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Grain, greed and green wood: the late sixteenth-century Scheurrak SO1 shipwreck and the use of double hull planking in the early modern Netherlands

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Appendix II – data on lengthening and doubling

Appendix II.1 – Die Vier Heemskinderen, Amsterdam, 1593

<i>Notary:</i>	<i>Jan Franssen Bruijningh</i>
<i>Commissioner:</i>	<i>Luijtghe Jacobsz (shipmaster from the city of Workum, Frisia)</i>
<i>Shipbuilder(s):</i>	<i>Huijbrecht Pietersz (shipbuilder from Amsterdam)</i>
<i>Date of contract:</i>	<i>19 October 1593</i>

On 19 October 1593, a contract was made by notary Jan Franssen Bruijningh for the lengthening of a ship by 16 feet. The document specifies the “*verlanginge, vertimmeringe ende vernieuwinge*” (*i.e.* “the lengthening, reconstruction and renewal”) that had to be executed in detail. The ship had to be delivered by Shrove Tuesday; the final day before the Christian fastening period or Lent. The first Shrove Tuesday following the date of the contract, would be 22 February 1594, giving the shipbuilder about four months to lengthen the vessel and make the required changes. It is, so far, the only known account specifying the time needed to lengthen a vessel. The compensation would be 1700 guilders. For this price, the shipbuilder would deliver all required materials, except for the needed iron, which was paid for separately by the commissioning party.

The ship had to be sawn in half in the middle, and a keel, similar in size to the old keel, had to be added. This suggests that the new keel section was integrated in the original keel, resulting in a composite keel made of multiple parts. The exact length of the new keel is not specified. It is unlikely that the old keel was completely removed and replaced by a new keel, as this would come down to rebuilding the entire ship. The keelson, on the other hand, had to have a length of 26 feet. This is 10 feet longer than the size of the lengthened section. The frame timbers in this section, had to be as thick as the old timbers and the old hull planking together. New hull planking was added around the lengthened vessel. It is notable that the planks in the lengthened section, had to come from Königsberg (present day Kaliningrad), while the planks in the fore and aft sections, which were meant to “double and strengthen the ship”, had to come from Hamburg. In addition, both planks required a different thickness, which was drawn in the margin of the document. The thickness of the Königsberger planks had to be *ca.* 6.3 cm, while the Hamburger planks required a thickness of only *ca.* 5.5 cm. Parts of the hull planking that were rotted, had to be removed by axe. The new ceiling planks had to be worked one *vadem* (*i.e.* one fathom, or *ca.* 1.7 m) into the existing ceiling planks. Also, for the lower deck, new deck planks had to be worked into the existing ones, and they had to be coniferous planks from Prussia.

When the ship was halved, both in the fore and aft sections, two deck beams had to be replaced with new ones. In the lengthened section, four additional deck beams had to be installed. It seems that an additional three wales had to be added to each side of the ship, with a thickness of ‘*drije vuyt een voet*’ (*i.e.* three from one foot, or 1/3 foot). The old wales had to be checked for rot and, if any was present that exceeded the size of one fathom, that part had to be cut out and filled with a caulked plank.

Appendix II.2 – unidentified vessel, Enkhuizen, 1595

<i>Notary:</i>	<i>Willem Cornelisz In 't Wijnhuis</i>
<i>Commissioner:</i>	<i>Pieter Geurtszoon (shipmaster from the city of Amsterdam)</i>
<i>Shipbuilder(s):</i>	<i>Thoenis Fredricxzoon, Cornelis Claeszoon, Maertin Janszoon, Wigger Gerritszoon(?) and Simon Willemszoon (all shipbuilders from the city of Enkhuizen)</i>
<i>Date of contract:</i>	<i>2 November 1595</i>

This contract was signed on 2 November 1595 and details the lengthening of a vessel with by an additional 24 feet. The client is a shipmaster from Amsterdam, who apparently came to the city of Enkhuizen to let local shipbuilders lengthen his vessel. The price to be paid was 1550 guilders, excluding the cost of iron and nails.

