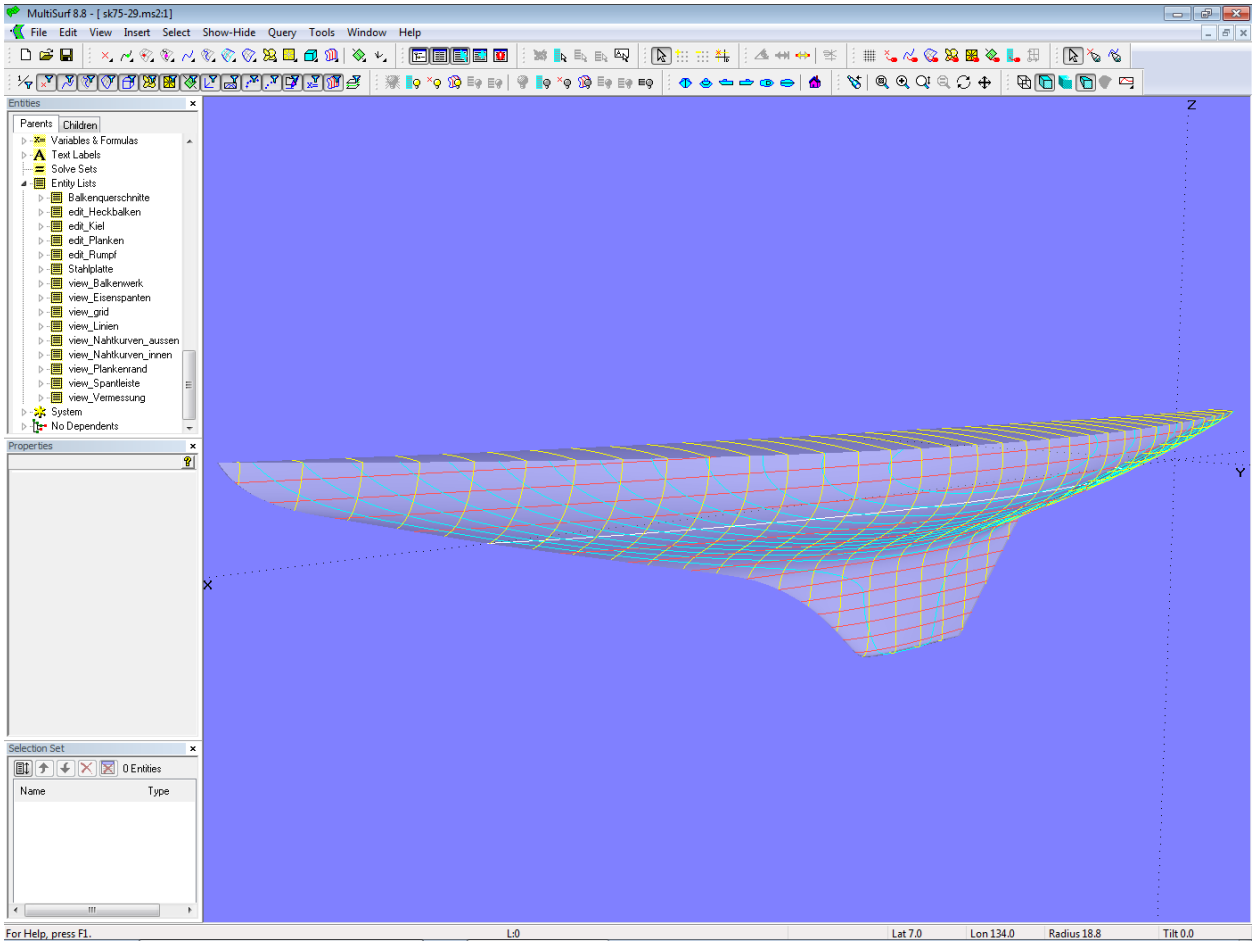
On the Modeling of a 75 sqm Yacht Hull

by Reinhard Siegel

Introduction

Juliane Hempel of *Yachtkonstruktion Dipl. Ing. Juliane Hempel* was given in 2015 the commision for the design work of a 75 square metre skerry cruiser. The yacht is based on a never built Gustav A. Estlander design of 1927. MultiSurf was used extensively for the 3D modeling of hull, deck, structural parts and the layout of the hull planking. The yacht is currently under construction at *Yacht- und Bootswerft Josef Martin*, Lake of Constance.



75 sqm yacht (design by Juliane Hempel*) – bow view*

Rules for square metre yachts

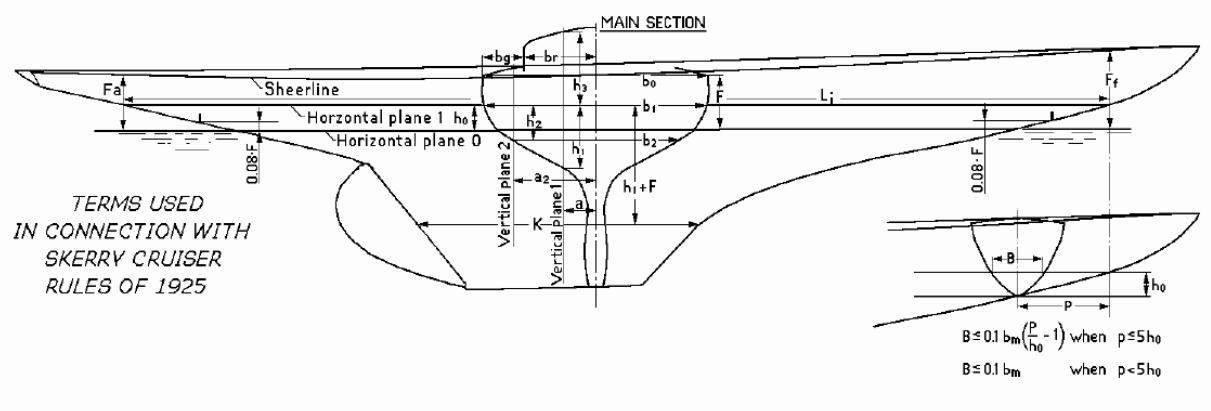
The square metre yachts (skerry cruisers) are regulated by a set of class rules. Basis for the hull regulations is a table of hull particulars of an ideal square metre yacht. If certain measurements exceed the ideal ones, displacement, mean breadth, freeboard and length of keel are to be increased.

