.00	0.0	28.9	28.9	0.0	2.3	2.3	179.17	0.00	2.37
YY010103		A	10.00	0.0	24.3	24.3	0.0	1.9	1.9	4.90	3.81	11.17
RUDER		A	15.00	0.0	52.2	52.2	0.0	6.2	6.2	-0.57	-0.00	4.93
RUDERH		A	15.00	0.0	26.6	26.6	0.0	3.1	3.1	-0.73	-0.00	9.68
TOTAL				16998	67929.8	84928.0	1607.2	4989.6	6596.8	91.54	-0.01	10.04

Information about stiffeners

PROFID	Wsti [t]	Lsti [m]	areasti [m2]	xcg [m]	YCG [m]	ZCG [m]
HP*140*8	29.9	2146.7	300.5	24.5	-0.1	27.2
HP*160*8	1.0	258.8	41.4	30.1	-0.0	32.7
HP*180*8	529.9	29843.7	5371.9	90.1	0.0	10.6
HP*200*9	81.2	2983.7	596.7	70.7	-1.0	17.5
HP*220*10	9.2	273.7	60.2	30.0	-0.0	16.0
HP*260*10	35.5	1251.9	384.3	118.7	0.0	4.9
HP*280*11	84.6	2524.0	835.4	92.4	-0.0	0.3
HP*290*10	12.4	378.8	129.3	3.7	-0.0	11.3
HP*350*12	39.5	821.6	338.9	25.9	0.0	6.9
.						
.						
.						
I*150*10	0.8	68.0	10.2	94.0	0.0	1.7
I*150*8	49.7	5267.0	790.2	108.9	0.0	12.1
I*280*10	30.7	1392.9	390.0	108.8	-0.0	17.2
I*400*10	94.0	2989.6	1195.8	96.1	-0.0	12.3
T*1000*15*300*18	44.9	283.6	366.2	183.7	0.0	17.9
T*230*10*400*12	164.0	2989.6	1865.5	96.1	-0.0	12.3
T*240*9*151*12	18.9	622.2	239.6	100.4	-0.0	17.1
T*250*9*151*12	62.2	2000.1	790.0	24.3	-0.1	27.1
T*350*11.5*100*15	173.4	4122.0	1824.0	108.6	-0.0	11.8
T*400*9*151*10	0.0	458.2	250.2	0.0	0.0	0.0
TOTAL	1607.2	69206.3	16998	90.9	-0.1	11.4

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Different list output from 3-D model

- For stiffeners, openings, blocks, cross section properties, etc.
- Standard quantities
- User defined quantities and formulas

cost estimation, budgets

Buil. Grou	Pos. No.	Quantity	M	Description	DM per Qua.	Total DM	K A
				Luboilsystem			
4711		150	STD	Man hours Luboilsystem	100,00	**15.000,00**	1
4711		1	STZ	Bulk material Luboilsystem	5.000,00	**5.000,00**	2
4711	001	1	STK	Main Lubricating Pump1	35.000,00	**35.000,00**	4
4711	002	1	STK	Main Lubricating Pump2	35.000,00	**35.000,00**	4
4711	003	1	STK	Main Crosshead Lubricating Oil Pump1	12.000,00	**12.000,00**	4
4711	004	1	STK	Main Crosshead Lubricating Oil Pump2	12.000,00	**12.000,00**	4
4711	005	1	STK	Cylinder Lub.Oil Transfer Pump	1.500,00	**1.500,00**	4
4711	006	1	STK	Main Cylinder Lu 1 Transfer Pump	4.000,00	**4.000,00**	4
4711	007	1	STK	Stern Tube Tank Filling Pump (by Hand)	1.000,00	**1.000,00**	4
4711	008	1	STK	Main Lubricating Oil Cooler 2448 KW	40.000,00	**40.000,00**	4
4711	009	1	STK	Main Lubricating Oil Separator1	60.000,00	**60.000,00**	4
4711	010	1	STK	Main Lubricating Oil Separator2	60.000,00	**60.000,00**	4
4711	011	1	STK	Main Lubricating Oil Separator Preheater1	3.000,00	**3.000,00**	4
4711	012	1	STK	Main Lubricating Oil Separator Preheater2	3.000,00	**3.000,00**	4
4711	013	1	STK	Saugefilter L.O. Separat. Pump1	800,00	**800,00**	4
4711	014	1	STK	Saugefilter L.O. Separat. Pump2	800,00	**800,00**	4
4711	015	1	STK	Main Lubricating Oil Discharge Filter	75.000,00	**75.000,00**	4
4711	016	1	STK	Main Lubricating Oil Bypass Filter	20.000,00	**20.000,00**	4
4711	017	1	STK	Zylinderöl-Druckfilter	500,00	**500,00**	4
4711	018	1	STK	Main Cylinder Lub. Oil Meter	5.000,00	**5.000,00**	4
4711	999	1	STK	Small Items	15.000,00	**15.000,00**	4
Total Luboilsystem						**403.600,00**	

