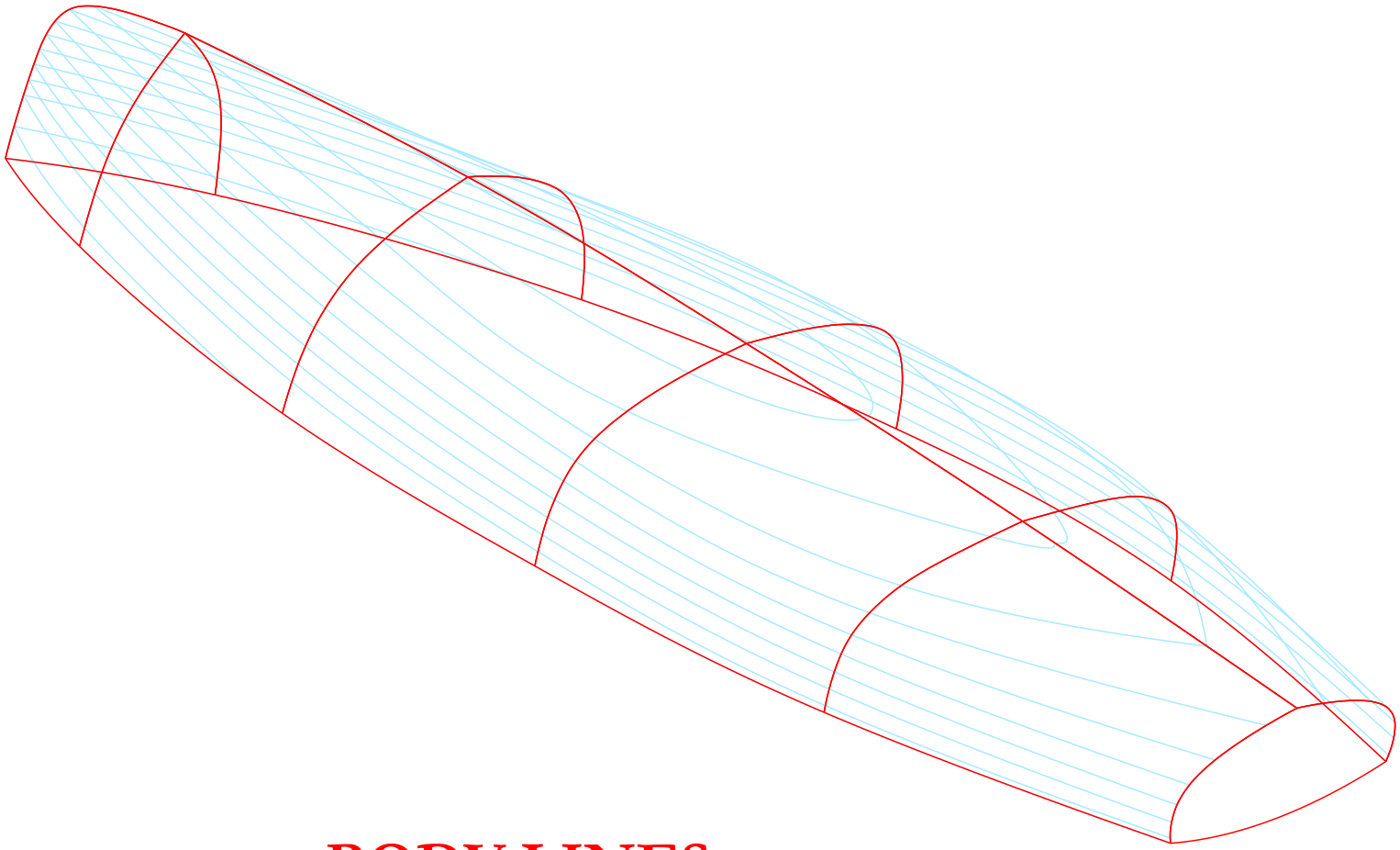
RICKARD SARBY'S FINN



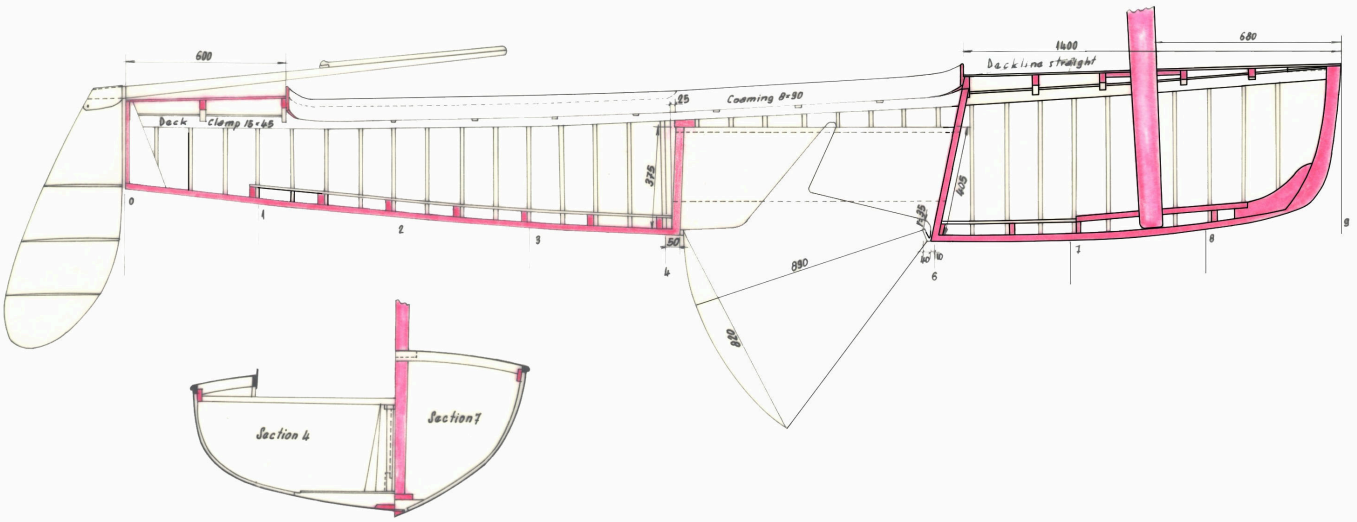
BODY LINES
DEFINITION and CONTROL

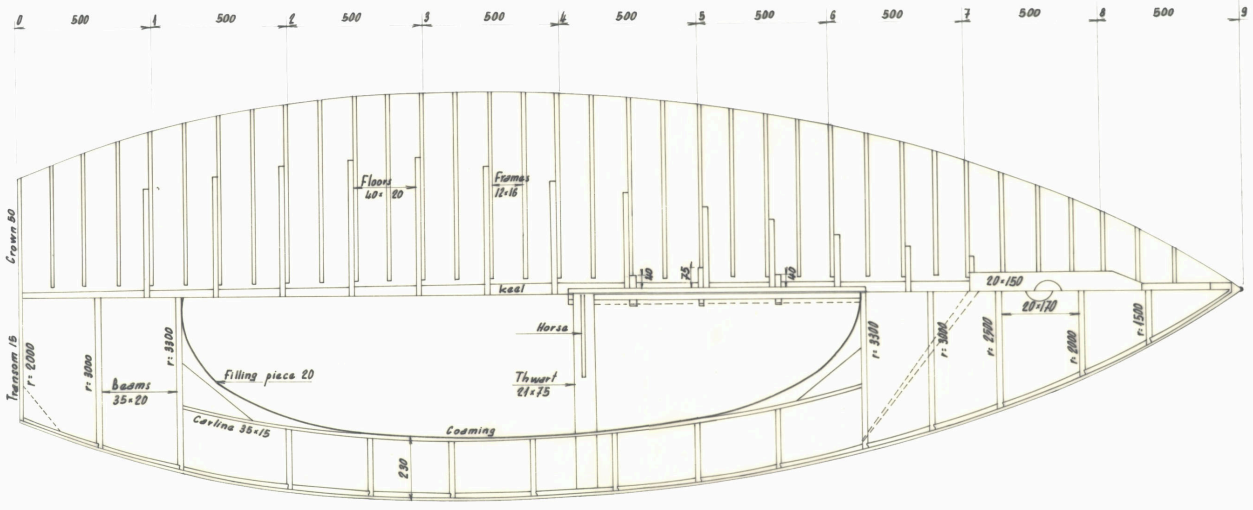
Gilbert LAMBOLEY june 2003

Under the direction of Richard HART, Chairman of INTERNATIONAL FINN ASSOCIATION Technical Committee

I NTERNATIONAL FINN CLASS
ORIGINAL CARVEL CONSTRUCTION

SCALE 1/10 *356-18*





Definition and Control of Hull Shape

First Finn,

as is known, was designed and built in early 1949 by **Rickard Sarby**. The drawings were achieved full size and the first Finn, was afloat on the first week of May 1949.
The drawings were sent to the Jury at Helsinki. The rest of the story is well known. What with those drawings? Gone with the wind? I heard that they had been published by the Finnish Yachting Association, and that prototypes could be built in several countries for training. I remember sailing one on river Seine, south of Paris.
At least drawings of the original wooden scantlings still exist. They allowed amateur construction of so many boats.

A confused youth

The Scandinavian Yachting Union got the charge of administrating the new Olympic single handed dinghy; but curiously enough that Union did not look very keen regarding Finn definition and destiny (see FINNatics chapter 8).
Several legendary names, with the strong support of IYRU, kept the babe alive.
I heard that a number of people redrew plans of the hull. Gone with the wind?

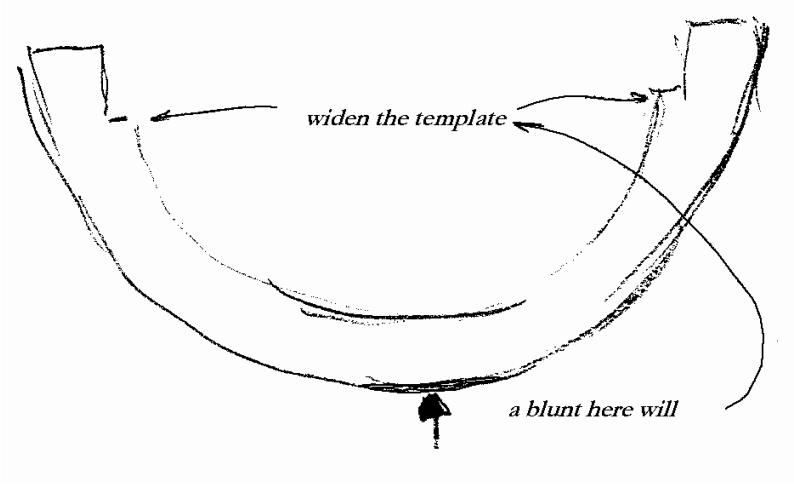
Second birth

By 1956, IFA had been born and would in its turn bear again the Finn.
Charles Currey, silver medallist at Helsinki, was in charge of building Finns at **Fairey Marine**, one of those times most famous firm.
Richard Creagh Osborne who was eager about an actual one design definition of the Finn became the first Chairman of the IFA Technical Committee in 1962. One of his main advisers was Rickard Sarby, who had become quite pessimistic as he thought that weight distribution would never be controlled.
The continued story is clearer to me as I got it directly from my regretted friends, Richard and Rickard.
Richard Creagh Osborne had only been handed a poor table of offsets as a definition of the hull.
The **Finn owes him her precise definition together with the first serious edition of rules** which were enforced to any Finn in the World, thanks to the new born IFA.
In April 1964, the body lines of the Finn together with the templates lines were carved at Fairey Marine under the control of Charles Currey. Of course those lines took into account as far as possible the Swedish table of offsets. They were carved full size onto a sheet of aluminium alloy specially treated so as to neutralize all residual stresses that appear during lamination.
Fairey Marine was alas to disappear soon after; Charles Currey saved the carving and took it home. A picture of that carving may be seen page 117 of FINNatics.
From the carving, copies of lines and templates had been drawn on “Mylar” tracing material, so that no hydrometric variations might alter their shapes. Copies of those have been issued to many places. Those copies were heliographic “Mylar” reproductions on flat beds (rotation machines induce a more or less important slipping between original and copy). And yet, beware using them as I discovered later on that their dimensions might have nevertheless varied under unknown factors.
A master set of templates was also made that would prevail among all anarchic templates which had been issued here and there. Vernon Forster, Chief Measurer of IFA, was in hold of them.

New disease,

In 1970 Richard Creagh Osborne handed the job over to me. I soon became suspicious about the stability of "Mylar" copies.

At 1973 Gold Cup at Brest a much worse problem appeared as the wider templates (station two and four) showed wider than "Mylar" drawings by two or three centimetres. Yet, at 1974 Gold Cup at Long Beach, the US templates appeared to conform perfectly to the drawings.
I quickly understood that the round shape of those templates caused them to enlarge when they would fall down as the underneath sketch will better explain.



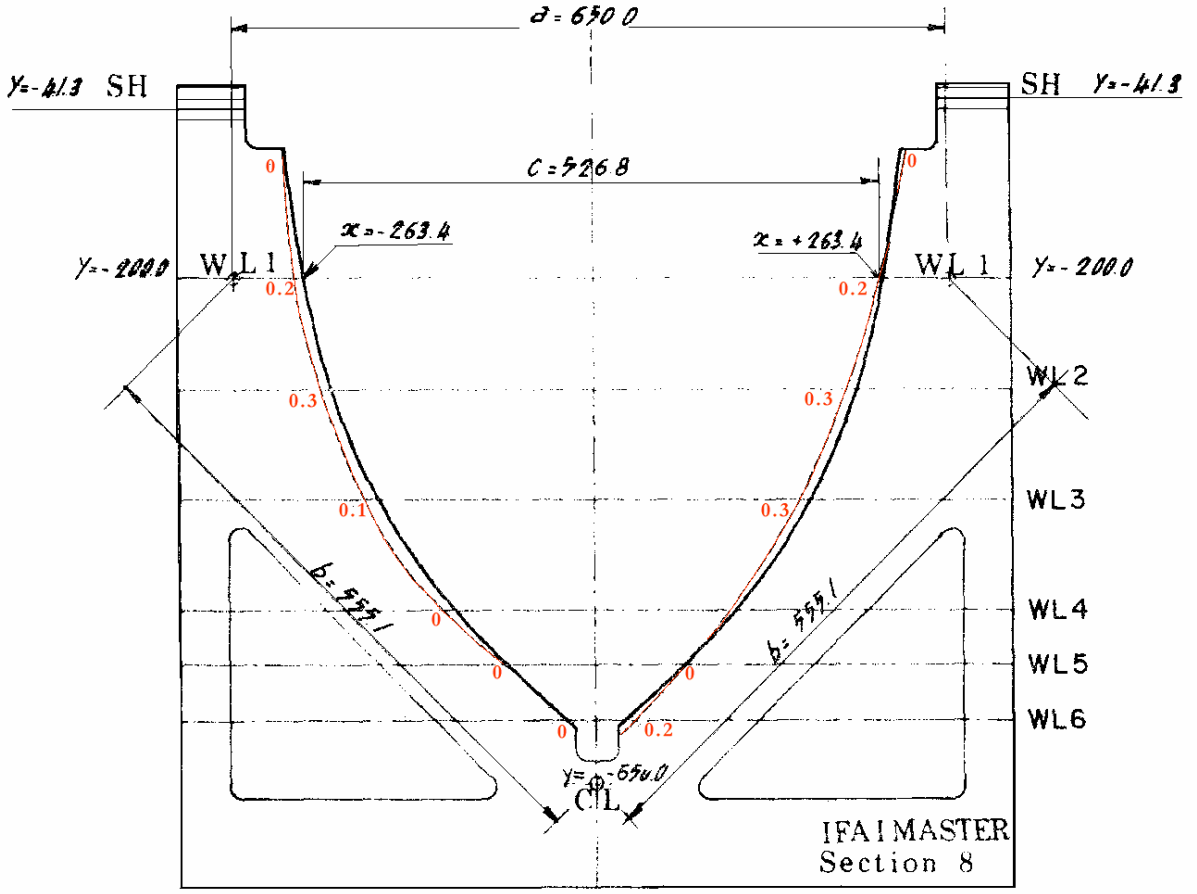
A new design showed urgent. And a precise copy of the original carving appeared to be vital. Thus Charles Currey handed me that precious carving.