Table I. MEASUREMENT OF SQUARE METRE CLASSES

Sail area (S — see 1.3.2)	Sqm	Class sq m. 15	22	30	40	55	75	95	120	150
Ideal length (L_i — see 1.3.4 and 1.3.7), measured at the points where h_1 intersects the hull in the midship plane on the outer side, table value	m	6.50	7.80	9.10	10.50	12.20	14.10	15.80	17.70	19.70
Displacement (W_i — see 1.3.7) table value	kg	790	1 320	2 000	2 940	4 510	6 840	9 380	12 830	17 800
Mean breadth at main section (bm_i — see 1.3.3 and 1.3.7) The main section is defined as the transverse plane at the maximum mean breath table value	m	1.46	1.66	1.86	2.05	2.29	2.56	2.78	3.01	3.26
Freeboard (F_i — see 1.3.6 and 1.3.7), measured on the main section, from h_0 to the upper edge of the covering board on the sides of the yacht table value	m	0.40	0.45	0.50	0.57	0.67	0.80	0.90	1.00	1.10
Sum of the freeboards ($F_f + F_a$), measured from h_0 to the upper edge of the covering board, at fore and aft ends of L_x. The measurement shall be at least 2 F_i table value increased according to 1.3.7 by…	m	0.100	0.118	0.136	0.156	0.182	0.212	0.238	0.266	0.296
Length of keel (K_i), to be measured externally, where a horizontal plane situated at a distance h_1+F_i (table values) below HP1 intersects the hull in the midship plane.	m	1.60	2.00	2.30	2.60	3.00	3.50	3.90	4.40	4.90
Horizontal plane 1 : (h_0) height above horizontal plane 0	m	0.13	0.15	0.18	0.21	0.24	0.28	0.31	0.35	0.39
Vertical plane 1: distance (a_1) from midship plane	m	0.18	0.21	0.23	0.26	0.29	0.32	0.35	0.38	0.41
Vertical plane 2: distance (a_2) from midship plane	m	0.61	0.70	0.78	0.86	0.96	1.07	1.17	1.27	1.37
Minimum of height (h_1) from inside of planking to h_0, measured at main section in vertical plane 1	m	0.40	0.48	0.55	0.63	0.74	0.86	0.97	1.08	1.20
Minimum of height (h_2) from inside of planking to h_0, measured at main section in vertical plane 2	m	0.19	0.23	0.27	0.31	0.36	0.42	0.47	0.52	0.58

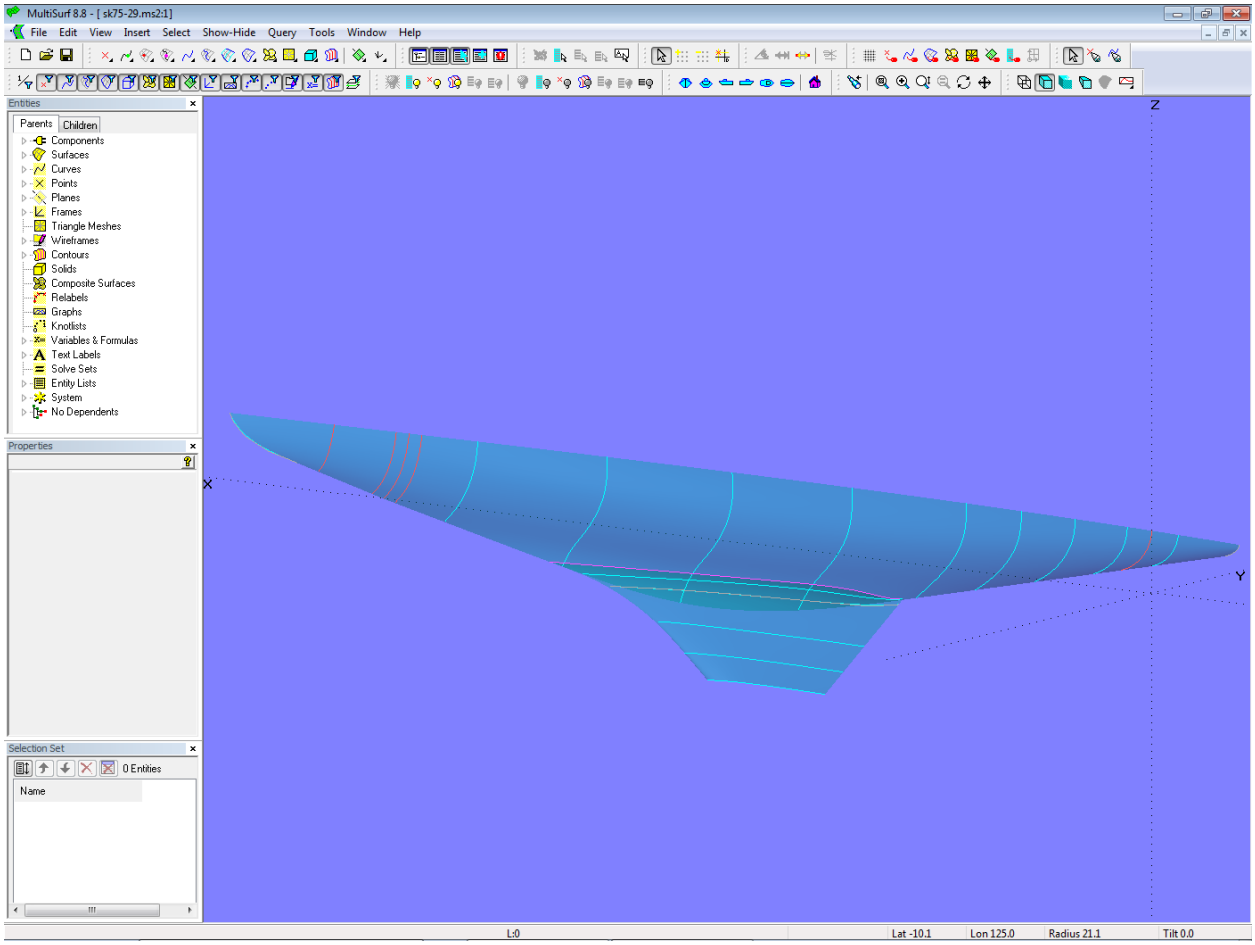
Table I: ideal hull particulars (taken from "Rules for skerry cruisers (square metre yachts", SSKF, 2013)