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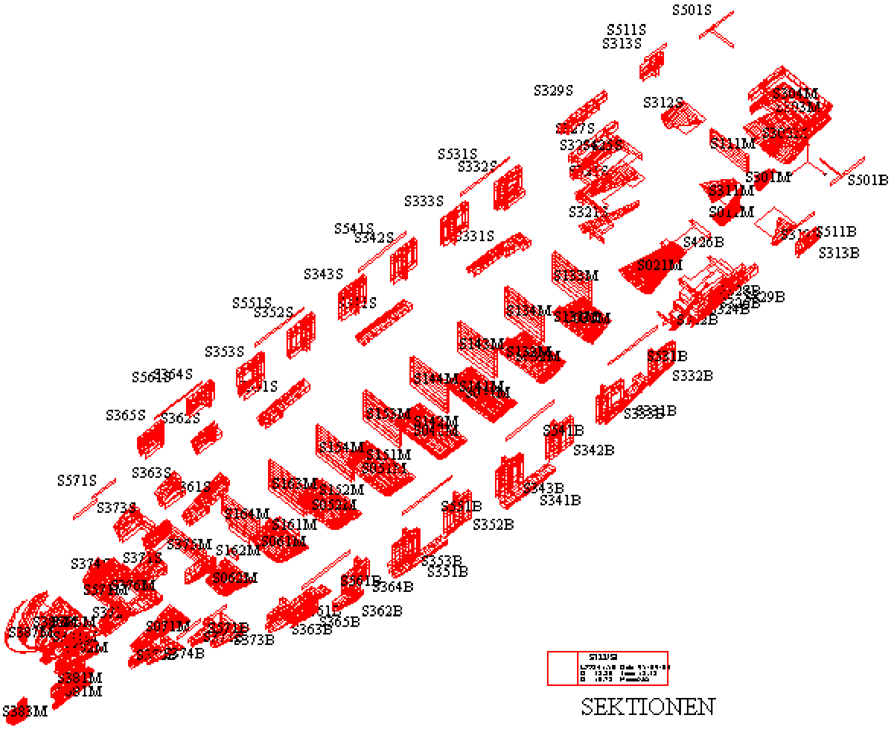
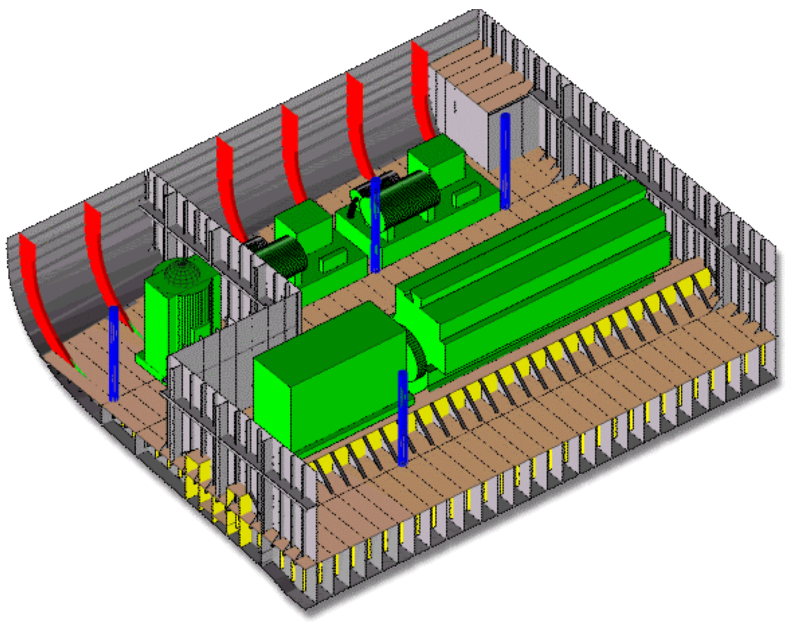
block assembly plan in NAPA