I read coordinates of the carved template lines about every 25 mm with a weaver's glass (a graduated magnifying glass used by silk men to count numbers of threads in a given area). That allowed me to record coordinates to a 1/20 mm precision. A tremendous work indeed!
The original lines were made of a succession of circles (as was the use in those times drawing offices who always showed so gracious collections of pear tree curves) and it soon appeared that they could not be represented by one mathematical equation.
Another problem was to have a precise cut of the templates.

Saved by electronics

The solution was obviously to use one of those newly come electronic milling machines driven by computer. Thus we had to draw continuous lines between the recorded points. This is done by curves called "splines" (as sequential polynomial lines). Between two points, a mathematical curve (a polynomial up to 20^{th} degree) is computerized. All those curves draw an apparently (but not mathematically speaking) continuous line which we compared to the drawings. By the way, it is certainly possible to draw one true mathematical curve and better a whole hull surface which lie within tolerances. But our concern was precisely to define the limits of those tolerances, and then to respect the original design.
Where are those curves which were handed back to IFA when I was thrown out? Gone with the wind?
The new templates were designed according to the underneath drawing which also show the discrepancies with the original carving as were recorded by a sworn geometrician. The accuracy is quite a miracle as it must be kept in mind that the hand carved lines could not be perfect and that moreover the basic axes were not absolutely parallel or perpendicular.

Any measurement tool must be controlled; that is why each template bears triangle measurements which are to be controlled with certified meters!



Station 8 template; discrepancies with carving recorded red in mm.

A good job had been done. Too good?
Yet, since the idea of computerizing the lines had started to be materialized, it should have been pursued. But was not for obscure reasons.

The FINN forever

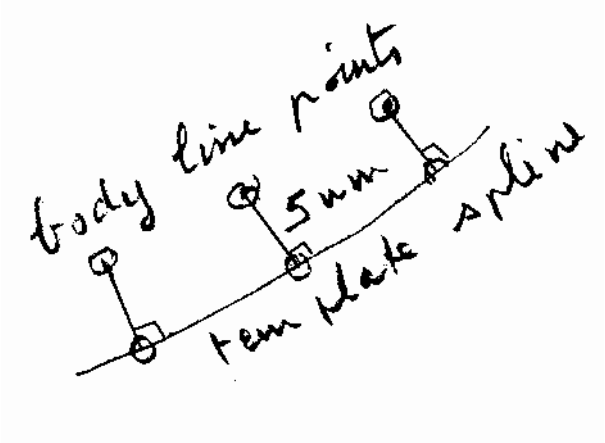
By mere luck, I have found some spare copies through the documents I brought back from my company when I sold it.

The main discovery was the coordinates with which the new templates were carved. Between my measured points, the University who did the job (INSA in LYON) had retained a number of points of their splines; the milling tool was driven by a program from one point to next one along straight segments of lines; those points were chosen so that the cut never kept apart from the spline by more than 0.01 *mm* (all that being subjected to the frailty of 30 years back memories).

I have decided to go back closer to beginning. Another lucky matter is that I have got much more coordinates than I measured, as explained above.

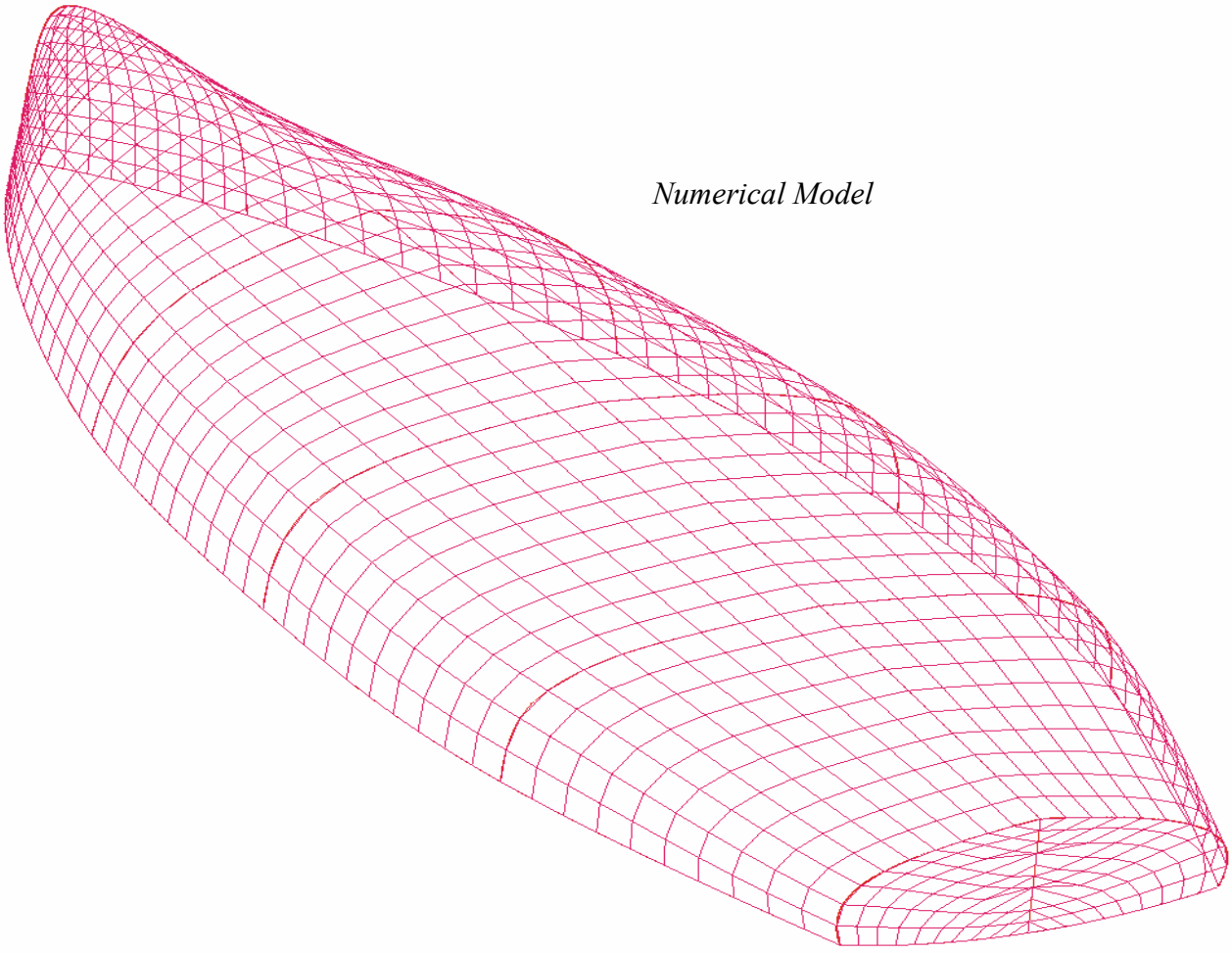
So that, whichever CAO (among serious ones) be used and whichever sort of “splines” be drawn between all points (measured or calculated), our computerized lines cannot be significantly astray from the mother carving.

Attention must be drawn to a work achieved by Jiri Outrata, who, from all points above mentioned calculated splines both for templates and body lines in 1985. Where are they? Gone with the wind?



25 years after it should have been done, but with much more powerful tools, I have drawn new “splines” of the templates; then from every point of those splines, I have drawn perpendiculars and recorded points at 5 mm distance so as to draw the quasi perfect original body “splines”. Hundreds of points to a precision of half a micron!

From the body “splines” which are the skeleton of the hull, an automatic regular meshing of that hull could be achieved, showing thus, together with the rendering that no major mistake had occurred.



Numerical Model

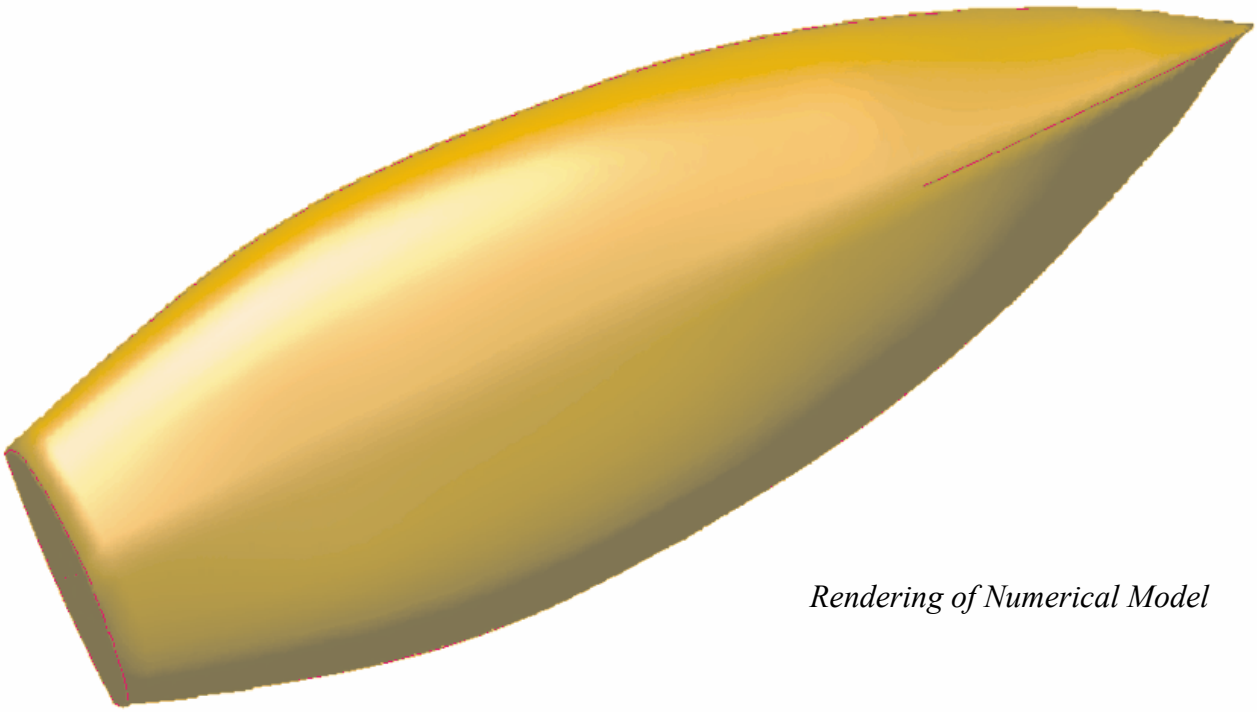
Underneath, I deliver the results of the work in a “raster” format (“.pdf”) which is convenient for screen viewing or for ordinary printing. Coordinates are also delivered in a text format which may be used on any computer; actually, they are rough outputs from my UNIX working station. Click here to get Body Lines Tables. Click here to get Templates Lines Tables.

Full size lines have been drawn in vector format on Mylar film. Coded file “Lines.vdf” is enclosed with present document in “Finn-Disc”. It enables to draw the Finn lines on plotting machines of Benson type (high precision pen plotters no longer built since 10 years) or on plotting ink jet machines of OCE 5120 type (production has just been stopped but many are kept being used throughout the world).
Nowadays those drawings should be recorded in a vector format such as “.dxf” which allows full size reproductions on current machines.
Electronic drawing is moving so fast that it is essential that tables of coordinates be saved in a simple “.txt” text format.

Points of the splines are close enough to allow drawing straight segments of lines from point to point, without letting appear significant gaps with those splines (no more than 0.017 mm could be found along station 0; no more than 0.005mm along other stations).

Consistency with rules and original carving.

Charles Currey drawings are related to Base Axes. The Ox longitudinal one passes through the top of stem.
The measurement rules define a Keel Base Line related to the flat between hull and keel protection bands.
distances between those flats have been set in round figures. There arises an inconsistency between those two bases. Sketches at every station show the problem.
The prevailing base is of course the keel measurement one which has been used for about forty years.
Actually measurers are shifting the templates by a slight translation from the theoretical design base to the keel measurement base. We have delivered the amount of translation which should be granted to every template onto a new theoretical Base under condition the keel is at the exact rule data.



Rendering of Numerical Model

FINN - STATION 0 - COORDINATES

HALF BODY LINE

	y	z		y	z
1	0,000	-468,073	47	411,376	-351,237
2	10,456	-467,001	48	415,118	-347,897
3	19,946	-465,925	49	418,708	-344,251
4	28,903	-464,824	50	422,665	-340,419
5	36,848	-463,752	51	426,471	-336,711
6	45,767	-462,485	52	429,680	-333,165
7	55,039	-461,129	53	432,579	-329,732
8	64,344	-459,720	54	435,211	-326,383
9	77,876	-457,580	55	437,608	-323,098
10	94,160	-454,899	56	439,761	-319,935
11	110,898	-452,018	57	441,798	-316,755
12	127,841	-448,969	58	443,960	-313,149
13	144,230	-445,882	59	446,032	-309,422
14	157,183	-443,345	60	447,872	-305,802
15	168,870	-440,971	61	449,502	-302,267
16	182,857	-438,020	62	450,927	-298,823
17	196,810	-434,950	63	452,131	-295,550
18	208,745	-432,219	64	453,195	-292,273
19	220,209	-429,507	65	454,185	-288,811
20	232,448	-426,497	66	455,078	-285,256
21	244,028	-423,512	67	455,899	-281,603
22	254,345	-420,718	68	456,592	-278,037
23	262,637	-418,399	69	457,215	-274,448
24	271,080	-415,976	70	457,727	-270,937
25	282,176	-412,711	71	458,166	-267,309
26	292,617	-409,511	72	458,569	-262,978
27	301,954	-406,499	73	458,859	-258,490
28	310,513	-403,582	74	459,028	-253,980
29	318,474	-400,710	75	459,081	-249,309
30	325,947	-397,851	76	459,005	-244,265
31	332,900	-395,046	77	458,784	-239,208
32	339,296	-392,366	78	458,413	-234,264
33	346,156	-389,400	79	457,898	-229,474
34	353,965	-385,901	80	457,282	-225,051
35	361,221	-382,497	81	456,608	-221,141
36	367,891	-379,203	82	455,788	-217,119
37	374,092	-375,972	83	454,791	-212,817
38	379,895	-372,779	84	453,676	-208,496
39	384,603	-370,074	85	452,468	-204,186
40	387,959	-368,087	86	451,277	-200,205
41	391,565	-365,885	87	450,301	-197,130
42	395,368	-363,453	88	449,271	-194,108
43	398,305	-361,465	89	447,601	-189,371
44	400,603	-359,821	90	445,062	-182,250
45	403,667	-357,514			
46	407,546	-354,449			