Measurements are taken at a variety of horizontal and transverse sections.



Definition of horizontal and transverse measurement sections (taken from "Rules for skerry cruisers (square metre yachts", SSKF, 2013)

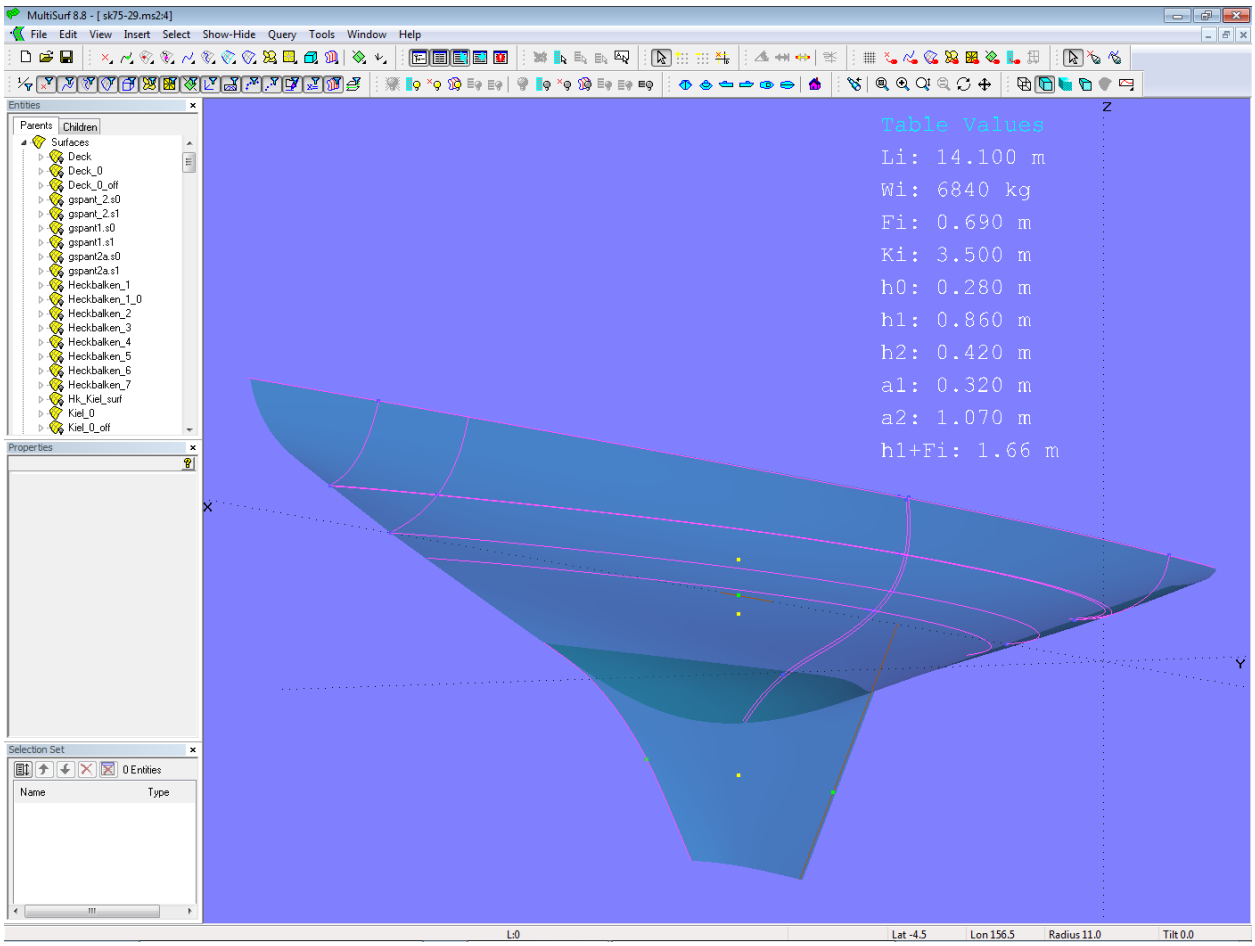
Model construction



Mastercurves of the C-spline Lofted Surface hull_0 and the B-spline Lofted Surface keel_0