The contract does not give much detail about the execution of the required work. It does specify, however, that the ship should be lengthened by adding a section of 24 feet in the middle. The lower deck had to be made 3 feet higher than its original height, completely new from bow to stern with Prussian planks. On top of that, another three feet were to be added to the hull. This specification gives the impression that the vessel did not have an upper deck. In the aft, the lengthened vessel had to be given a transom and upper works. Double hull planking had to be applied from the keel as far as the height of the ship's sides before reconstruction, and three new wales had to be added as well. Ceiling planks had to be added to the lengthened section. The original ceiling planks could be replaced too, but this would cost extra. Some complementary requirements were listed as the contract continued. These include the addition of a pinrail, beakhead, windlass and rudder. Furthermore, hatches had to be included, as well as six bunks, a galley and a main cabin. Further details about, among others, the keel, frame timbers or deck beams, were not included in the contract.

Appendix II.3 – Buss, Enkhuizen, 1596

<i>Notary:</i>	<i>Willem Cornelisz In 't Wijnhuis</i>
<i>Commissioner:</i>	<i>Hendrick Linartszoon (shipmast from the city of Enkhuizen)</i>
<i>Shipbuilder(s):</i>	<i>Jacop Wijntgeszoon and Erick Wijntgeszoon (shipbuilders from the city of Enkhuizen)</i>
<i>Date of contract:</i>	<i>20 November 1596</i>

This contract, made by notary In 't Wijnhuis on 20 November 1596, specifies the required works for the lengthening of a buss by 19 feet. The price to be paid was 597 guilders and 10 *stuivers*.

Although the buss was only lengthened by 19 feet, *Königsberger* planks of 40 feet had to be used to complete the hull planking of the lengthened section. These planks had to be used over their full length and worked in the original hull with shifting butts. Underneath the first wale, the ship had to be doubled from fore to aft. The document seems to suggest that the doubling layer was limited to a single strake, yet it is likely that it was implied to double the entire hull underneath the first wale. Ceiling planks had to be added to the lengthened section with shifting butts too, similarly to the hull planking. They had to continue as far as the *halsgaten* (*i.e.* presumably the bulwark fairlead). Care had to be taken that the shifting butts from the hull and ceiling planks did not correspond. *Hartwerck* had to be used on the inside and outside, which may refer to the need for planks without sapwood. A false keel had to be placed underneath the lengthened vessel, and in front of the stem a gripe had to be added. Inside, a keelson had to be worked into the original keelson with scarfs, which would result in a composite keelson existing of at least three sections.

The ship's bottom had to be widened as much as possible, with the intent to make the ship two feet wider than it originally was. Six top timbers had to be added. On the inside of the hull, futtock riders had to be added, running from the bilge upwards. The lower deck had to be lengthened with Prussian planks, over the length they were available. Each deck beam had to be supported by a knee. In the hold, a small rider had to be placed near the bow. As far as the wales go, the document only seems to mention that 'one strong wale' had to be removed from the ship's starboard. Whether any wales had to be added or replaced, is not specified. Some other small parts had to be installed too, such as a pinrail. Any rotted parts had to be replaced, and any damage as a consequence of the lengthening process had to be repaired. The latter included the aft of the hull and the upper works.

Appendix II.4 – Square-rigged boyer, Enkhuizen, 1597 (I)

Notary:	<i>Willem Cornelisz In 't Wijnhuis</i>
Commissioner:	<i>Albert Janszn (from the city of Harlingen, Frisia)</i>
Shipbuilder(s):	<i>Olfert Hertzn and Gerrit Reijnerstzn (master shipbuilders from the city of Enkhuizen)</i>
Date of contract:	<i>3 January 1597</i>

In the archive of notary In 't Wijnhuis, there are two entries to be found for the lengthening of a *raboeier* on 3 January 1597 (*see also appendix II.5*). Although it is the same kind of work, contracted on the same day for the same type of vessel, both documents describe a somewhat different lengthening process. This is notable, since both projects were to be executed by the same shipbuilder. The ship type referred to with the term *raboeier* is similar to a boyer, yet square-rigged. The first of both *raboeiers* had to be lengthened in the middle by 16 feet for the price of 750 guilders – exclusive of the price of iron and nails.