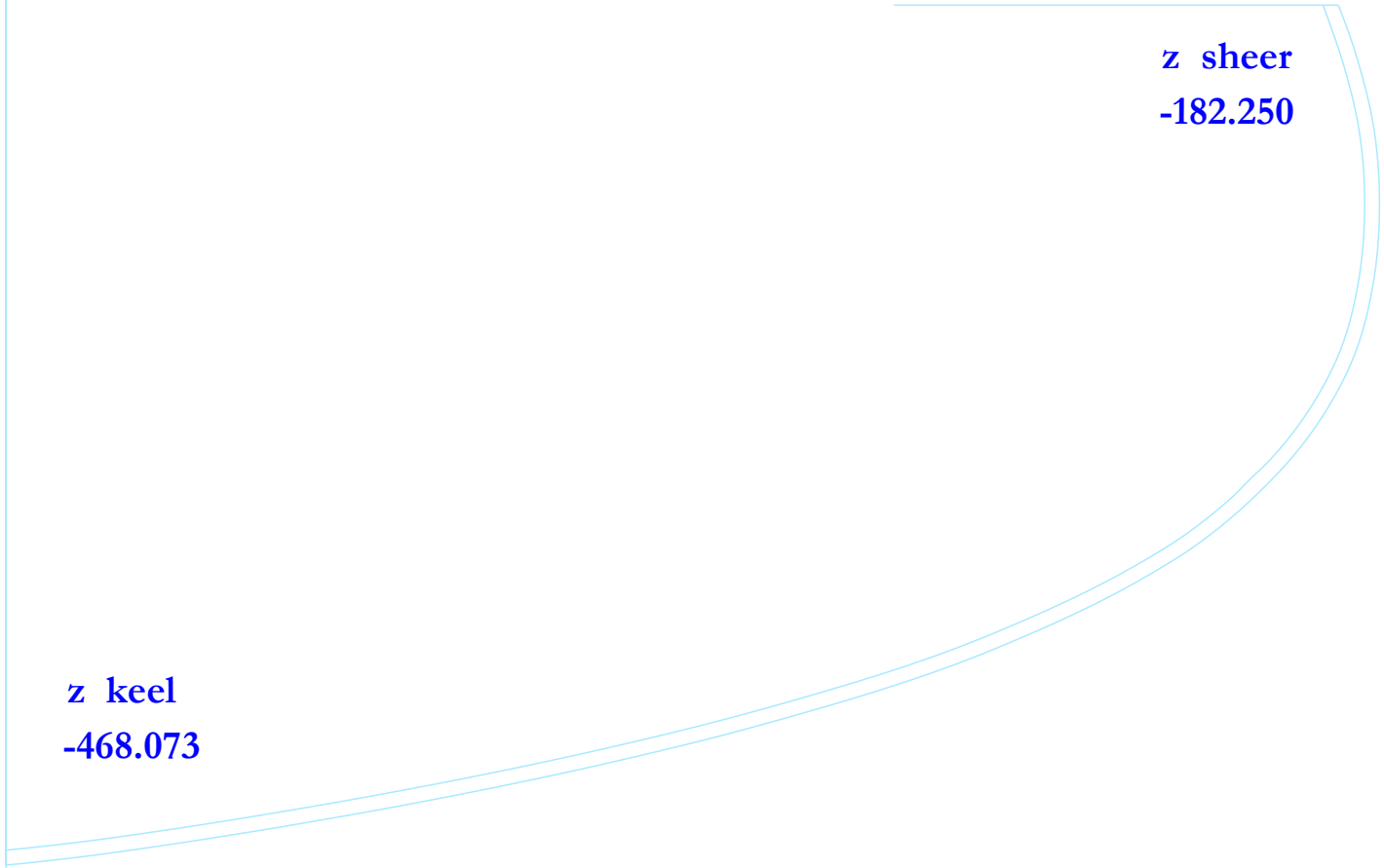
HALF TEMPLATE LINE

	y	z		y	z
1	**0,000**	**-473,100**	47	408,711	-359,954
2	6,673	-472,442	48	412,612	-356,779
3	13,340	-471,734	49	416,424	-353,493
4	**25,200**	**-470,350**	50	**420,150**	**-350,100**
5	32,922	-469,348	51	424,193	-346,233
6	40,636	-468,277	52	428,010	-342,394
7	**50,200**	**-466,900**	53	431,445	-338,734
8	58,990	-465,602	54	434,566	-335,194
9	67,773	-464,260	55	437,412	-331,741
10	83,746	-461,714	56	440,016	-328,348
11	**99,700**	**-459,050**	57	**442,400**	**-325,000**
12	116,344	-456,154	58	444,494	-321,862
13	132,966	-453,129	59	446,508	-318,680
14	**149,350**	**-450,000**	60	448,809	-314,795
15	160,485	-447,793	61	450,871	-311,017
16	171,607	-445,527	62	452,712	-307,331
17	186,438	-442,387	63	454,351	-303,712
18	**200,100**	**-439,350**	64	**455,800**	**-300,150**
19	211,189	-436,795	65	456,999	-296,832
20	222,262	-434,174	66	458,074	-293,483
21	234,742	-431,101	67	459,092	-289,888
22	246,001	-428,187	68	459,995	-286,263
23	**256,400**	**-425,350**	69	460,796	-282,613
24	**264,000**	**-423,210**	70	461,510	-278,941
25	271,592	-421,046	71	**462,150**	**-275,250**
26	283,450	-417,573	72	462,671	-271,789
27	293,688	-414,441	73	463,103	-268,321
28	302,909	-411,476	74	463,540	-263,806
29	311,392	-408,598	75	463,844	-259,279
30	319,306	-405,761	76	464,027	-254,744
31	326,752	-402,934	77	**464,100**	**-250,200**
32	**333,800**	**-400,100**	78	464,052	-245,069
33	340,031	-397,495	79	463,858	-239,949
34	346,239	-394,840	80	463,515	-234,921
35	354,340	-391,251	81	463,028	-230,045
36	361,654	-387,860	82	**462,400**	**-225,300**
37	368,387	-384,579	83	461,754	-221,378
38	374,657	-381,362	84	460,997	-217,482
39	380,546	-378,175	85	460,024	-213,113
40	**386,100**	**-375,000**	86	458,939	-208,771
41	389,314	-373,106	87	457,759	-204,451
42	392,515	-371,189	88	**456,500**	**-200,150**
43	396,683	-368,590	89	455,389	-196,582
44	**400,200**	**-366,250**	90	454,216	-193,036
45	402,474	-364,650	91	452,282	-187,615
46	404,718	-363,012	92	**450,200**	**-182,250**

All coordinates related to general base.

Bold template coordinates were measured from carved layout; others were "splined".

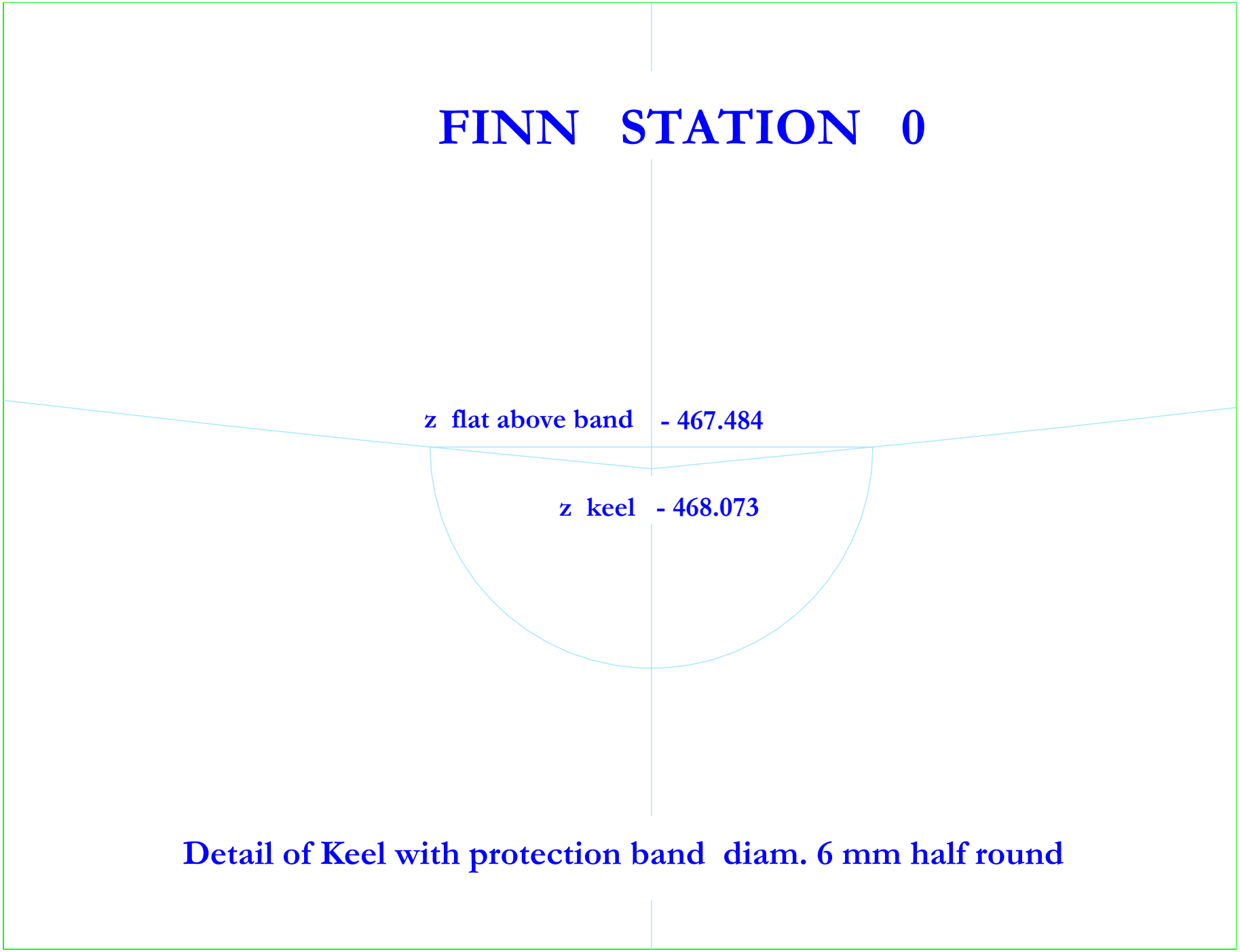
FINN STATION 0



Template and Body Half Lines

"Splines" built from table above

FINN STATION 0



Detail of Keel with protection band diam. 6 mm half round

FINN - STATION 2 - COORDINATES

HALF BODY LINE

	y	z		y	z
1	0,000	-559,777	60	597,701	-453,237
2	12,104	-559,171	61	602,965	-450,000
3	24,453	-558,377	62	606,727	-447,782
4	36,133	-557,525	63	610,464	-445,383
5	49,823	-556,486	64	614,975	-442,389
6	62,126	-555,540	65	619,438	-439,333
7	74,608	-554,582	68	623,840	-436,220
8	86,945	-553,593	67	628,175	-433,036
9	99,296	-552,586	68	632,433	-429,772
10	118,082	-551,069	69	636,608	-426,414
11	133,830	-549,784	70	639,759	-423,762
12	149,559	-548,436	71	642,867	-421,041
13	171,218	-546,443	72	646,320	-417,905
14	185,361	-545,081	73	649,714	-414,715
15	199,510	-543,692	74	653,032	-411,478
16	216,822	-541,982	75	656,272	-408,181
17	234,126	-540,255	76	659,419	-404,819
18	251,415	-538,482	77	662,468	-401,379
19	268,688	-536,631	78	664,396	-399,090
20	284,043	-534,895	79	666,278	-396,762
21	299,391	-533,054	80	669,246	-392,893
22	310,299	-531,711	81	672,176	-388,818
23	321,204	-530,362	82	675,071	-384,530
24	332,097	-528,997	83	677,943	-380,003
25	342,975	-527,593	84	680,227	-376,196
26	353,836	-526,131	85	682,432	-372,334
27	364,677	-524,593	66	684,922	-367,710
28	375,497	-522,000	87	687,346	-362,892
29	386,290	-521,208	88	689,710	-357,855
30	392,691	-520,103	89	691,891	-352,874
31	399,098	-518,950	90	693,946	-347,834
32	406,893	-517,511	91	695,734	-343,101
33	414,683	-516,057	92	697,531	-337,943
34	422,461	-514,585	93	699,379	-332,186
35	430,223	-513,083	94	700,711	-327,764
38	437,968	-511,536	95	701,986	-323,315
37	445,692	-509,933	96	703,611	-317,276
38	453,390	-508,263	97	705,241	-310,676
39	461,064	-506,513	98	706,587	-304,780
40	468,709	-504,672	99	707,856	-298,852
41	476,321	-502,728	100	709,425	-290,935
42	483,898	-500,668	101	710,867	-282,877
43	491,439	-498,481	102	711,582	-278,509
44	496,799	-496,837	103	712,252	-274,133
45	502,139	-495,118	104	713,272	-266,754
46	509,896	-492,509	105	714,254	-258,583
47	517,616	-489,799	106	715,228	-249,284
48	525,289	-486,993	107	715,889	-242,188

HALF TEMPLATE LINE

	y	z		y	z
1	**0,000**	**-565,100**	60	600,206	-457,797
2	12,403	-564,396	61	605,563	-454,621
3	**24,800**	**-563,600**	62	609,400	-452,245
4	36,514	-562,743	63	**613,200**	**-449,800**
5	**50,000**	**-561,700**	64	617,767	-446,765
6	62,501	-560,759	65	622,290	-443,672
7	**75,000**	**-559,800**	66	626,762	-440,510
8	87,351	-558,809	67	631,174	-437,270
9	**99,700**	**-557,800**	68	635,519	-433,939
10	118,483	-556,285	69	639,788	-430,508
11	134,244	-554,999	70	643,021	-427,790
12	**150,000**	**-553,650**	71	**646,200**	**-425,000**
13	171,690	-551,653	72	649,710	-421,807
14	185,846	-550,290	73	653,167	-418,562
15	**200,000**	**-548,900**	74	656,559	-415,255
16	217,314	-547,190	75	659,879	-411,877
17	234,627	-545,462	76	663,115	-408,420
18	251,935	-543,687	77	666,257	-404,874
19	269,234	-541,833	78	668,252	-402,509
20	284,623	-540,095	79	**670,200**	**-400,100**
21	**300,000**	**-538,250**	80	673,261	-396,105
22	310,910	-536,904	81	676,278	-391,910
23	321,819	-535,557	82	679,255	-387,501
24	332,726	-534,190	83	682,202	-382,854
25	343,627	-532,783	84	684,541	-378,954
26	354,519	-531,317	85	**686,800**	**-375,000**
27	365,400	-529,773	86	689,358	-370,255
28	376,269	-528,131	87	691,845	-365,310
29	387,120	-526,372	88	694,265	-360,148
30	393,563	-525,262	89	696,493	-355,053
31	**400,000**	**-524,100**	90	**698,600**	**-349,900**
32	407,803	-522,656	91	700,438	-345,045
33	415,603	-521,204	92	702,276	-339,759
34	**423,400**	**-519,730**	93	704,156	-333,889
35	431,186	-518,222	94	705,504	-329,403
36	438,964	-516,668	95	**706,800**	**-324,900**
37	446,728	-515,057	96	708,456	-318,764
38	454,475	-513,377	97	710,109	-312,056
39	462,204	-511,614	98	711,468	-306,087
40	469,911	-509,758	99	**712,750**	**-300,100**
41	477,594	-507,796	100	714,339	-292,097
42	485,249	-505,715	101	715,797	-283,942
43	492,874	-503,505	102	716,520	-279,525
44	498,296	-501,841	103	717,200	-275,100
45	**503,700**	**-500,100**	104	718,234	-267,629
46	511,519	-497,468	105	719,223	-259,370
47	519,300	-494,740	106	**720,200**	**-250,000**
48	527,040	-491,910	107	720,867	-242,858