machinery layout in NAPA

according to the specification the equipment can implemented into the 3D model.



- Pieces of equipment and space reservations for e.g. pipelines
- Software under development
- Forms the new basic design system together with NAPA Steel

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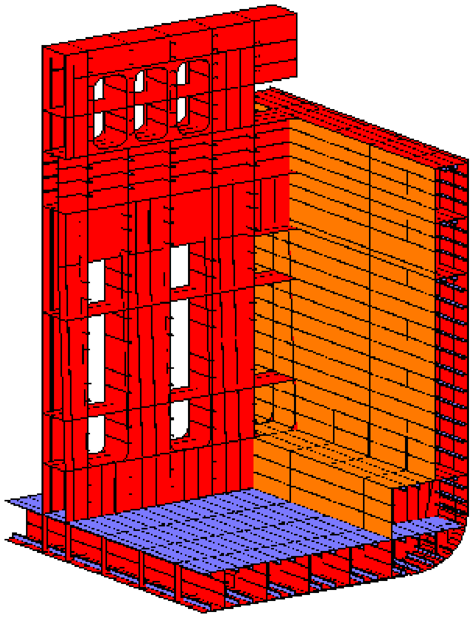
Painting plan from the 3D – Model



NAME	DES	PLTH	MAT	AREA_PL	AREA_ST	AREA_TOT
HULLPB		14.5	A36	237.70	63.56	301.25
HULLPS		14.5	A36	376.35	119.60	495.96
BH---005	SCHOTTE	10.5	A36	256.10	52.47	308.57
BH---006	SCHOTTE	10.5	A36	207.42	48.15	255.57
BH---021	SCHOTTE	10.5	A36	49.19	4.41	53.59
BW---046	BODENWRANGEN	9.0	A36	23.71	3.01	26.72
BW---047	BODENWRANGEN	9.0	A36	24.02	3.07	27.09
BW---048	BODENWRANGEN	9.0	A36	24.41	3.13	27.54
BW---049	BODENWRANGEN	9.0	A36	24.67	3.18	27.85
BW---050	BODENWRANGEN	9.0	A36	24.82	3.20	28.02
DE---001	DOPPELBODEN DECK	13.5	A36	273.71	67.36	341.07
DE---002	DECK ueber DB.	12.0	A36	34.65	8.17	42.82
DE---006	DECK Unterkante Pass.Way	10.0	A36	40.27	11.04	51.31
X-FR-242	KIM Blech	10.0		1.18	0.42	1.60
X-FR-025	WEBFRAMES	10.0		41.05	8.24	49.29
X-FR-026	WEBFRAMES	10.0		41.08	9.07	50.15
X-FR-027	WEBFRAMES	10.0		41.10	9.07	50.16
Z-LP-007	Schotten Gaenge	9.0		28.78	2.32	31.10
Z-LP-009	Schotten Gaenge	9.0		28.78	2.32	31.10
Z-LP-032	Schottgang Deck 002 #92	9.0		23.43	1.90	25.32
TOTAL				2783.76	645.20	3428.97