The contract does not give much details about the changes that have to be made, yet it gives an interesting insight in how the ship is halved. Binding strakes, waterway, lower deck and ceiling all had to be removed as far as the present scarfs, presumably in reference to the first scarf following the cutting line. Only the specification for the keelson was different, which had to start at the bow and continue as far as two fathoms (*ca.* 3.4 m) beyond the mast. The entire ship had to be given a second layer of hull planking underneath the lowest wale. *Königsberger* planks had to be used for the hull planking, which seems to indicate that the lengthened section was provisioned with hull planking before it was doubled. A false keel was added from bow to stern. Two deck beams were removed to make the ship two feet wider. Then, seven new deck beams were installed, five more than the original structure. Each deck beam was supported by a knee. At the fore of the boyer, a *pin* (*i.e.* presumably a bowsprit) was installed, supported by three knees, which had to be worked into the existing structure. Aft, a transom with a hatch had to be created. The contract also specifies the need for two new *visken*, which may refer to *vissing* or *visser* (*i.e.* mast partner).

Appendix II.5 – Square-rigged boyer, Enkhuizen, 1597 (II)

<i>Notary:</i>	<i>Willem Cornelisz In 't Wijnhuis</i>
<i>Commissioner:</i>	<i>Cornelis Jarichszn (from the city of Londen (?))</i>
<i>Shipbuilder(s):</i>	<i>Olfert Hertz and Gerrit Reijnerstzn (master shipbuilders from the city of Enkhuizen)</i>
<i>Date of contract:</i>	<i>3 January 1597</i>

The lengthening of the second *raboeier* was, with a required payment of 700 guilders plus iron and nails, slightly cheaper than the commissioned lengthening of the other *raboeier*, contracted the same day (*see appendix II.4*). The lengthening, with an addition of 15 feet, was only one foot shorter than the lengthening required in the previous contract. The execution, however, was somewhat different.

It appears that this boyer did not need to be lengthened in the middle, contrary to all other vessels discussed so far, but in the aft of the ship. The aft needed to be given a new sternpost, a new transom with a port and a new rudder. The original hull needed to be doubled entirely, also in between the wales. Planks from Hamburg had to be used for the hull (presumably for the outer hull planking), while in between the wales '*schuijteplancken*' (reused ship timber) had to be applied. A covering board had to be added, with a '*schuijteplanck*' above it. Underneath the boyer, a false keel had to be installed. The lower deck was raised by one foot and all deck planks, from bow to stern, had to be replaced by new Prussian planks. Top timbers had to be placed 'as deep as possible' in the ship's sides, and they had to be fastened one and a half foot wider than before, indicating that the ship was widened as well. Four bunks, a galley, a steering stand and a galley were asked for as well. Also new mast partners were required.

Appendix II.6 – Boat, Enkhuizen, 1600

Notary:	<i>Willem Cornelisz In 't Wijnhuis</i>
Commissioner:	<i>Jan Jacopszn Hem (merchant from the city of Amsterdam)</i>
Shipbuilder(s):	<i>Erick Jacopszn (shipbuilder from the city of Enkhuizen)</i>
Date of contract:	<i>15 January 1600</i>

On 15 January 1600, notary In 't Wijnhuis stipulated the contract between a merchant from Amsterdam and a shipbuilder from the city of Enkhuizen for the lengthening of a boat. The same shipbuilder had made the boat in the past for another merchant, who had sold it now to the Amsterdam merchant. It is notable that the shipbuilder who made the ship in the past, now was contracted to execute the lengthening as well. The price charged for this work was 800 guilders. It seems to be one of the unique cases where the nails were included in the demanded price, yet the other iron was not.