FINN - STATION 2 - COORDINATES

HALF BODY LINE

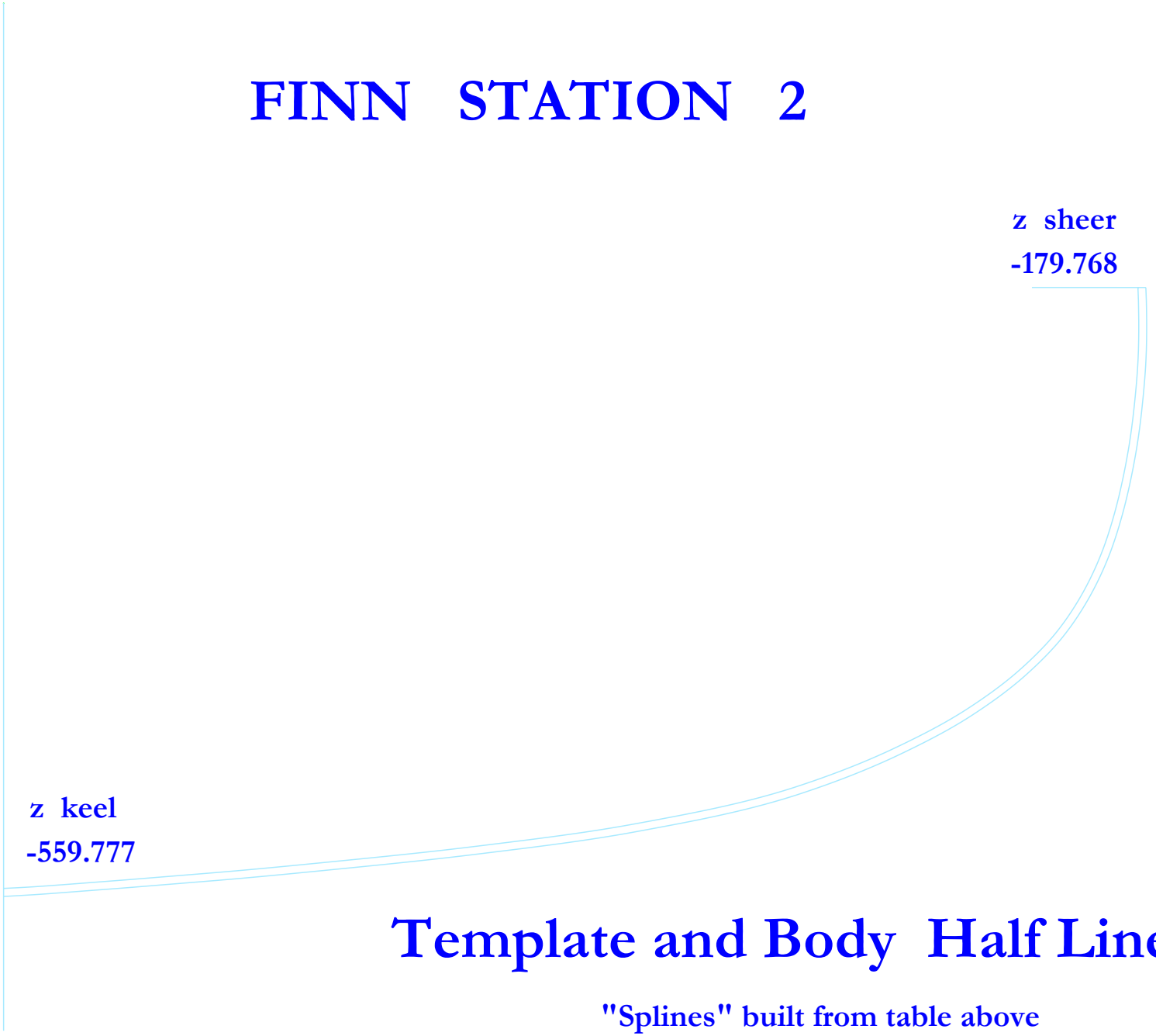
	y	z		y	z
49	532,917	-484,079	190	716,465	-235,106
50	540,493	-481,051	109	716,820	-229,867
51	548,017	-477,901	110	717,101	-224,632
52	555,475	-474,625	111	717,364	-217,446
53	560,192	-472,469	112	717,500	-209,503
54	564,897	-470,255	113	717,517	-204,693
55	570,471	-467,566	114	717,499	-199,856
56	576,016	-464,828	115	717,358	-190,528
57	581,517	-462,041	116	717,214	-185,479
58	586,969	-459,188	117	716,995	-179,768
59	592,366	-456,258			

HALF TEMPLATE LINE

	y	z		y	z
49	534,736	-488,969	108	721,452	-235,710
50	542,386	-485,912	109	721,813	-230,409
51	549,987	-482,729	110	**722,100**	**-225,100**
52	557,526	-479,419	111	722,361	-217,808
53	562,299	-477,239	112	722,497	-209,774
54	**567,050**	**-475,000**	113	722,517	-204,937
55	572,662	-472,290	114	**722,500**	**-200,100**
56	578,249	-469,534	115	722,357	-190,697
57	583,804	-466,720	116	722,204	-185,348
58	589,320	-463,834	117	**722,000**	**-180,000**
59	594,789	-460,864			

z template ccordinates to be raised by 0,232 mm to fit general base.
Bold template coordinates were measured from carved layout; others were "splined".

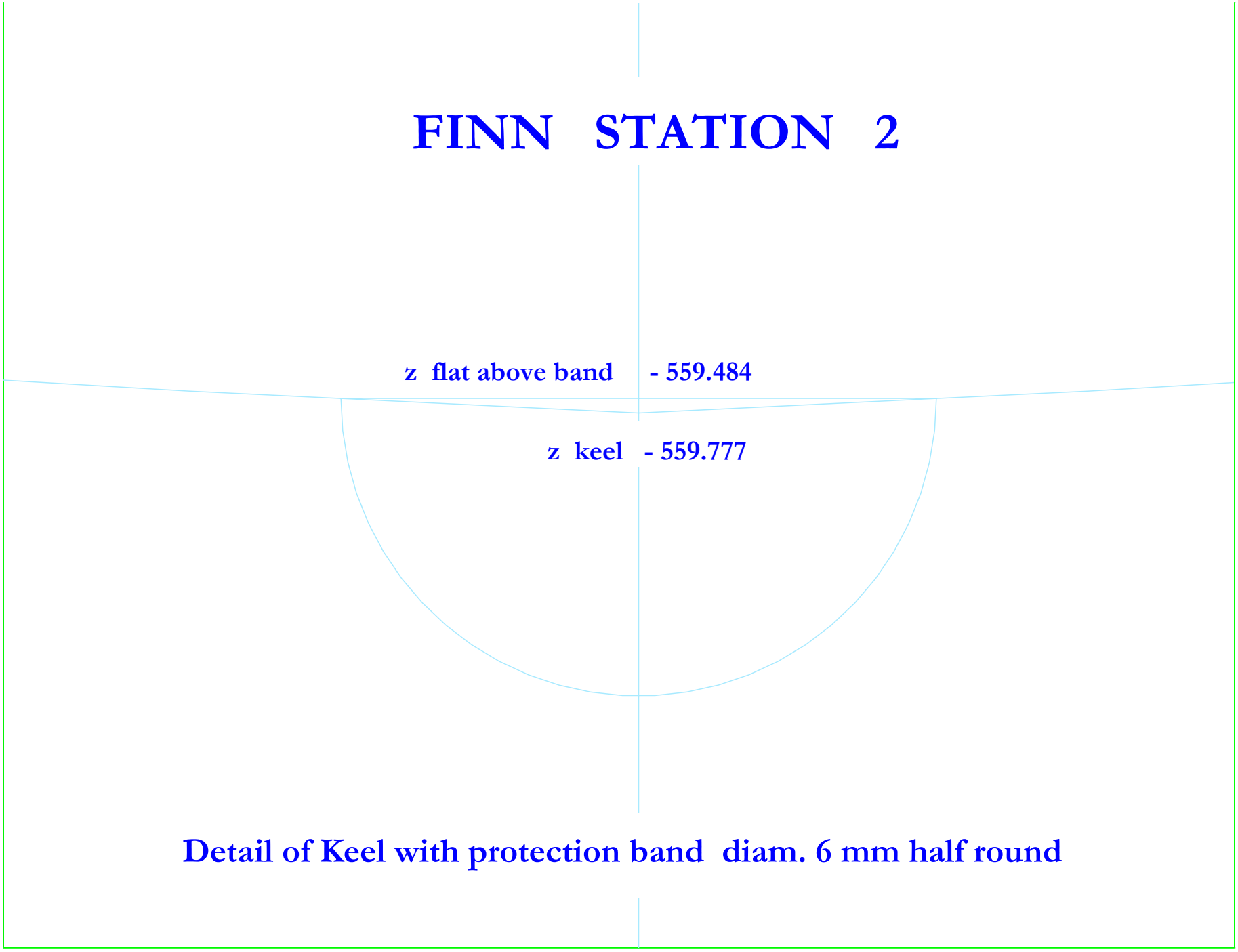
FINN STATION 2



Template and Body Half Lines

"Splines" built from table above

FINN STATION 2



Detail of Keel with protection band diam. 6 mm half round

FINN - STATION 4 - COORDINATES

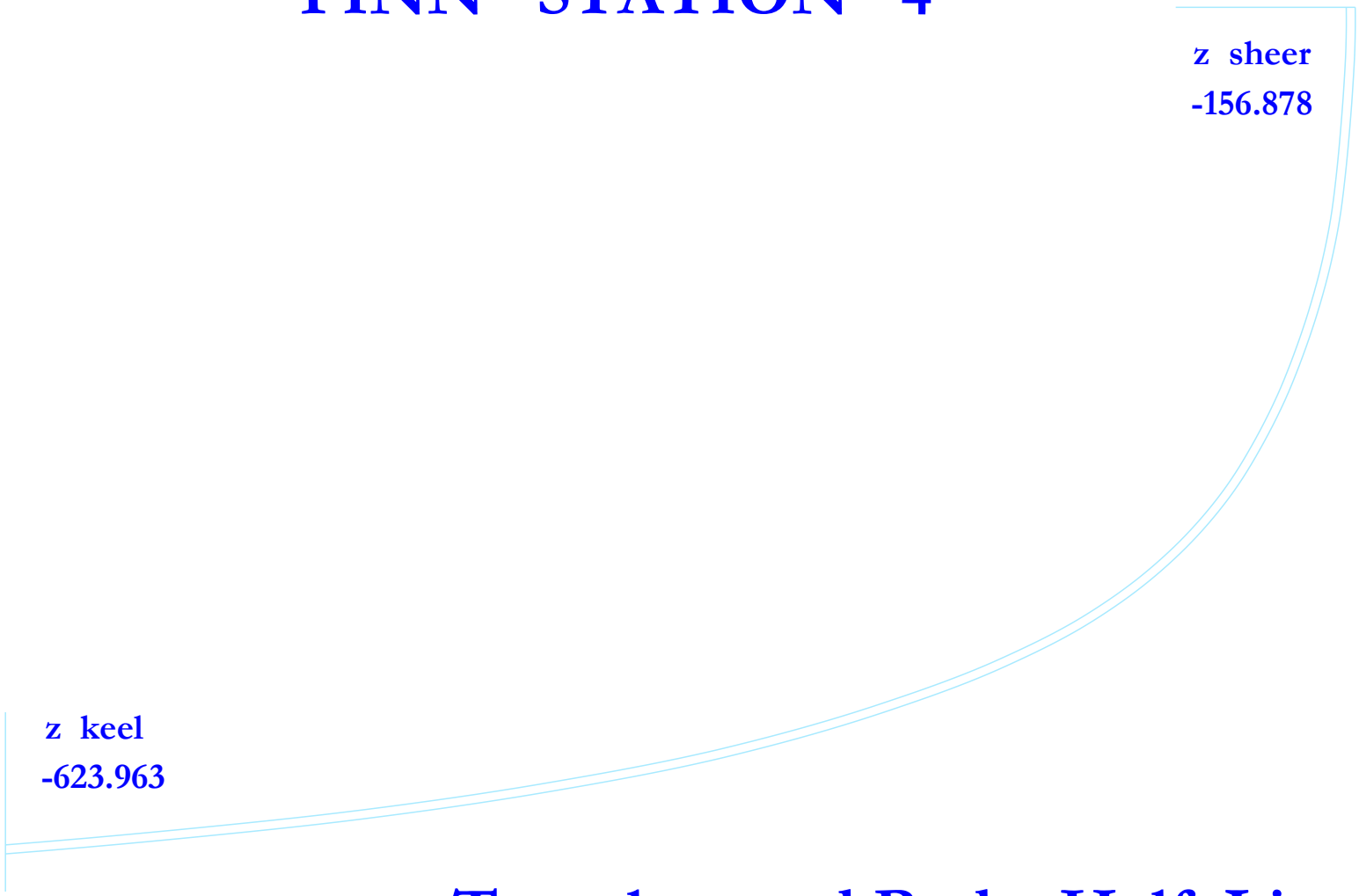
HALF BODY LINE						HALF TEMPLATE LINE					
	y	z		y	z		y	z		y	z
1	0,000	-623,963	59	622,171	-482,042	1	**0,000**	**-629,100**	59	625,002	-486,287
2	29,020	-621,608	60	627,138	-478,345	2	28,646	-626,778	60	629,976	-482,587
3	57,421	-619,141	61	631,558	-474,906	3	57,280	-624,295	61	634,831	-478,803
4	78,657	-617,192	62	636,328	-470,999	4	78,594	-622,342	62	**639,600**	**-474,900**
5	99,907	-615,154	63	640,970	-467,019	5	**99,900**	**-620,300**	63	644,245	-470,919
6	116,843	-613,486	64	645,527	-462,946	6	116,913	-618,626	64	648,803	-466,847
7	133,868	-611,778	65	649,986	-458,781	7	133,924	-616,920	65	653,268	-462,679
8	150,868	-610,013	66	653,946	-454,922	8	150,928	-615,157	66	657,638	-458,410
9	167,841	-608,166	67	658,050	-450,715	9	167,923	-613,310	67	661,742	-454,206
10	183,706	-606,340	68	662,056	-446,409	10	183,968	-611,465	68	**665,750**	**-449,900**
11	199,749	-604,370	69	665,998	-441,968	11	**200,000**	**-609,500**	69	669,694	-445,459
12	216,269	-602,232	70	669,836	-437,445	12	216,520	-607,364	70	673,534	-440,936
13	232,774	-600,006	71	673,565	-432,836	13	233,027	-605,140	71	677,266	-436,325
14	249,251	-597,680	72	676,768	-428,668	14	249,520	-602,815	72	680,884	-431,625
15	265,587	-595,257	73	679,146	-425,435	15	265,996	-600,374	73	683,269	-428,384
16	281,927	-592,702	74	681,481	-422,142	16	282,453	-597,803	74	**685,600**	**-425,100**
17	290,580	-591,290	75	684,483	-417,693	17	291,229	-596,373	75	688,599	-420,656
18	299,417	-589,805	76	687,440	-413,047	18	**300,000**	**-594,900**	76	691,692	-415,799
19	310,744	-587,863	77	690,697	-407,648	19	311,304	-592,962	77	694,949	-410,403
20	321,917	-585,917	78	693,652	-402,526	20	322,603	-590,995	78	697,909	-405,273
21	333,207	-583,905	79	696,331	-397,741	21	333,892	-588,984	79	**700,800**	**-400,100**
22	344,481	-581,831	80	699,681	-391,523	22	345,170	-586,911	80	704,147	-393,889
23	355,743	-579,680	81	702,898	-385,253	23	356,433	-584,762	81	707,368	-387,615
24	366,976	-577,439	82	705,955	-378,978	24	367,678	-582,520	82	710,426	-381,341
25	377,992	-575,129	83	708,875	-372,644	25	378,901	-580,169	83	**713,350**	**-375,000**
26	389,125	-572,666	84	711,221	-367,233	26	390,100	-577,693	84	715,890	-369,139
27	394,990	-571,309	85	713,852	-360,778	27	396,054	-576,317	85	718,520	-362,688
28	401,023	-569,870	86	716,306	-354,430	28	**402,000**	**-574,900**	86	720,977	-356,336
29	412,155	-567,124	87	718,680	-348,040	29	413,079	-572,169	87	**723,350**	**-349,950**
30	422,967	-564,363	88	721,412	-340,361	30	424,132	-569,347	88	726,081	-342,276
31	433,996	-561,438	89	723,887	-333,001	31	435,156	-566,425	89	728,675	-334,558
32	444,984	-558,405	90	725,423	-328,193	32	446,150	-563,393	90	730,216	-329,738
33	455,943	-555,252	91	726,910	-323,346	33	457,110	-560,243	91	**731,700**	**-324,900**
34	466,855	-551,977	92	729,023	-316,083	34	468,034	-556,966	92	733,812	-317,646
35	477,355	-548,682	93	731,008	-308,810	35	478,761	-553,603	93	735,800	-310,360
36	488,004	-545,189	94	732,218	-304,095	36	**489,450**	**-550,100**	94	737,111	-305,239
37	495,399	-542,698	95	733,458	-298,948	37	496,884	-547,596	95	**738,350**	**-300,100**
38	502,832	-540,161	96	735,078	-291,705	38	504,308	-545,063	96	739,970	-292,862
39	510,230	-537,585	97	736,560	-284,448	39	511,715	-542,485	97	741,454	-285,597
40	517,375	-535,036	98	737,547	-279,164	40	519,100	-539,848	98	742,442	-280,306
41	524,733	-532,321	99	738,387	-274,276	41	526,457	-537,136	99	**743,350**	**-275,000**
42	532,049	-529,521	100	739,315	-268,122	42	533,779	-534,335	100	744,278	-268,850

FINN - STATION 4 - COORDINATES

HALF BODY LINE						HALF TEMPLATE LINE					
	y	z		y	z		y	z		y	z
43	539,341	-526,608	101	740,245	-260,989	43	541,062	-531,428	101	745,208	-261,715
44	546,537	-523,598	102	740,930	-255,139	44	548,301	-528,402	102	745,894	-255,859
45	549,960	-522,110	103	741,586	-249,275	45	552,057	-526,770	103	**746,550**	**-250,000**
46	553,734	-520,425	104	742,528	-240,165	46	**555,800**	**-525,100**	104	747,510	-240,708
47	559,421	-517,833	105	743,245	-232,371	47	561,471	-522,515	105	748,228	-232,906
48	565,068	-515,213	106	743,918	-224,558	48	567,124	-519,893	106	**748,900**	**-225,100**
49	570,695	-512,539	107	744,872	-212,582	49	572,751	-517,221	107	749,855	-213,120
50	576,282	-509,806	108	745,339	-206,083	50	578,345	-514,485	108	750,323	-206,611
51	581,473	-507,180	109	745,755	-199,764	51	583-898	-511,671	109	**750,750**	**-200,100**
52	586,984	-504,272	110	746,194	-192,554	52	589,405	-508,766	110	751,189	-192,888
53	592,428	-501,265	111	746,541	-186,115	53	594,858	-505,756	111	751,537	-186,446
54	597,218	-498,490	112	746,804	-179,669	54	599,655	-502,979	112	**751,800**	**-180,000**
55	601,962	-495,609	113	747,004	-171,000	55	**604,400**	**-500,100**	113	752,004	-171,089
56	606,817	-492,538	114	747,052	-163,958	56	609,645	-496,779	114	752,052	-164,045
57	612,004	-489,131	115	747,000	-156,878	57	614,831	-493,375	115	**752,000**	**-157,000**
58	617,121	-485,636				58	619,952	-489,880			

z template coordinates to be raised by 0,122 mm to fit general base.
Bold template coordinates were measured from carved layout; others were "splined".