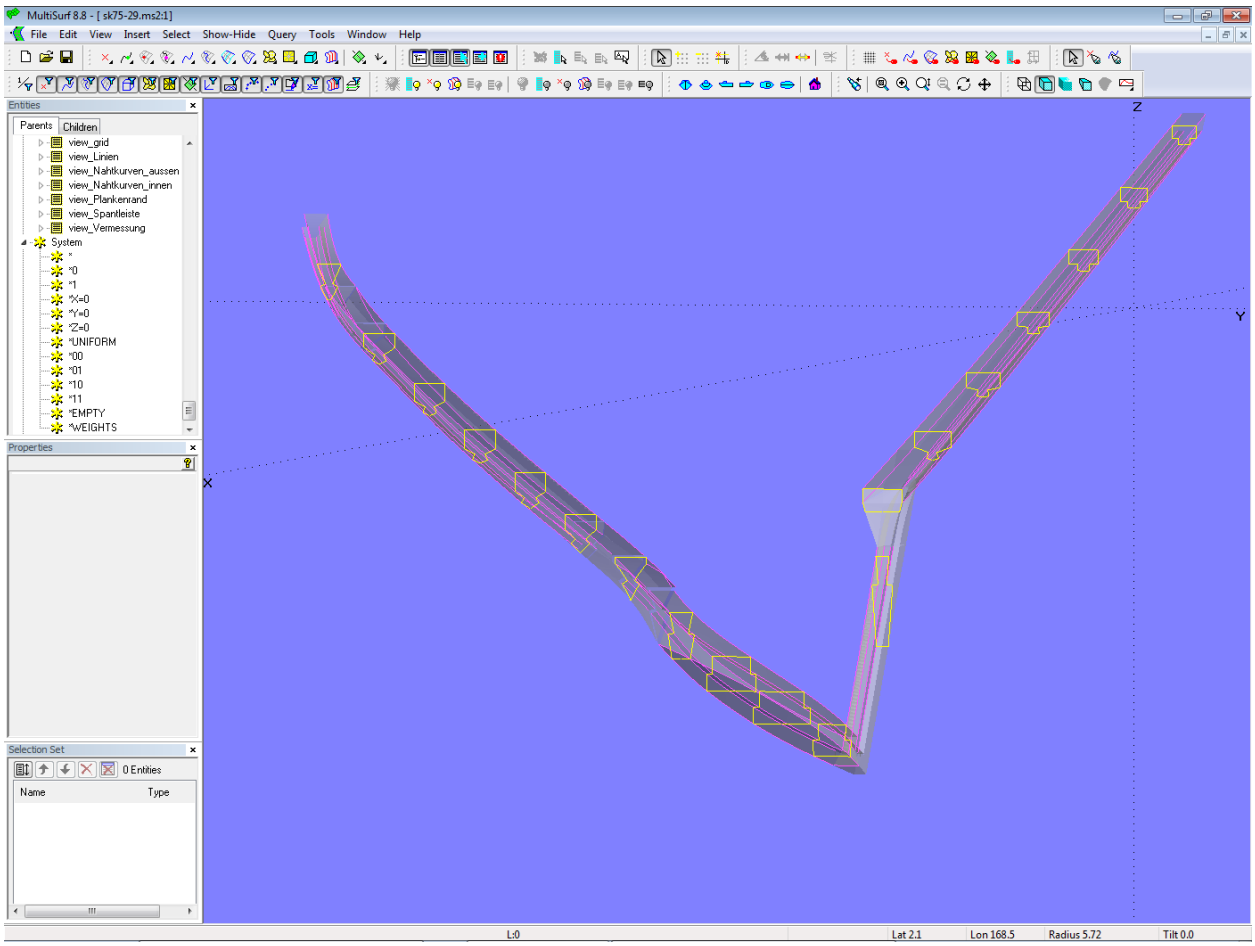
The hull is split in two parts – the canoe body and the keel appendage. The canoe body is a C-spline Lofted Surface on B-spline mastercurves. Attached to it is the keel as a B-spline Lofted Surface, using a snake and a Procedural Curve for tangential joint and several B-spline Curves.

For direct comparison of hull dimensions against rule measurements the class regulations are implemented in the model by variables and formuals.