The boat had to be lengthened in the middle by 20 feet. It is the only contract not mentioning the need for double hull planking. The deck beams in the lengthened section had to lay 3.5 feet from one another and each beam had to be supported by a knee. The lower deck needed to be made of Prussian planks. The 'ganckborden' and 'scheerstocken', referring to the waterways and binding strakes, had to be equally strong as the original ones. The deck beams in the lengthened section, however, had to be heavier than the ones in the original section. A *verdek* or upper deck had to be added at 4 feet and a palm, presumably counted from the lower deck upwards. The deck had to be made of Prussian planks and needed large hatches. A cabin and a 'voer onder plecht hutte ende rochganck' had to be installed as well. The latter probably refers to a forecastle with railing. The 'scherganck' or master ribband in the lengthened section had to follow the rising of the sheer of the original hull. Furthermore, a windlass¹ and rudder were asked for.

¹ The document specifies the need for a 'spil' and 'braetspit', yet both seem to refer to a windlass.

Appendix II.7 – The B&W1 shipwreck

Notary: *not applicable*

Commissioner: *not applicable*

Shipbuilder(s): *not applicable*

Date of contract: *not applicable*

The B&W1 shipwreck is one of the shipwrecks that were found in the Christianshavn area of Copenhagen, Denmark, in 1996. It was named after the Burmeister & Wain company (B&W) which had been the last owner of the plot where B&W1 and the other B&W shipwrecks were found. Dendrochronological analysis of the hull remains demonstrated that the initial construction of the B&W 1 shipwreck dated back to the mid-1580s, while the lengthening phase only occurred over twenty years later around 1608. The B&W1 shipwreck had been reused as landfill for a careening wharf which was established here in the first half of the seventeenth century (Lemée 2006: 29, 256). The importance of this shipwreck lies in the fact that, so far, it is the only archaeologically identified example of a *verlanger*. Therefore, it gives a unique insight in the construction methods used to lengthen the hull and to strengthen it. The hull remains were analyzed in detail by maritime archaeologist Christian Lemée and this summary is based upon his research (Lemée 2006: 236-254).

The B&W1 shipwreck originally had a length of 18,7 m and was built in the Dutch flush tradition. To lengthen the ship, it was cut in half amidships and pulled apart. Over a length of 7,7 m a new hull section was inserted, leading to a new total length of 26,4 m over stem and stern. The original hull planking did not continue in the lengthened part, which in this case was a clear diagnostic feature to identify the shipwreck as a *verlanger*. Yet, several other structural elements were added to give the ship the necessary longitudinal strength again, which was lost when the ship was halved. The lower part of the original keel had been removed to just underneath the keel rabbet, not to affect the original hull planking. A new keel, which Lemée refers to as ‘the *verlanger* keel’, was added underneath the original keel over the full length of the lengthened vessel. Underneath the *verlanger* keel a false keel was added. A second layer of hull planking was built around the lengthened vessel and fastened to the original hull with treenails. The second layer of hull planking had the same thickness as the original layer of hull planking, measuring 4.5 cm. Special care was taken to enter the these new treenail through, or very near, the already present treenails of the existing hull planking. This may have been done not to weaken the original timbers with an abundance of holes. The floor timbers in the lengthened part were made somewhat thicker to compensate for the missing inner hull planking in this section, while simultaneously allowing for flush laid ceiling strakes over the full length of the hull. The ceiling planks did indeed continue over the lengthened part, yet most strakes were assembled with a plain scarf between the original and lengthened section of the hull. The keelson, on the other hand, was probably replaced during the lengthening process as it was made of one solid piece that continued over the entire length of the lengthened hull. The original construction had a bilge stringer on each side. When the ship was lengthened, three additional stringers were added per side. The three new bilge stringers surrounded the original stringer on its left, right and top side, and must have given longitudinal strength to the lengthened vessel. Seven riders had preserved, of which four or five covered the lengthened section and must have been added in the rebuilding phase. In this phase, a gripe was added to the stem as well. In the aft, the second layer of hull planking continued to the aft face of the stern, while the original layer of hull planking was rebated into the sternpost.