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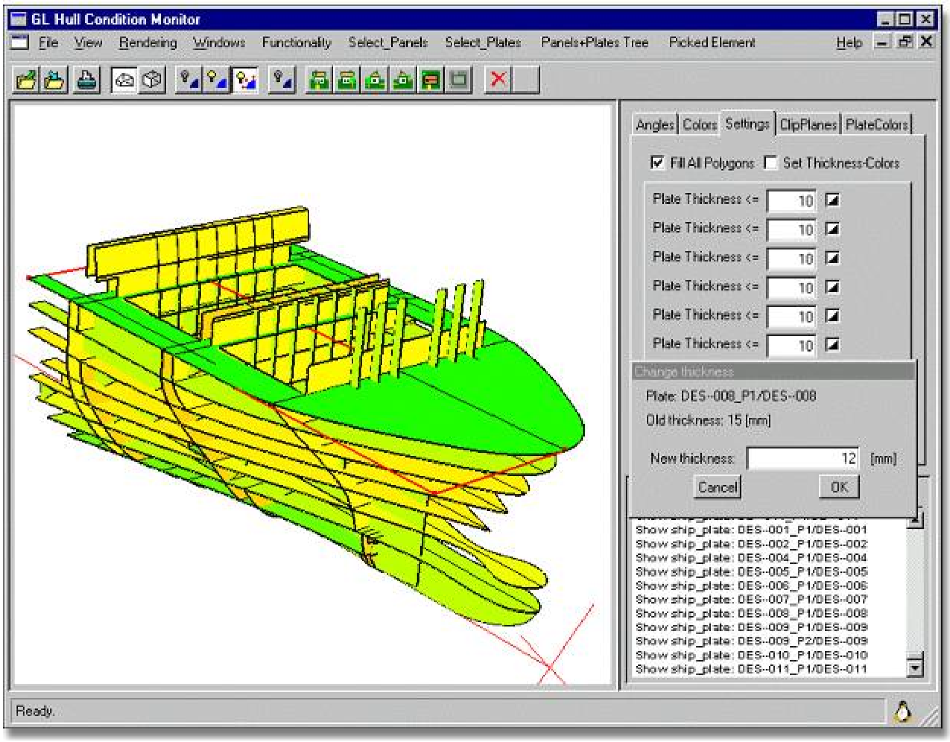
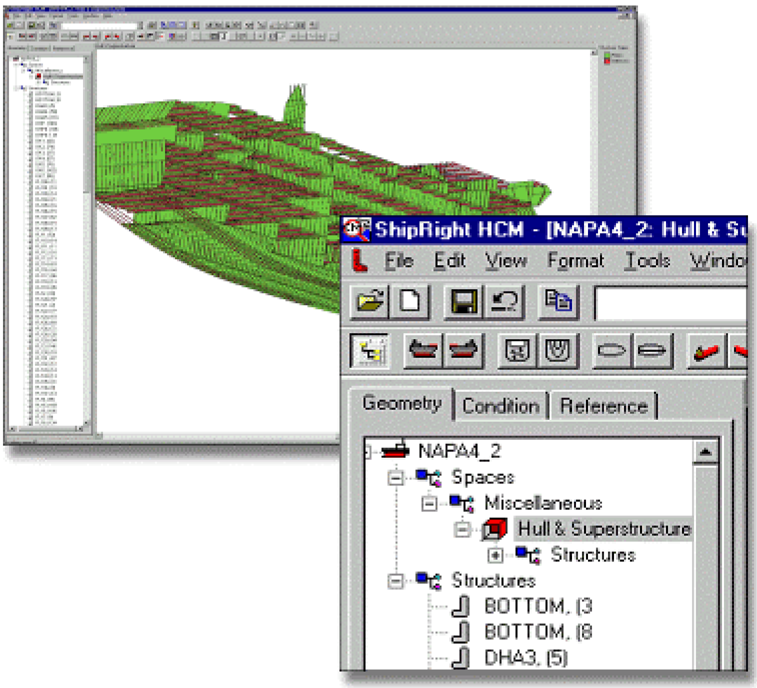
hull condition monitoring



NAPA-STEEL DATA to GL HULL CONDITION MONITOR via AP218



Hull Condition Monitoring in Ships Right

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Virtual prototyping

Rendering

Animations and simulation