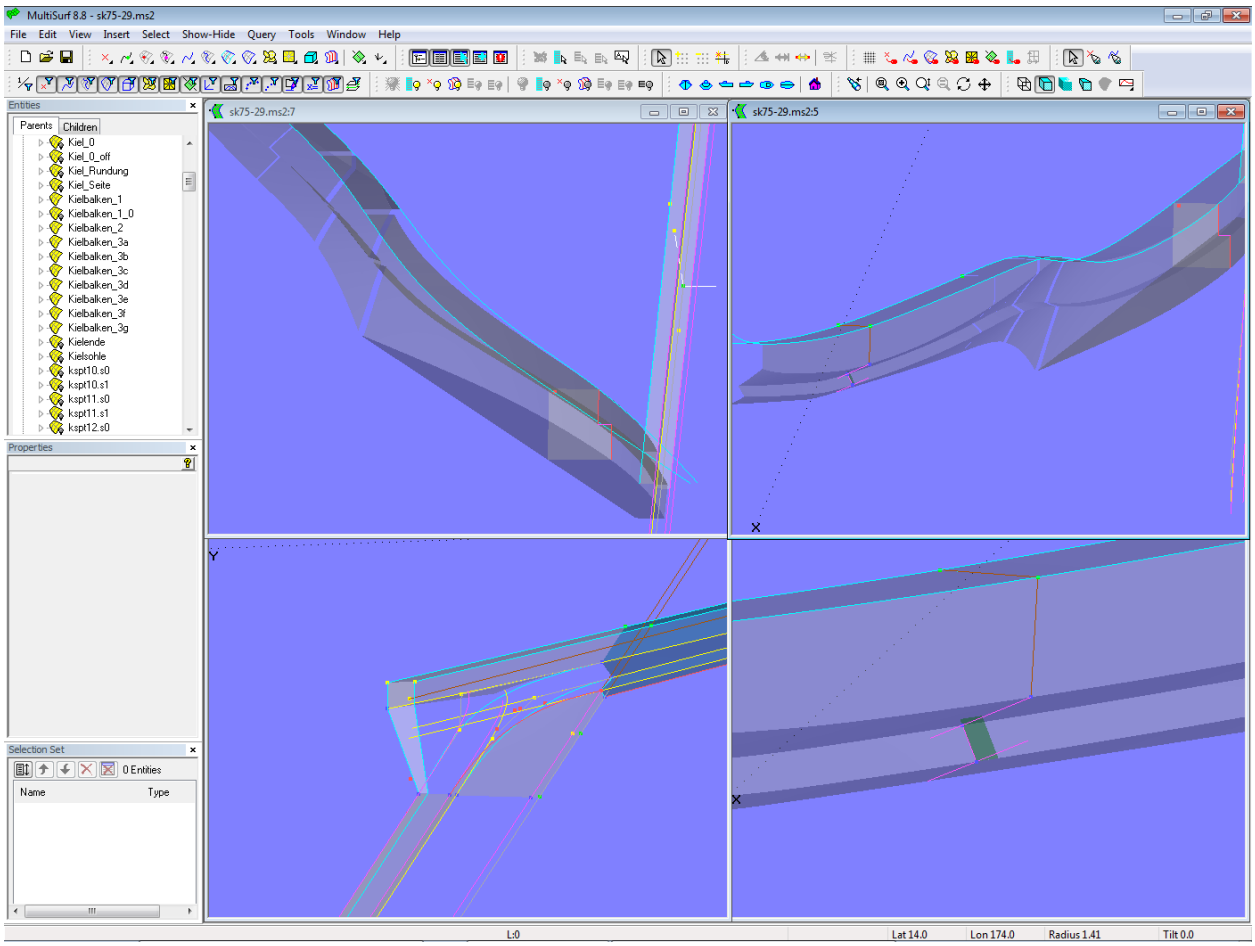


Measurement data and defining sections

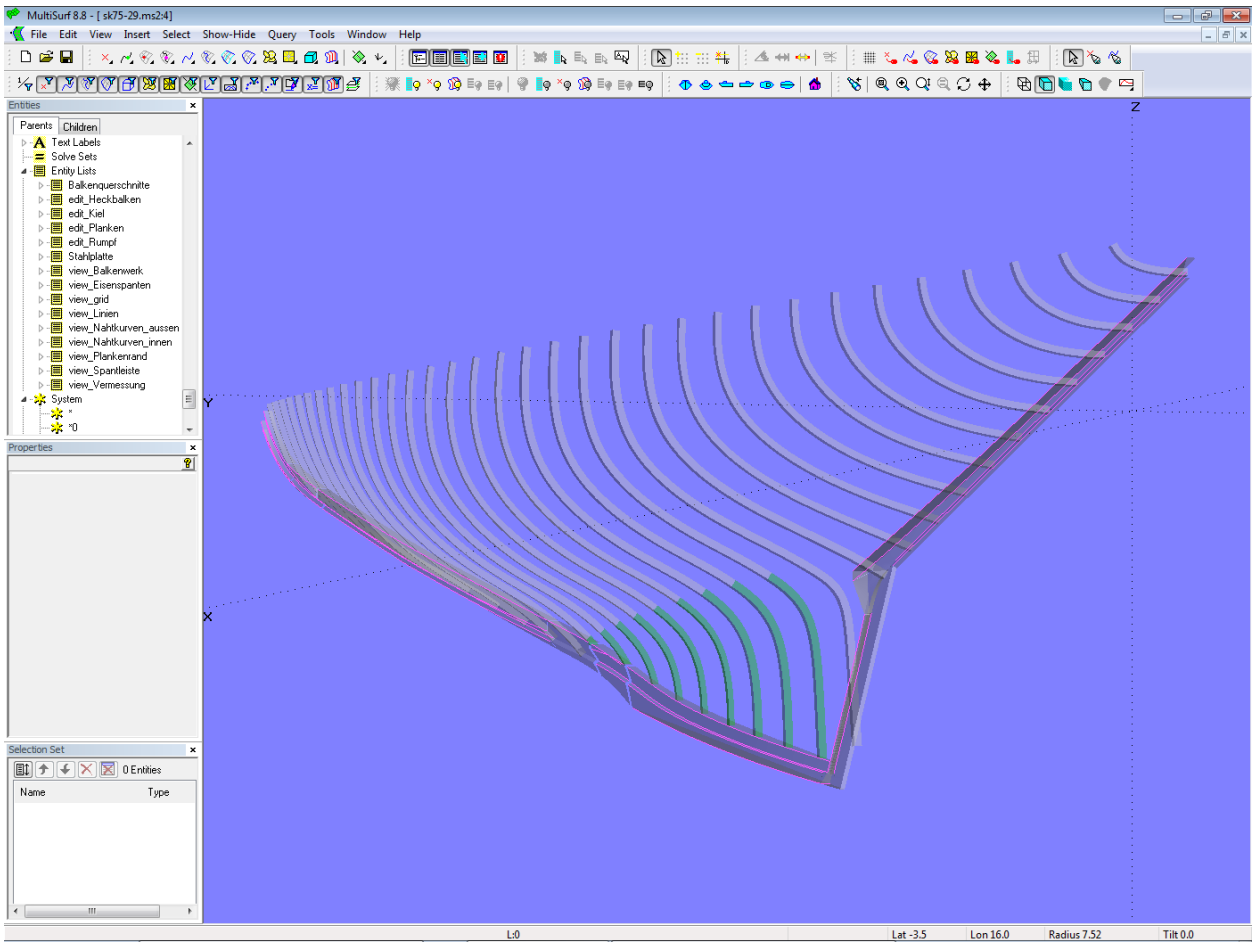
Furtheron structural parts like stem, keel plank, rudderpost, etc. are included in the model.