Appendix II.8 – Boat, Enkhuizen, 1591

<i>Notary:</i>	<i>Willem Cornelisz In 't Wijnhuis</i>
<i>Commissioner:</i>	<i>Fredrick Peeter Wiggerszoon (shipmaster from the city of Harlingen, Frisia), Claes Janszoon and Cornelis Hendricxzoon (shipowners)</i>
<i>Shipbuilder(s):</i>	<i>Cornelis Ghijsbrechtszoon and Simon Janszoon Lobbes (shipbuilders from the city of Enkhuizen)</i>
<i>Date of contract:</i>	<i>24 October 1591</i>

Within the In 't Wijnhuis archive, one contract was found in which the *verdubbeling* of an existing ship was commissioned. The contract was signed on 24 October 1591, and mainly requires the addition of a second layer of hull planking and a beakhead. The contract specifies that the “*dubbele huijt*” (*i.e.* double hull planking) had to start from the keel upwards, as far as the lower wale. The outer hull planking had to be made of oak planks from the Baltic and Hamburg (each representing half of the planks). In between both layers, the hull had to be tarred, and moss had to be applied. The doubling layer also required a *streek* in the aft. Furthermore, the converted hull required four wales. It is unclear whether this refers to the total number of wales after conversion of the hull, or whether four wales had to be added to the number of wales present in the construction already. Specifications about the height of the *koerbrug* deck and the deck beams of the upper deck were included as well, indicating that these were either added to the construction or were altered during the conversion process. The conversion of the hull was commissioned by Fredrick Peeter Wiggersz, a shipmaster from Harlingen, and was executed by four shipbuilders from Enkhuizen. For the commissioned work, they charged 1125 guilders and four barrels of beer. A deadline for the commissioned work was not specified in the contract.