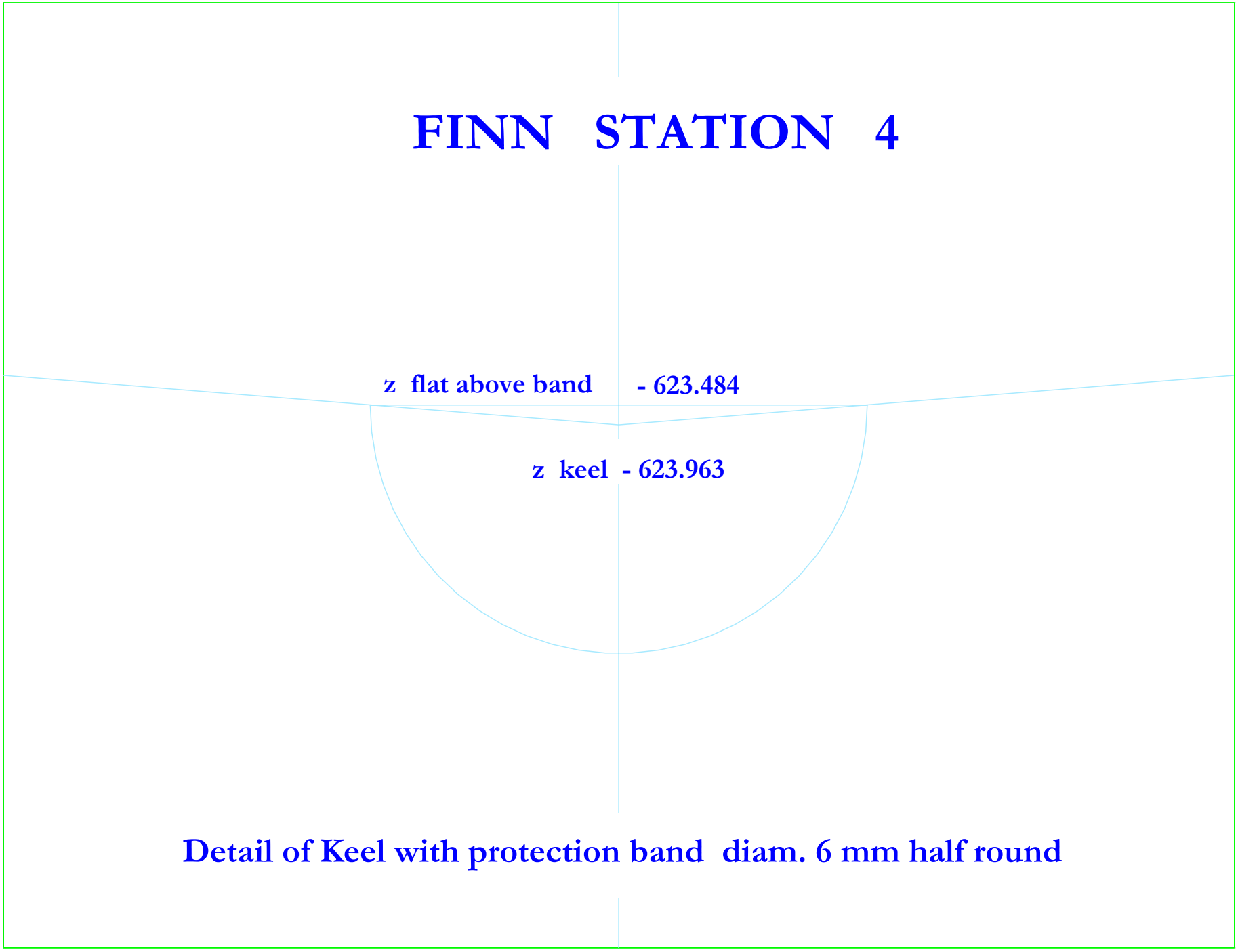
FINN STATION 4



Template and Body Half Lines

"Splines" built from table above

FINN STATION 4



Detail of Keel with protection band diam. 6 mm half round

FINN - STATION 6 - COORDINATES

HALF BODY LINE						HALF TEMPLATE LINE					
	y	z		y	z		y	z		y	z
1	0,000	-653,822	54	466,154	-460,231	1	**0,000**	**-658,200**	54	469,423	-463,270
2	13,239	-650,852	55	471,693	-455,084	2	12,712	-655,353	55	475,169	-457,929
3	25,802	-647,911	56	476,532	-450,424	3	**25,400**	**-652,400**	56	480,023	-453,256
4	37,228	-645,152	57	481,301	-445,674	4	37,450	-649,498	57	**484,800**	**-448,500**
5	43,186	-643,671	58	486,668	-440,132	5	43,829	-647,917	58	490,373	-442,741
6	49,933	-641,950	59	492,178	-434,210	6	**50,200**	**-646,300**	59	495,894	-436,808
7	59,540	-639,401	60	497,642	-428,104	7	59,881	-643,740	60	501,369	-430,690
8	66,878	-637,402	61	500,596	-424,704	8	67,490	-641,671	61	504,327	-427,285
9	74,884	-635,226	62	503,376	-421,436	9	**75,100**	**-639,600**	62	**507,250**	**-423,850**
10	87,141	-631,916	63	508,132	-415,676	10	87,254	-636,318	63	512,136	-417,926
11	99,472	-628,539	64	513,160	-409,337	11	**99,400**	**-633,000**	64	517,173	-411,575
12	115,902	-623,919	65	518,012	-403,000	12	115,538	-628,474	65	522,034	-405,224
13	131,494	-619,437	66	522,665	-396,730	13	**131,650**	**-623,850**	66	**526,800**	**-398,800**
14	141,974	-616,401	67	526,539	-391,390	14	142,404	-620,735	67	530,674	-393,456
15	152,764	-613,267	68	530,344	-386,020	15	153,156	-617,614	68	534,488	-388,072
16	163,399	-610,144	69	533,947	-380,782	16	163,899	-614,463	69	538,224	-382,633
17	174,106	-606,942	70	536,927	-376,289	17	174,626	-611,261	70	541,200	-378,143
18	184,801	-603,660	71	539,812	-371,774	18	185,330	-607,985	71	**544,100**	**-373,600**
19	195,213	-600,364	72	543,353	-365,978	19	196,006	-604,614	72	547,818	-367,502
20	203,648	-597,601	73	547,083	-359,571	20	204,616	-601,801	73	551,551	-361,080
21	212,491	-594,602	74	550,559	-353,322	21	**213,200**	**-598,900**	74	555,029	-354,821
22	225,753	-589,941	75	553,925	-347,014	22	226,445	-594,255	75	**558,400**	**-348,500**
23	238,860	-585,162	76	557,188	-340,614	23	239,647	-589,455	76	561,758	-341,910
24	252,079	-580,170	77	560,542	-333,684	24	252,811	-584,498	77	565,194	-334,828
25	264,757	-575,221	78	563,154	-328,106	25	265,939	-579,383	78	567,779	-329,280
26	271,585	-572,485	79	565,606	-322,697	26	273,053	-576,538	79	**570,300**	**-323,700**
27	278,865	-569,519	80	568,622	-315,757	27	**280,150**	**-573,650**	80	573,348	-316,670
28	288,961	-565,329	81	571,855	-307,938	28	290,271	-569,454	81	576,626	-308,730
29	298,999	-561,072	82	573,896	-302,842	29	300,360	-565,182	82	578,629	-303,721
30	309,052	-556,700	83	575,836	-297,901	30	310,408	-560,820	83	**580,600**	**-298,700**
31	318,946	-552,272	84	578,429	-291,190	31	320,410	-556,351	84	583,270	-291,779
32	326,888	-548,611	85	581,049	-284,215	32	328,575	-552,595	85	585,874	-284,834
33	335,007	-544,764	86	583,077	-278,602	33	**336,700**	**-548,750**	86	587,876	-279,281
34	342,898	-540,938	87	584,898	-273,344	34	344,732	-544,860	87	**589,800**	**-273,700**
35	350,893	-536,989	88	587,415	-265,629	35	352,735	-540,911	88	592,358	-265,830
36	358,822	-532,978	89	589,958	-257,315	36	360,699	-536,887	89	594,859	-257,629
37	366,585	-528,937	90	591,329	-252,608	37	368,615	-532,772	90	596,175	-253,096
38	374,329	-524,770	91	592,491	-248,473	38	376,475	-528,548	91	**597,450**	**-248,550**
39	378,556	-522,430	92	594,319	-241,615	39	380,823	-526,144	92	599,317	-241,506
40	382,840	-520,008	93	596,393	-233,259	40	**385,150**	**-523,700**	93	601,393	-233,111
41	389,014	-516,452	94	598,521	-224,310	41	391,296	-520,162	94	**603,600**	**-223,800**
42	395,109	-512,878	95	601,188	-212,708	42	397,413	-516,578	95	606,245	-212,266
43	401,169	-509,240	96	602,735	-205,695	43	403,491	-512,932	96	607,722	-205,538
44	407,025	-505,618	97	604,147	-199,043	44	409,521	-509,208	97	**609,150**	**-198,800**

FINN - STATION 6 - COORDINATES

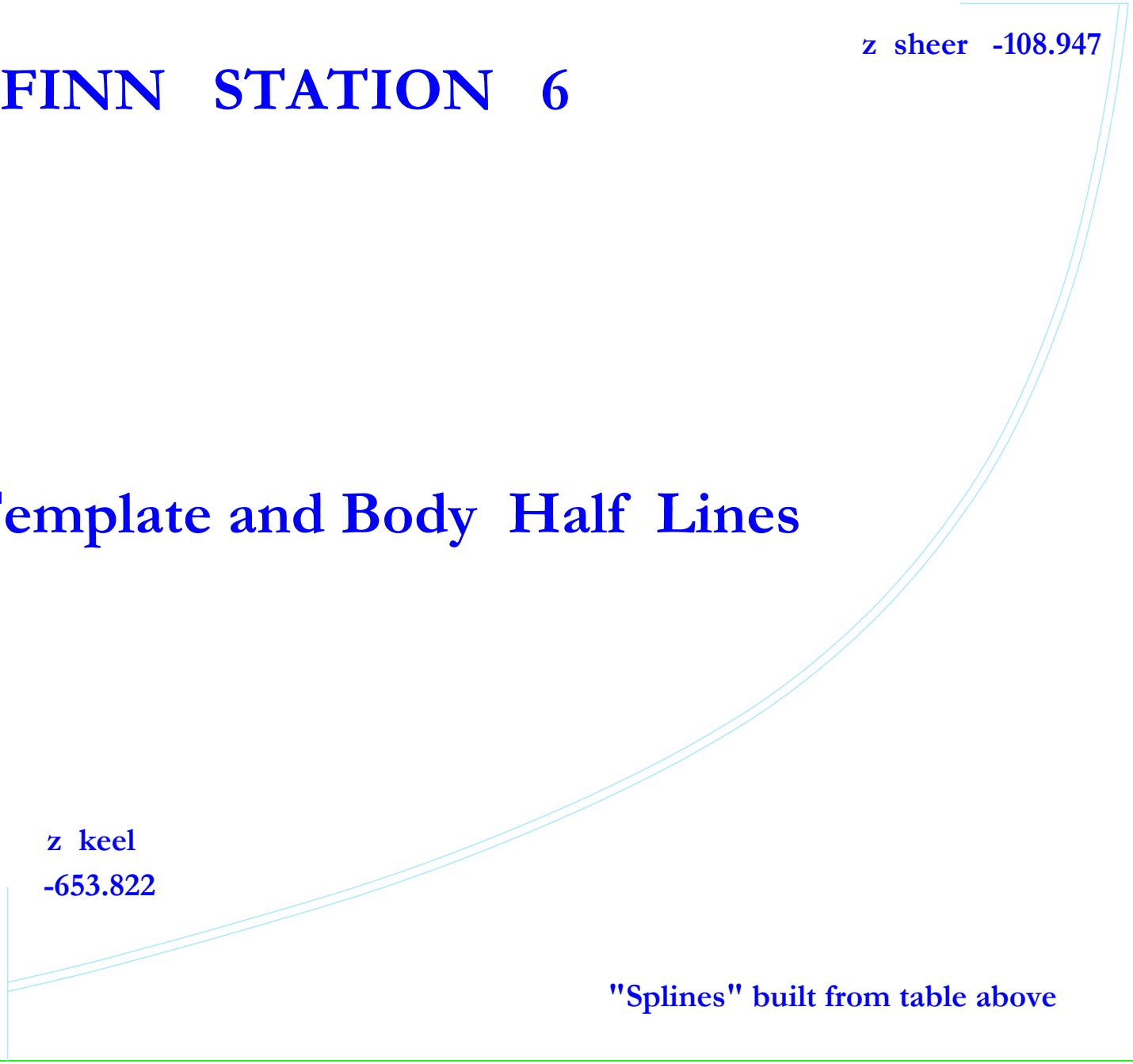
HALF BODY LINE						HALF TEMPLATE LINE					
	y	z		y	z		y	z		y	z
45	412,963	-501,817	98	605,747	-191,187	45	415,493	-505,389	98	611,565	-186,781
46	417,610	-498,735	99	608,028	-179,362	46	420,397	-502,137	99	613,822	-174,737
47	422,493	-495,374	100	610,180	-167,369	47	**425,250**	**-498,800**	100	615,922	-162,668
48	428,995	-490,712	101	612,438	-153,655	48	431,747	-494,147	101	617,863	-150,575
49	435,260	-486,038	102	614,280	-141,451	49	436,258	-489,290	102	619,647	-138,458
50	441,783	-480,970	103	615,937	-129,325	50	444,789	-484,220	103	621,271	-126,327
51	448,241	-475,756	104	617,297	-118,424	51	451,265	-478,995	104	622,379	-117,270
52	454,408	-470,592	105	618,366	-108,947	52	**457,650**	**-473,650**	105	**623,400**	**-108,200**
53	460,326	-465,461				53	463,582	-468,509			

z template coordinates to be lowered by 0,747 mm to fit general base.
Bold template coordinates were measured from carved layout; others were "splined".