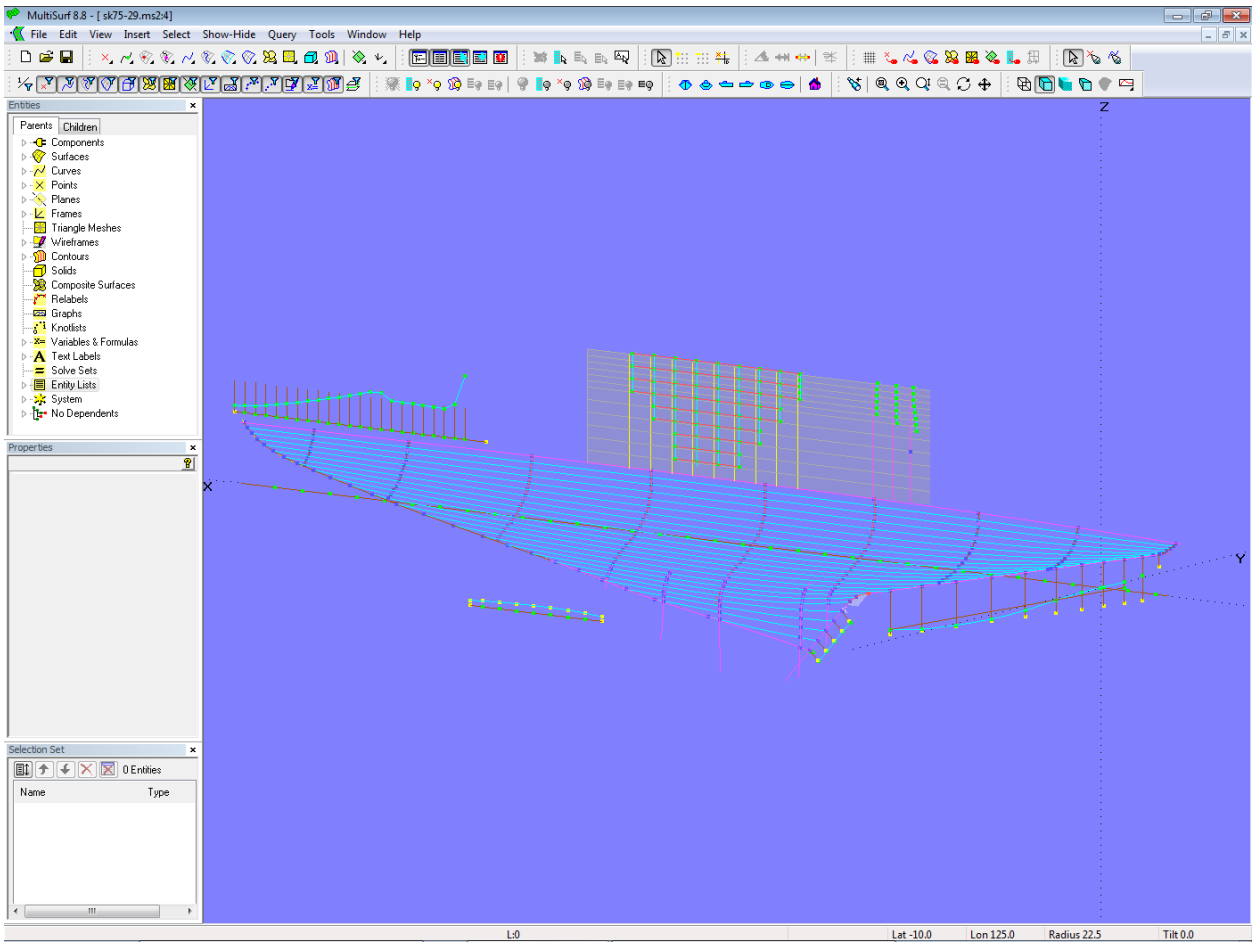
Stem, keel plank, rudderpost, sternpost



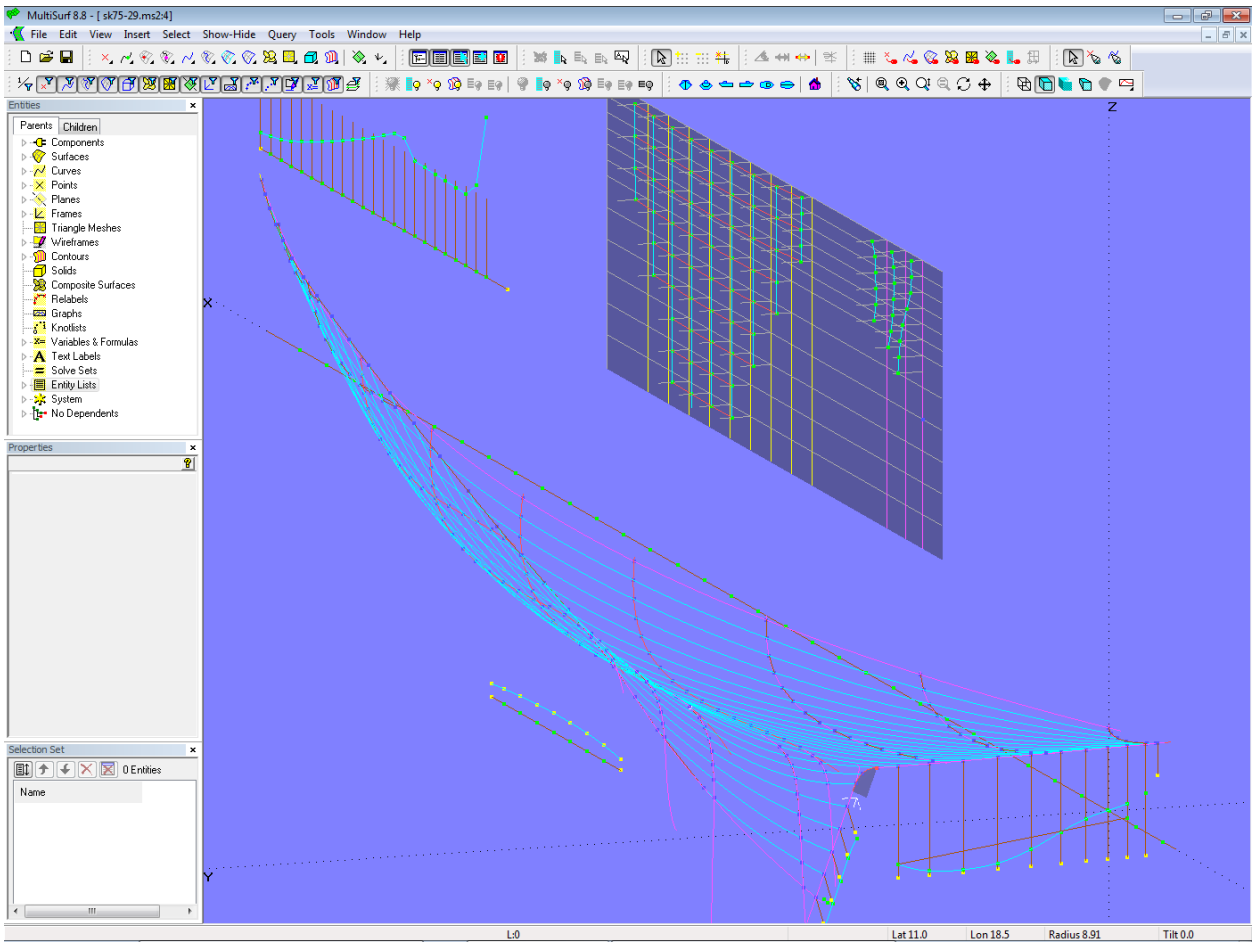
Construction details of stem, keel and stern parts



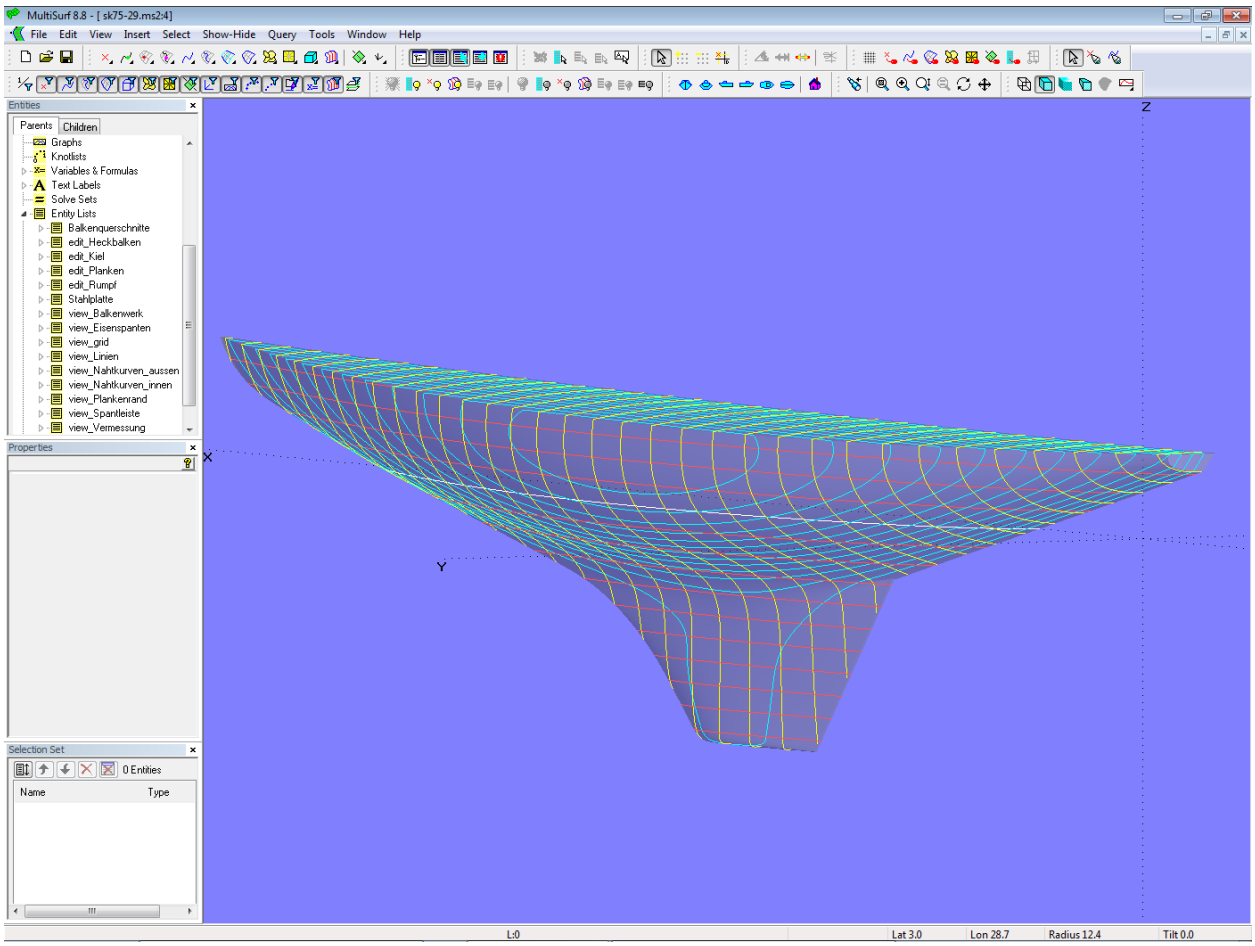
Iron frames to inside of hull planking



Layout of plank seams



Grid for vertical and longitudinal fairing of plank width



75 sqm yacht (design by Juliane Hempel*) - stern view*