FINN STATION 6

z sheer -108.947

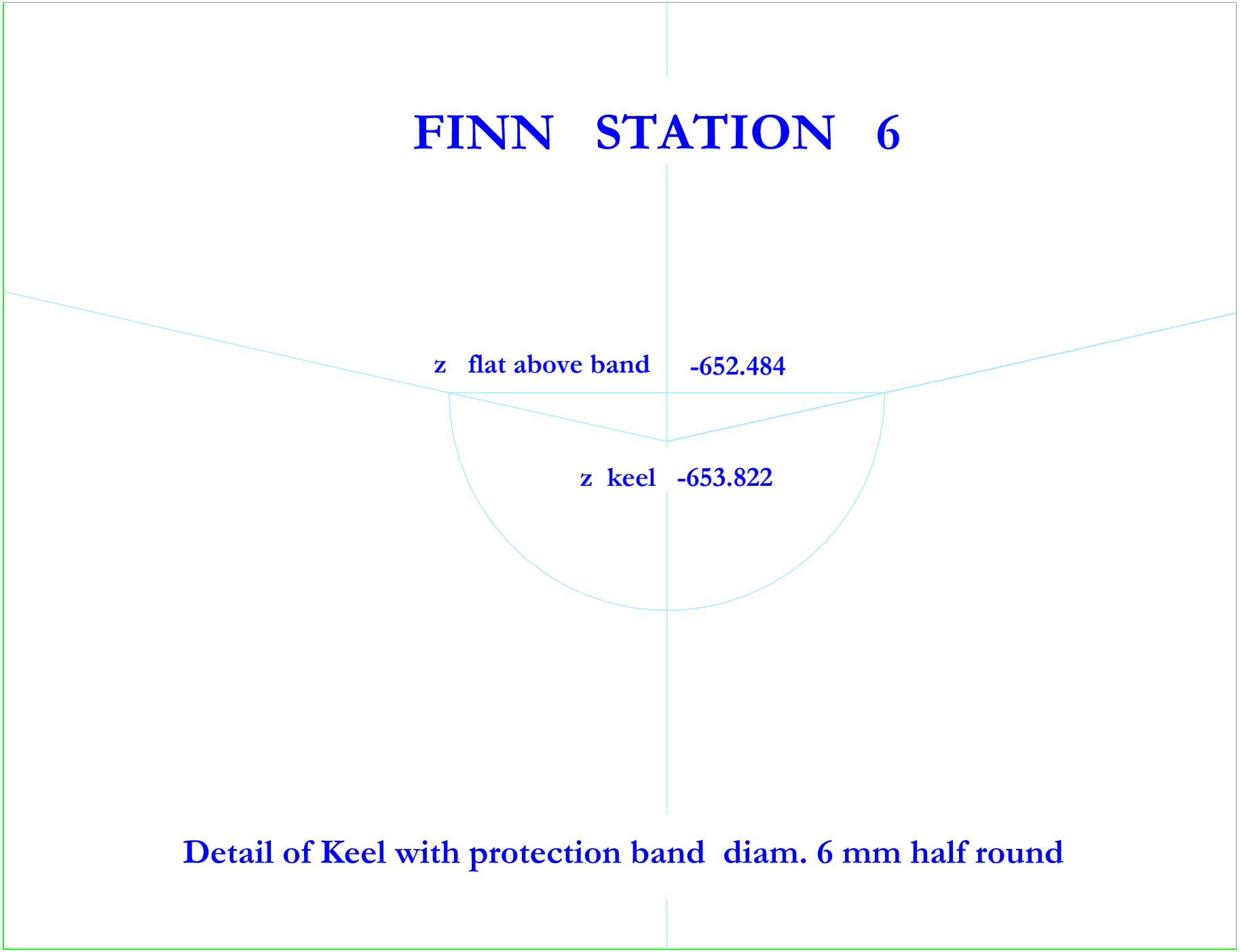
Template and Body Half Lines



z keel
-653.822

"Splines" built from table above

FINN STATION 6



Detail of Keel with protection band diam. 6 mm half round

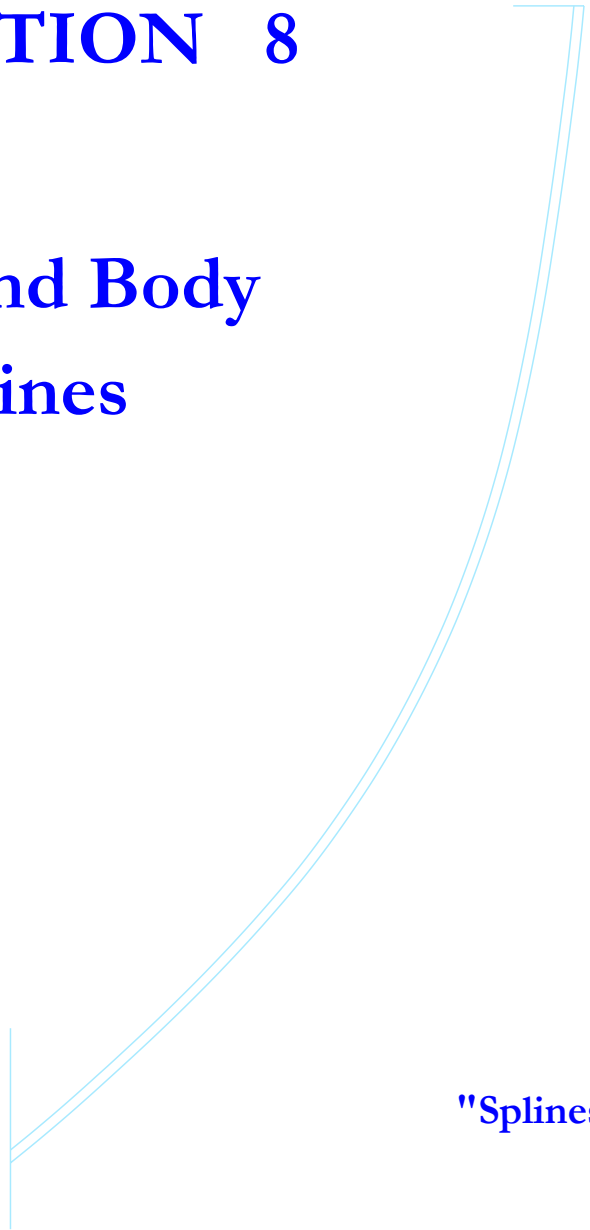
FINN - STATION 8 - COORDINATES

HALF BODY LINE						HALF TEMPLATE LINE					
	y	z		y	z		y	z		y	z
1	0,000	-615,346	39	202,817	-380,978	1	**0,000**	**-617,000**	39	206,773	-379,464
2	9,513	-607,606	40	206,833	-372,748	2	9,521	-609,287	40	**210,850**	**-371,150**
3	16,733	-601,550	41	210,480	-364,966	3	17,295	-602,835	41	214,531	-363,342
4	24,399	-595,001	42	213,821	-357,571	4	**25,000**	**-596,300**	42	218,094	-355,482
5	32,655	-587,738	43	215,717	-353,219	5	32,783	-589,526	43	220,121	-350,851
6	40,549	-580,651	44	217,788	-348,333	6	41,607	-581,652	44	**222,100**	**-346,200**
7	45,752	-575,939	45	220,860	-340,780	7	47,362	-576,436	45	225,219	-338,560
8	52,263	-570,006	46	224,102	-332,391	8	**53,100**	**-571,200**	46	228,471	-330,190
9	60,874	-562,016	47	227,457	-323,332	9	61,393	-563,577	47	**231,850**	**-321,100**
10	68,123	-555,239	48	230,532	-314,675	10	69,635	-555,898	48	235,047	-312,127
11	72,597	-550,981	49	233,194	-306,833	11	74,685	-551,118	49	237,754	-304,182
12	78,287	-545,485	50	235,792	-298,811	12	**79,699**	**-546,300**	50	**240,350**	**-296,200**
13	86,387	-537,521	51	238,579	-289,742	13	87,410	-538,763	51	243,230	-286,851
14	93,149	-530,742	52	240,826	-282,016	14	95,044	-531,151	52	245,518	-279,016
15	97,434	-526,363	53	242,995	-274,175	15	99,868	-526,246	53	**247,700**	**-271,150**
16	102,849	-520,730	54	245,113	-266,039	16	**104,650**	**-521,300**	54	249,882	-262,791
17	110,323	-512,787	55	247,142	-257,771	17	111,838	-513,711	55	251,932	-254,455
18	116,602	-505,959	56	249,109	-249,405	18	118,934	-506,038	56	**253,900**	**-246,100**
19	120,758	-501,337	57	251,374	-239,299	19	123,389	-501,114	57	256,211	-235,802
20	125,298	-496,208	58	252,913	-232,083	20	**127,800**	**-496,150**	58	257,778	-228,461
21	130,110	-490,689	59	254,439	-224,747	21	132,723	-490,523	59	**259,300**	**-221,150**
22	135,031	-484,940	60	256,890	-212,447	22	137,601	-484,858	60	261,793	-208,638
23	139,453	-479,649	61	259,228	-200,001	23	142,410	-479,135	61	**264,150**	**-196,100**
24	142,228	-476,238	62	261,156	-189,016	24	145,579	-475,262	62	266,090	-185,043
25	145,715	-471,832	63	263,173	-176,675	25	**148,700**	**-471,350**	63	268,136	-172,519
26	150,771	-465,222	64	265,199	-163,556	26	153,588	-465,009	64	270,174	-159,314
27	155,572	-458,709	65	267,165	-150,414	27	158,691	-458,137	65	**272,150**	**-146,100**
28	159,785	-452,823	66	268,954	-138,138	28	163,005	-452,144	66	273,958	-133,679
29	164,055	-446,716	67	270,686	-125,792	29	**167,250**	**-446,100**	67	**275,700**	**-121,250**
30	168,662	-439,962	68	272,356	-113,398	30	171,924	-439,284	68	277,378	-108,778
31	173,059	-433,325	69	273,967	-101,021	31	176,506	-432,407	69	**279,000**	**-96,300**
32	176,389	-428,145	70	275,415	-89,732	32	180,015	-426,978	70	280,438	-85,080
33	179,809	-422,661	71	276,315	-82,515	33	**183,450**	**-421,500**	71	281,315	-78,043
34	184,287	-415,194	72	277,093	-76,012	34	187,806	-414,289	72	**282,150**	**-71,000**
35	188,486	-407,917	73	278,635	-61,876	35	192,245	-406,639	73	283,703	-56,719
36	191,166	-403,134	74	279,445	-53,864	36	195,199	-401,385	74	284,474	-49,011
37	194,286	-397,421	75	280,177	-46,083	37	**198,100**	**-396,100**	75	**285,200**	**-41,300**
38	198,780	-388,930				38	202,561	-387,710			

z template coordinates to be lowered by 4,783 mm to fit general base.
Bold template coordinates were measured from carved layout; others were "splined".

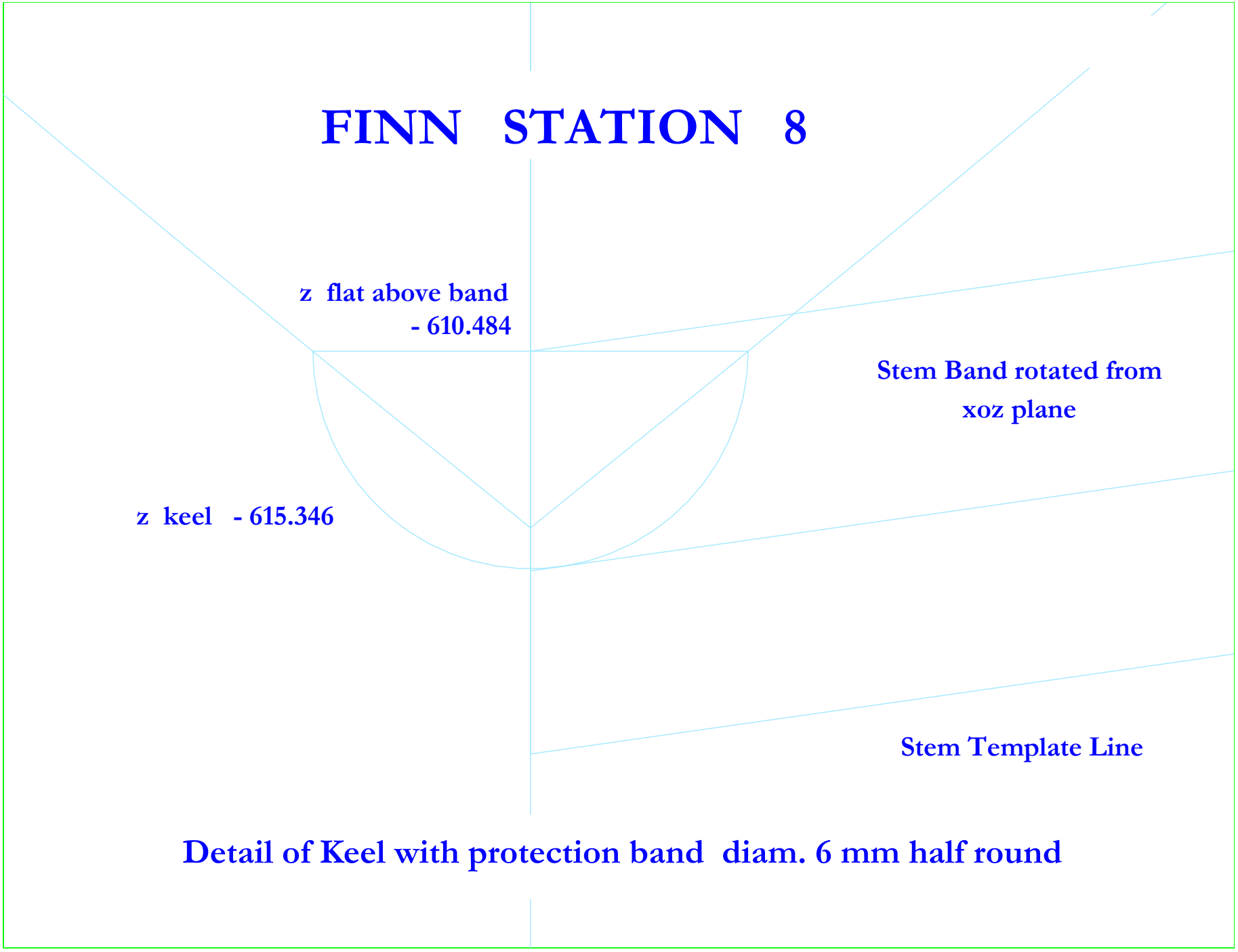
FINN STATION 8

Template and Body Half Lines



"Splines" built from table above

FINN STATION 8



Detail of Keel with protection band diam. 6 mm half round

FINN - STEM - COORDINATES

STEM BAND FORWARD LINE						TEMPLATE LINE					
	x	z		x	z		x	z		x	z
1	4000,000	-616,545	51	4408,197	-476,414	1	**4500,000**	**0,604**	51	4409,683	-483,040
2	4018,752	-613,878	52	4410,781	-472,563	2	4499,143	-16,696	52	4406,975	-486,785
3	4040,244	-610,744	53	4413,892	-467,703	3	4498,149	-33,600	53	4404,183	-490,467
4	4072,302	-605,930	54	4416,696	-463,069	4	**4497,000**	**-50,495**	54	4401,297	-494,078
5	4100,396	-601,573	55	4419,575	-458,032	5	4496,039	-63,099	55	4398,597	-497,273
6	4113,292	-599,560	56	4422,333	-452,932	6	**4495,000**	**-75,695**	56	**4395,800**	**-500,396**
7	4126,647	-597,436	57	4424,816	-448,083	7	4493,899	-88,148	57	4392,535	-503,820
8	4137,651	-595,581	58	4427,096	-443,367	8	**4492,750**	**-100,595**	58	4389,051	-507,248
9	4147,147	-593,900	59	4429,259	-438,601	9	**4490,400**	**-125,495**	59	4385,334	-510,687
10	4156,813	-592,126	60	4431,333	-433,780	10	4489,217	-137,797	60	4381,355	-514,153
11	4169,825	-589,622	61	4433,438	-428,644	11	**4488,000**	**-150,095**	61	4377,088	-517,662
12	4181,753	-587,180	62	4435,481	-423,480	12	4486,304	-166,556	62	4372,488	-521,240
13	4192,053	-584,989	63	4437,542	-418,041	13	4484,525	-183,007	63	4369,611	-523,387
14	4202,345	-582,737	64	4439,583	-412,368	14	4483,533	-191,753	64	**4366,700**	**-525,495**
15	4214,073	-580,057	65	4441,898	-405,555	15	**4482,500**	**-200,495**	65	4362,819	-528,176
16	4224,451	-577,544	66	4444,015	-398,943	16	4480,945	-212,973	66	4358,652	-530,867
17	4233,798	-575,140	67	4445,500	-394,073	17	**4479,350**	**-225,445**	67	4354,164	-533,580
18	4242,701	-572,700	68	4446,922	-389,193	18	**4476,200**	**-250,095**	68	4349,295	-536,342
19	4251,033	-570,265	69	4448,984	-381,660	19	4474,574	-262,649	69	4343,932	-539,207
20	4258,035	-568,138	70	4450,952	-373,870	20	**4472,900**	**-275,195**	70	4337,892	-542,262
21	4265,339	-565,865	71	4452,305	-368,028	21	4471,140	-287,801	71	4330,771	-545,698
22	4275,149	-562,699	72	4453,502	-362,441	22	**4469,300**	**-300,396**	72	4325,741	-548,057
23	4283,698	-559,797	73	4454,819	-355,904	23	4467,399	-312,803	73	**4320,700**	**-550,396**
24	4291,748	-556,915	74	4456,090	-349,360	24	**4465,400**	**-325,195**	74	4314,358	-553,248
25	4299,231	-554,080	75	4457,550	-341,473	25	4463,887	-334,227	75	4307,681	-556,080
26	4306,254	-551,260	76	4458,951	-333,437	26	4462,487	-342,269	76	4300,623	-558,904
27	4312,537	-548,587	77	4460,457	-324,442	27	**4461,000**	**-350,295**	77	4293,115	-561,740
28	4318,855	-545,743	78	4462,437	-312,165	28	4459,728	-356,850	78	4285,044	-564,623
29	4323,846	-543,424	79	4464,338	-299,770	29	4458,410	-363,395	79	4276,255	-567,599
30	4328,812	-541,094	80	4466,180	-287,170	30	4457,154	-369,255	80	4266,464	-570,753
31	4335,949	-537,645	81	4467,754	-275,922	31	**4455,800**	**-375,095**	81	4259,241	-572,997
32	4341,933	-534,610	82	4469,592	-262,179	32	4453,831	-382,886	82	**4252,000**	**-575,195**
33	4346,976	-531,911	83	4471,199	-249,767	33	4451,710	-390,635	83	4243,614	-577,638
34	4351,834	-529,150	84	4474,347	-225,150	34	4450,286	-395,524	84	4234,689	-580,076
35	4356,306	-526,437	85	4475,962	-212,523	35	**4448,800**	**-400,396**	85	4225,100	-582,535
36	4360,446	-523,746	86	4477,515	-200,068	36	4446,601	-407,256	86	4214,641	-585,059