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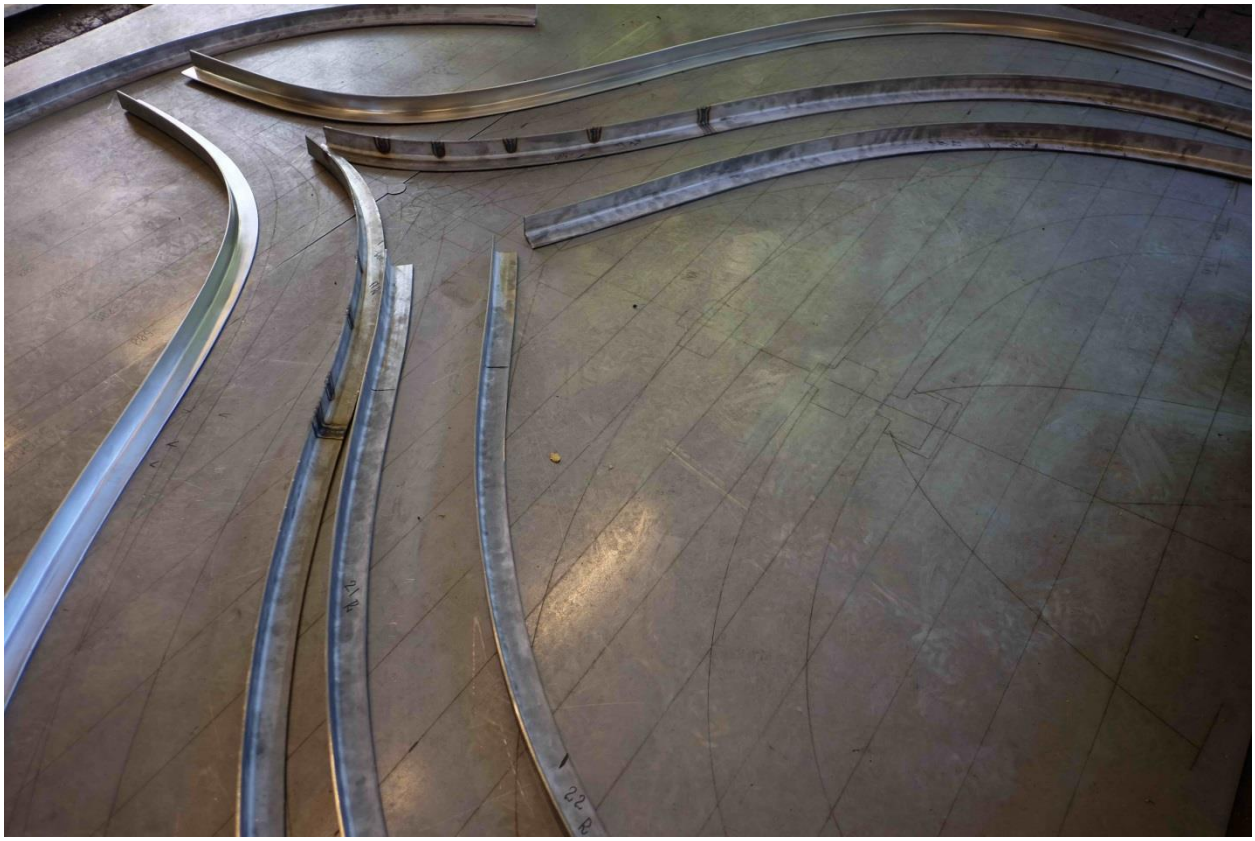

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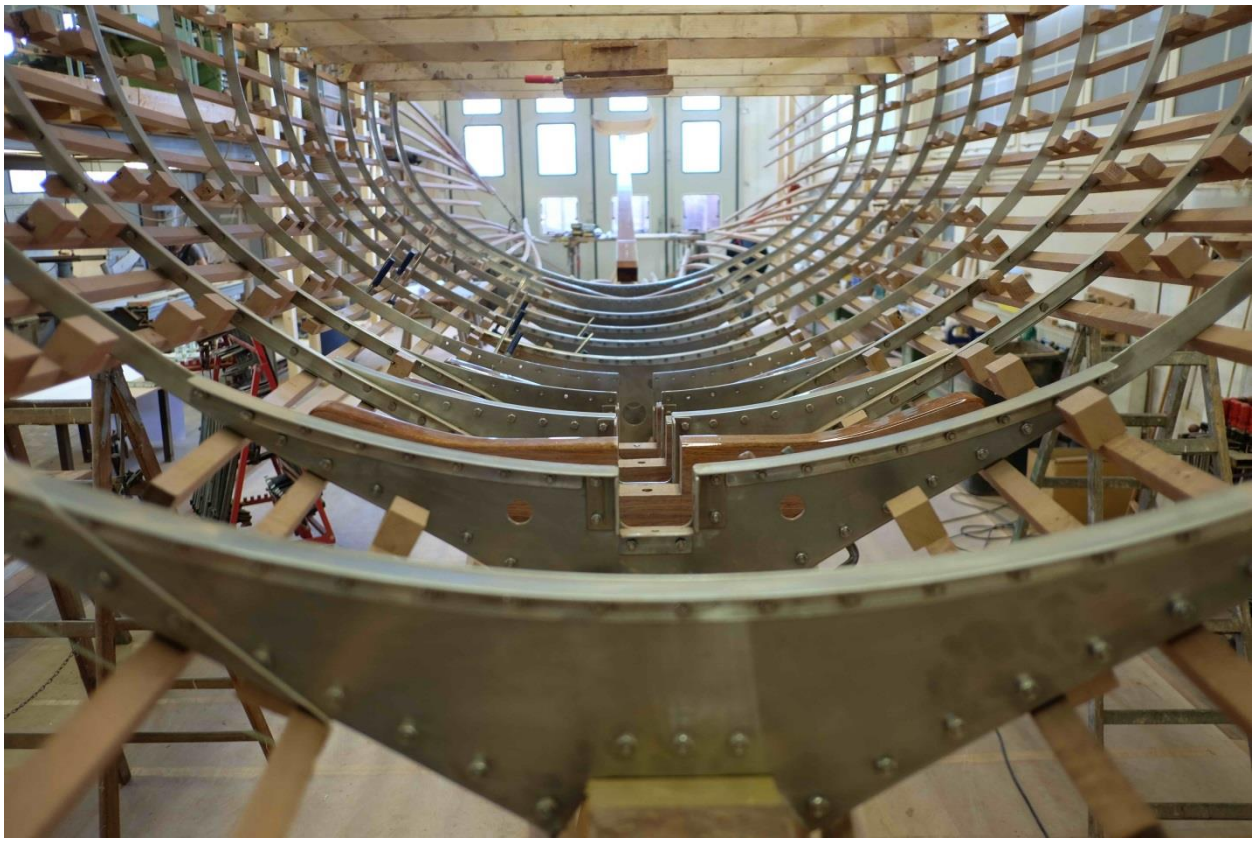

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