FINN - STEM - COORDINATES

STEM BAND FORWARD LINE						TEMPLATE LINE					
	x	z		x	z		x	z		x	z
37	4363,712	-521,485	87	4478,550	-191,318	37	4444,283	-414,075	87	4202,909	-587,734
38	4366,610	-519,387	88	4479,528	-182,693	38	4442,241	-419,752	88	4192,562	-589,994
39	4369,514	-517,220	89	4481,296	-166,366	39	**4440,100**	**-425,396**	89	**4182,200**	**-592,195**
40	4374,131	-513,625	90	4482,993	-149,924	40	4438,056	-430,564	90	4170,162	-594,652
41	4378,371	-510,127	91	4484,220	-137,523	41	4435,947	-435,704	91	4157,108	-597,158
42	4382,012	-506,950	92	4485,378	-125,482	42	4433,751	-440,806	92	4147,560	-598,906
43	4385,727	-503,509	93	4487,723	-100,638	43	4431,582	-445,575	93	**4138,000**	**-600,595**
44	4389,194	-500,085	94	4488,896	-87,940	44	**4429,300**	**-450,295**	94	4126,643	-602,502
45	4392,120	-497,013	95	4489,992	-75,576	45	4426,649	-455,465	95	4113,324	-604,616
46	4394,913	-493,891	96	4491,029	-63,016	46	4423,886	-460,569	96	**4100,000**	**-606,695**
47	4397,604	-490,695	97	4491,985	-50,510	47	4421,004	-465,606	97	4068,331	-611,595
48	4400,237	-487,397	98	4493,133	-33,690	48	4418,017	-470,538	98	4036,638	-616,330
49	4403,027	-483,714	99	4494,125	-16,906	49	**4414,900**	**-475,396**	99	4018,323	-618,990
50	4405,729	-479,972	100	4495,000	0,604	50	4412,322	-479,240	100	**4000,000**	**-621,595**

Both sets of oordinates are related to general base.

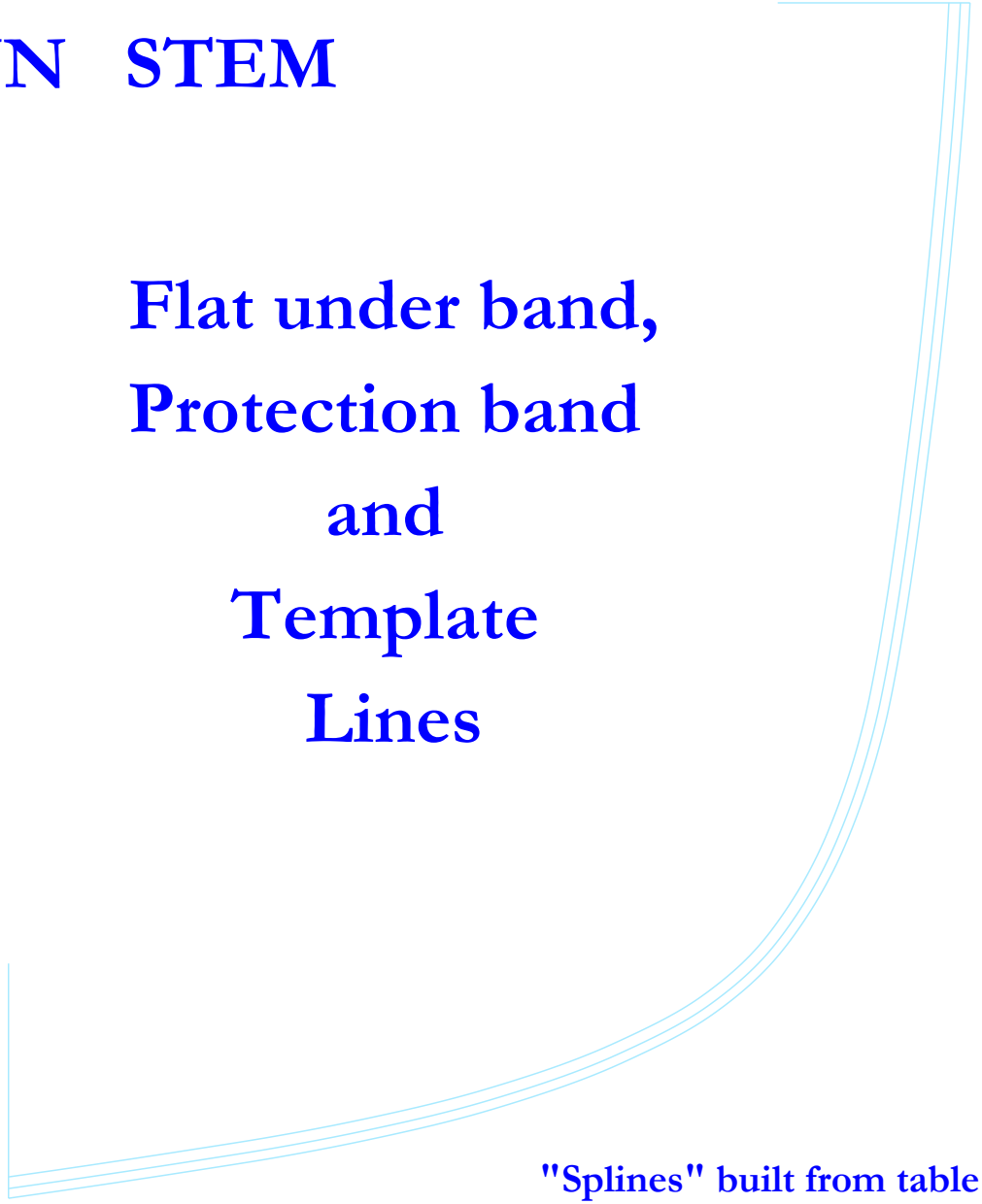
Bold template coordinates were measured from carved layout before translation; others were "splined".

FINN STEM

Flat under band, Protection band and Template Lines

z sheer 0.604

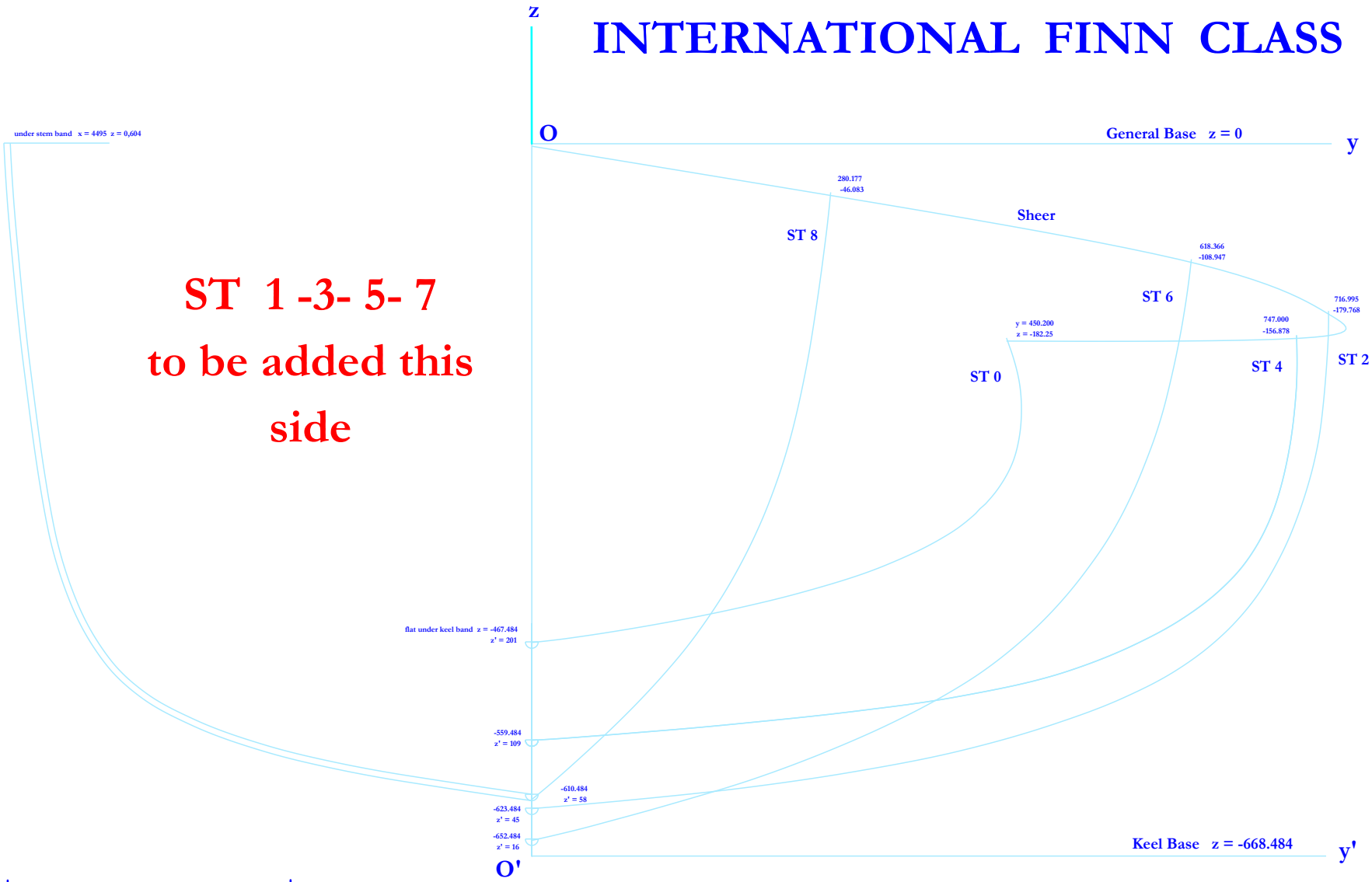
x flat 4 488.99
band 4 495
template 4 500



z flat -610.484
keel -615.346
band -616.545
template -621.595

"Splines" built from table above

INTERNATIONAL FINN CLASS



ST 1 -3- 5- 7

to be added this side

8th april 1964 First issue approved, checked and signed by
Richard CREAGH OSBORNE IFA TC Chairman,
John Vernon FORSTER RYA,
Charles CURREY Fairey Marine.

1974 and june 2003 Numerised and revised under control of
Richard HART, IFA TC chairman,
by Gilbert LMBOLEY, life honorary Chairman.

FULL SIZE BODY LINES to ouside of HULL

traced from MASTER LAY OUT

to print full size lines, see page 6

Checking theTemplates

Accuracy of design and cutting

A sworn geometrician examined the master set of templates and recorded the discrepancies he could observe with the carving onto aluminium alloy sheet. He looked at both sides of the templates.
His certificate is given below.
Copies of his records on back side are given further on with discrepancies delivered in mm, red in colour.
On those records we added the discrepancies which the geometrician had observed on front side; we coloured them blue.
Those discrepancies are often naught; when different from naught they keep close to the precision of the geometrician's observation.
Station 6 shows an exception close to sheer with discrepancies comprised between 0.5 and 0.7 mm. We did not think useful to correct a spot which is of no consequence for hull controls.
If we take into account all the adverse factors such as

- Difficulty of a hand carving and unevenness of the lines,
- Straight lines of the canvas not being absolutely parallel or perpendicular,
- Difficulty of measuring so many coordinates,

indeed the quasi perfect conformity looks like a miracle.

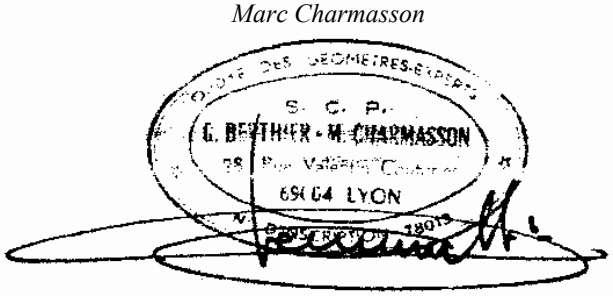
TESTING CERTIFICATE OF TEMPLATES

We, chartered geometricians, on 15th January 1980, examined the set of templates shown together with the original graphs drawn on aluminium sheet.
To wok out, we have set each template on its corresponding graph front side first, back side afterwards.
We have sought for the best coincidence by trying to set as well as possible the template on its graph in such a way that maximum gap between the theoretical graph and the template above mentioned be minimum.
With all imprecision due to lines thicknesses, we have read gaps with micrometer lens.
Those gaps are recorded in millimetres (mm) on the drawings enclosed herewith (theoretical graph being drawn in pecked lines).
Bearing in mind all the factors above mentioned, our measurement imprecision could be estimated to $\pm 0.2\ mm$.

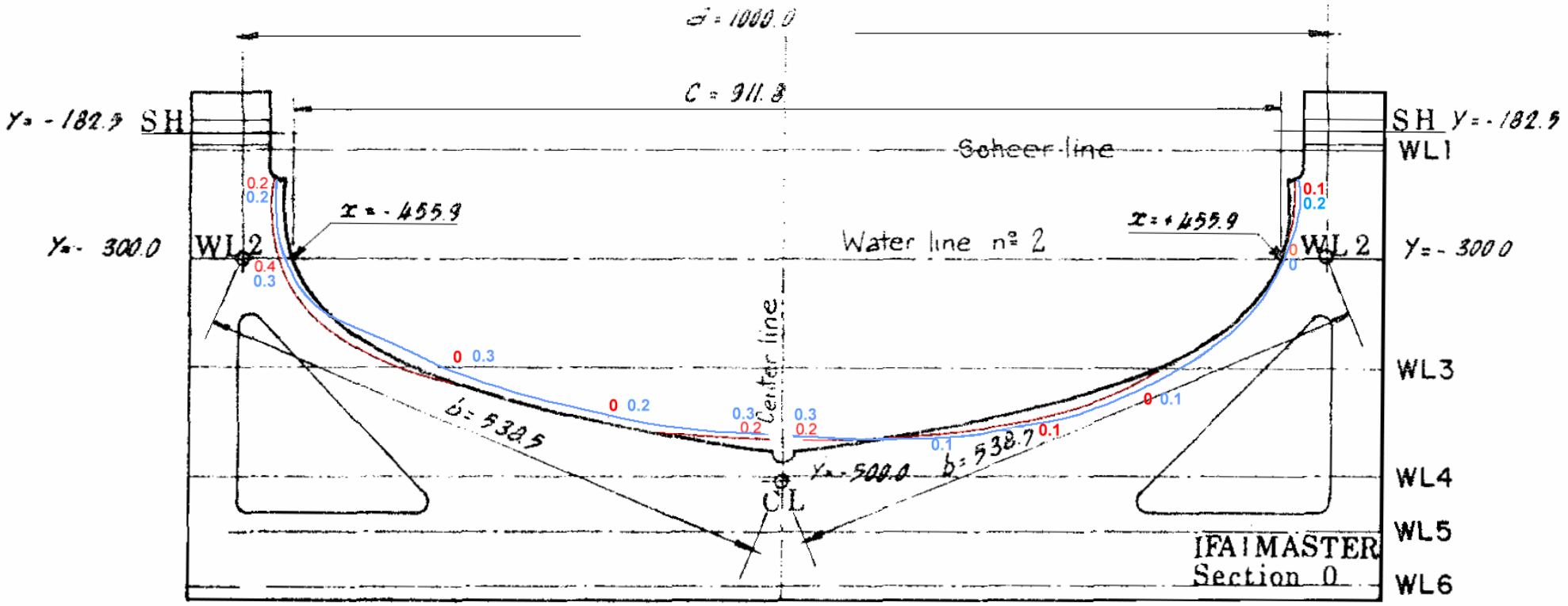
Certifié sincère et véritable,
Fait à Lyon le 15 janvier 1980

Les géomètres experts,
L'un d'eux :

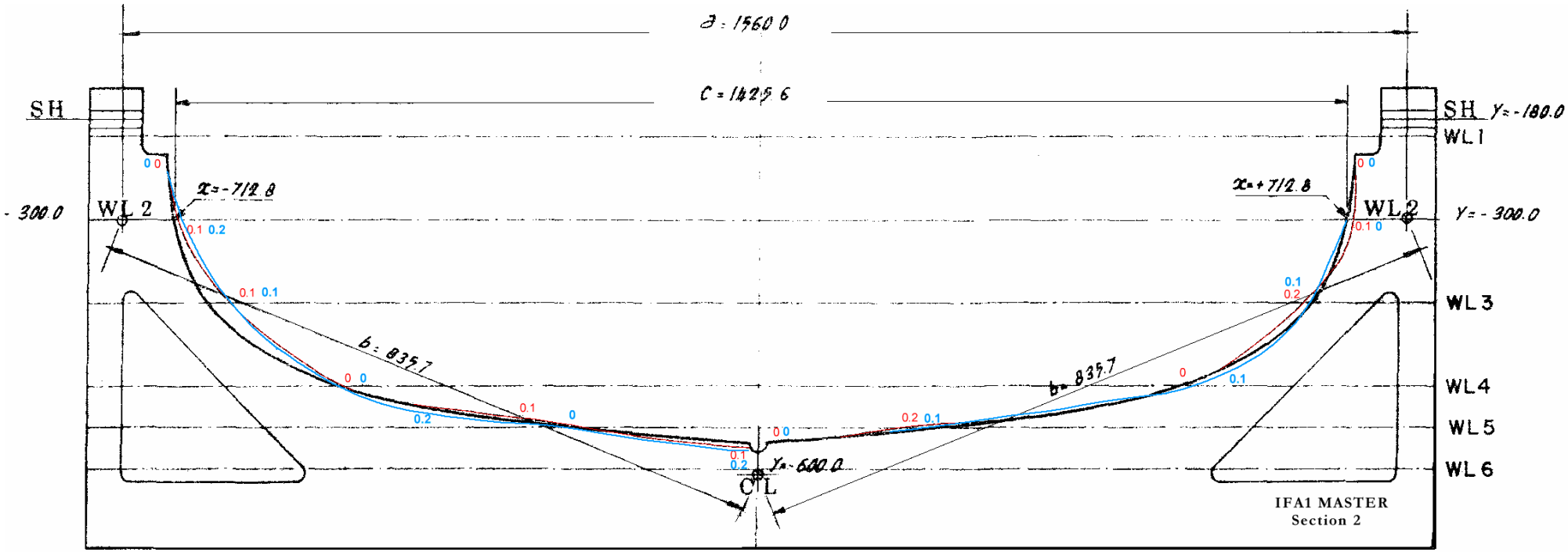
Marc Charmasson



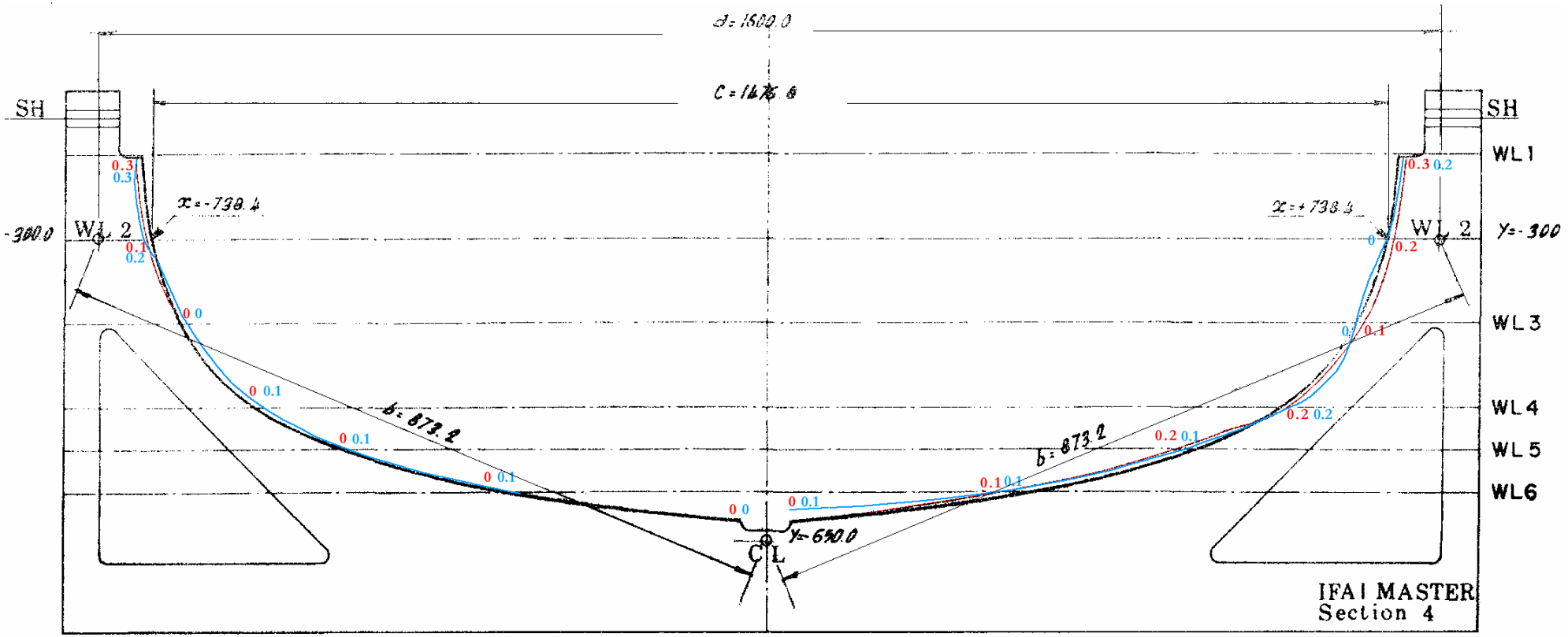
STATION 0


d = 1000.0
C = 911.3
Y= - 182.5 SH
SH Y= - 182.5
WL1
Scheer line
Y= - 300.0 WL2
x = - 455.9
x = + 455.9
Water line n° 2
WL 2
Y= - 300.0
Center line
WL3
b= 538.5
b= 538.7
x= - 500.0
C/L
WL4
WL5
WL6
IFA MASTER
Section 0

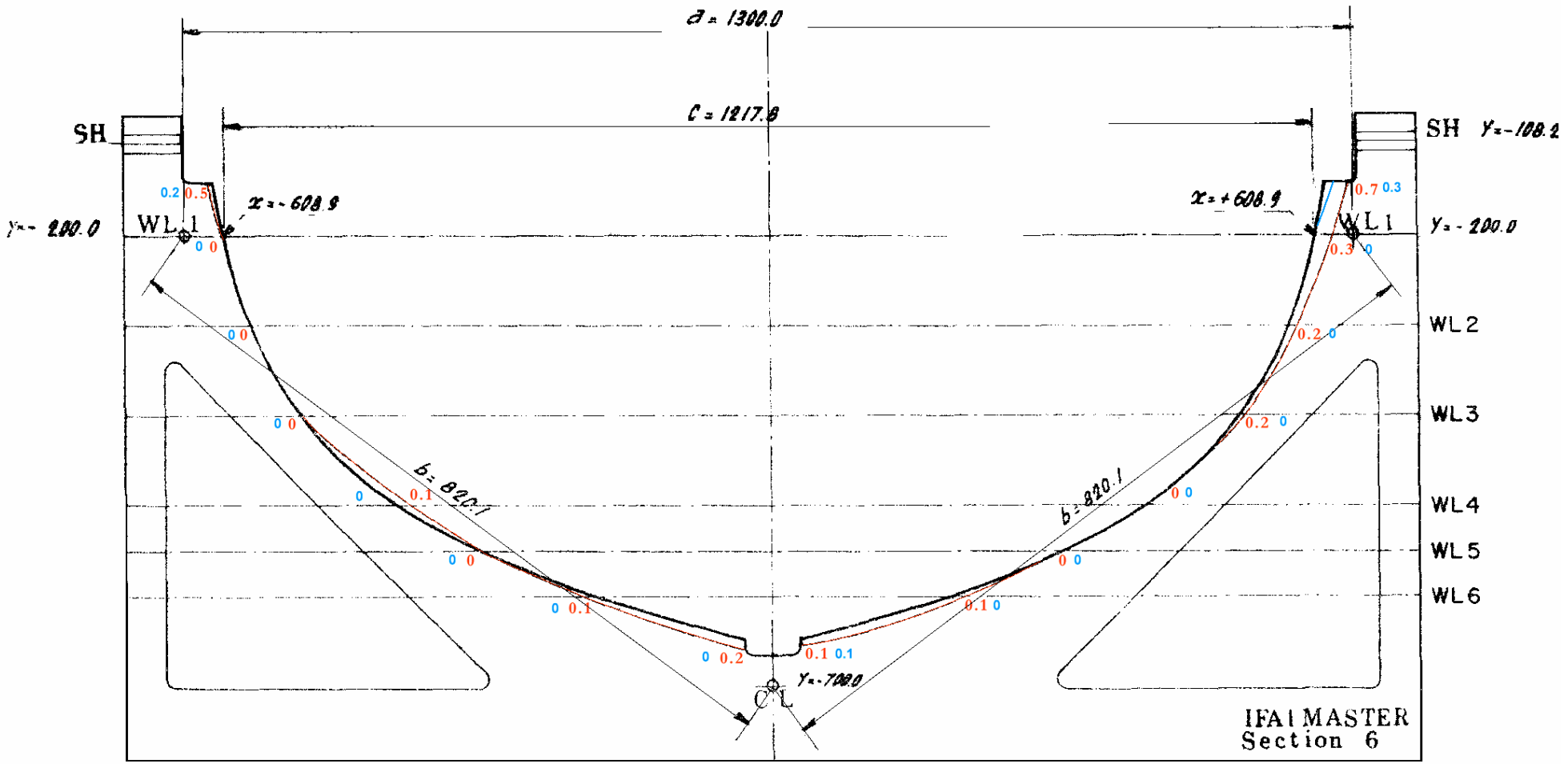
STATION 2


a = 1560.0
c = 1425.6
SH
SH y = -180.0
WL 1
WL 2
WL 2
- 300.0
y = - 300.0
x = - 712.8
x = + 712.8
WL 3
WL 4
WL 5
WL 6
b = 835.7
b = 835.7
y = - 600.0
C/L
IFA1 MASTER
Section 2

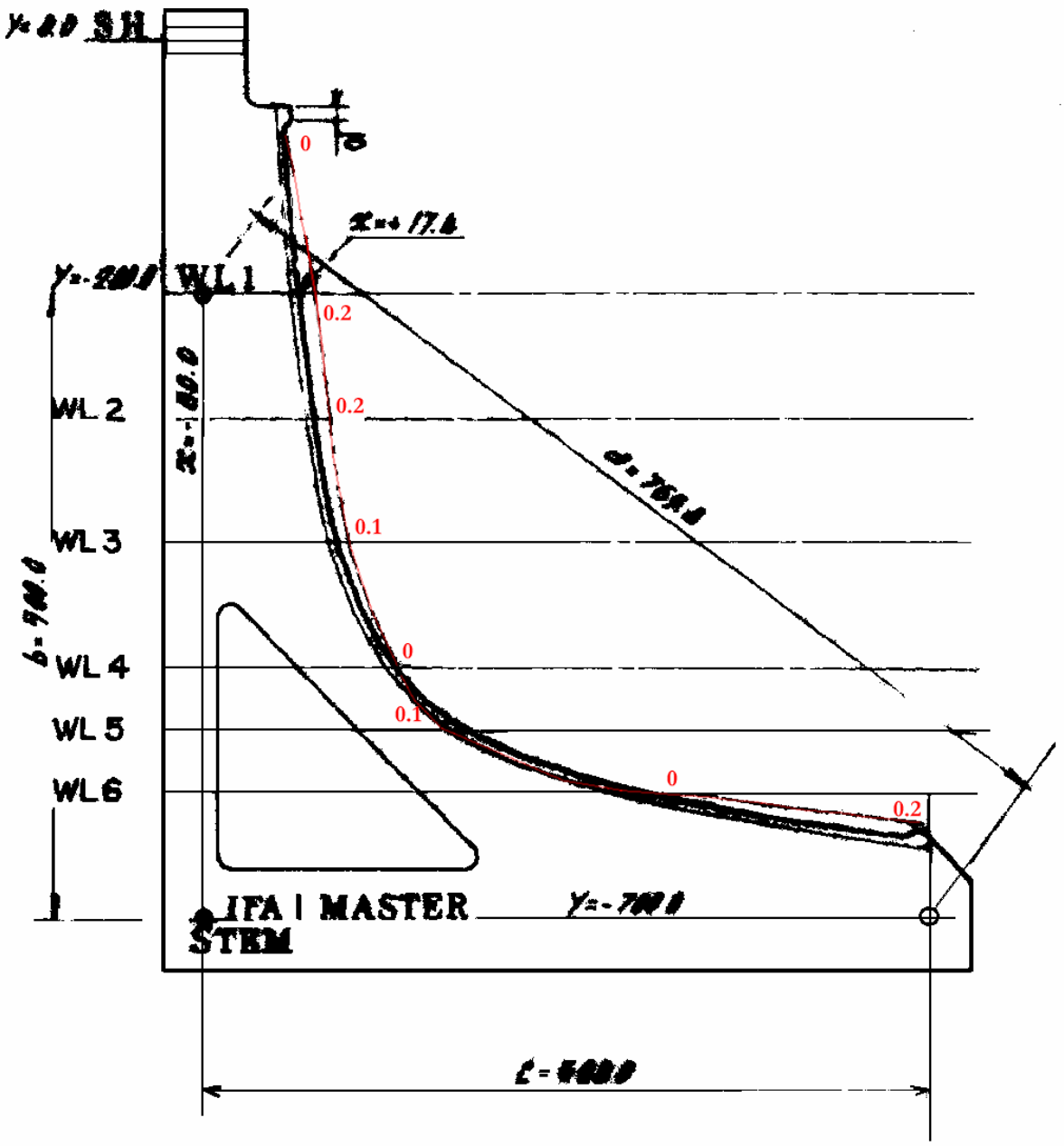
STATION 4


SH
SH
WL 1
WL 2
WL 2
WL 3
WL 4
WL 5
WL6
-300.0
y=-300
x=-738.4
x=+738.4
b=873.2
b=873.2
y=650.0
C/L
IFAI MASTER
Section 4

STATION 6


a = 1300.0
c = 1217.8
SH
SH y=-108.2
y=-200.0
WL 1
x=-608.9
x=+608.9
WL 2
WL 3
WL 4
WL 5
WL 6
b=820.1
b=820.1
y=-700.0
C/L
IFA MASTER
Section 6

STATION 8 **see page 4**



STEM

Checking Stability of the templates

As any measurement apparatus, those templates are subject to damage and distortion.
That is why triangle measurements have been provided so as to control the templates integrity.
Those control measurements must be checked with certified meter rules.

OL' MAN RIVER on river Saône