Appendix III – dendrochronological data

Appendix III

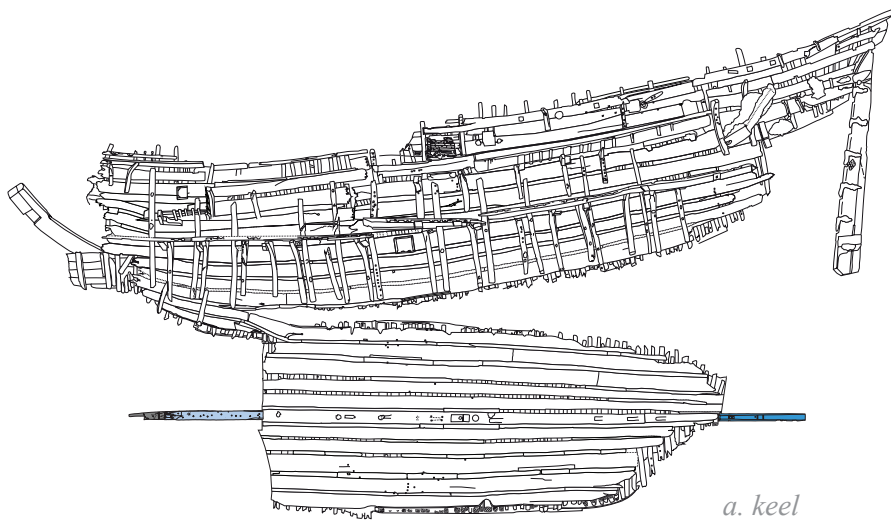
Element	find nr.	Location	Date	Provenance	-1569	1570-1579	1580-1589	1590-1599	1600-
Keel	VE Keel I	bow	1585 ±8	Germany					
Keel	VE Keel II	bow	no match	-					
Keel	AE Keel	stern	1580 ±5	Westphalia/ Twente					
Sternpost	AE A4/HS	stern	after 1554	Westphalia/ Twente	→				
False stern- post	AE HS/A1	stern	after 1544	Germany	→				
Inner hull planking	VE GA1/ BB	bow	after 1569	Westphalia/ Twente		→			
Inner hull planking	VE GA1/ SB	stern	after 1540	Westphalia/ Twente	→				
Inner hull planking	VE GB1/ SB	stern	after 1571	Westphalia/ Twente		→			
Inner hull planking	BD2 G2	midships	after 1503	-	→				
Inner hull planking	BD2 G3	midships	after 1499	-	→				
Inner hull planking	116	midships	after 1540	Westphalia/ Twente	→				
Inner hull planking	117	midships	no match	-					
Inner hull planking	118	midships	after 1570	Germany, Lower Sax- ony		→			
Inner hull planking	120	midships	after 1562	Baltic	→				
Inner hull planking	122	midships	after 1568	Hamburg		→			
Outer hull planking	D1	midships	after 1523	Baltic, Lithu- ania	→				
Outer hull planking	D2	midships	after 1581	Baltic			→		
Outer hull planking	D3	midships	after 1566	Baltic, Lithu- ania	→				
Wale	BD2 B1	midships	after 1562	Westphalia/ Twente	→				
Wale	BD2 B3	midships	after 1502	-	→				
Wale	119	midships	after 1579	Westphalia/ Twente			→		
Wale	121	midships	after 1583	Westphalia/ Twente			→		
Wale	122	midships	after 1572	Westphalia/ Twente		→			
Frame timber	VE S5A/ HS	bow	no match	-					
Frame timber	VE S13A/ HS	bow	no match	-					
Frame timber	VE S18A/ HS	bow	after 1512	Southern Norway	→				
Frame timber	S13A/HS	bow	1580 ±3	Westphalia/ Twente					
Frame timber	BD2 S22	midships	1586-1597	-					

Dendrochronological data

Element	find nr.	Location	Date	Provenance	-1569	1570-1579	1580-1589	1590-1599	1600-
Frame timber	BD2 S29	midships	1589-1601	-					
Frame timber	F2	midships	1572-1588	Westphalia/ Twente					
Frame timber	F3b	midships	1588-1589 autumn/ winter	Germany, Belgium or the Nether- lands					
Frame timber	F5	midships	after 1577	Westphalia/ Twente					
Frame timber	F6	midships	1588-1589 autumn/ winter	-					
Frame timber	F7	midships	after 1485	Germany, Belgium or the Nether- lands					
Frame timber	F8	midships	1580-1595	Westphalia/ Twente					
Frame timber	F9	midships	1586-1600	Westphalia/ Twente					
Frame timber	F10	midships	1588-1589 autumn/ winter	Hamburg					
Frame timber	F11	midships	1588-1589 autumn/ winter	Hamburg					
Frame timber	126	midships	no match	-					
Ceiling	437	unknown	after 1574	Westphalia/ Twente					
Ceiling	VE WB/ SB	bow	after 1539	Westphalia/ Twente					
Ceiling	VE WF2/ BB	bow	after 1565	Westphalia/ Twente					
Ceiling	VE WH2/ BB	bow	1576 ±6	Westphalia/ Twente					
Ceiling	BD2 W2	midships	after 1542	-					
Stringer	W02	midships	after 1576	Germany, Belgium or the Nether- lands					
Stringer	W04	midships	after 1567	Hamburg					
Ceiling	W07	midships	no match	-					
Ceiling	103	midships	no match	-					
Ceiling	112	midships	no match	-					
Deck knee	K3	midships	after 1575	Southern Norway					
Deck knee	K6	midships	after 1548	Southern Norway					
Deck beam	B1	midships	1587-1599	Hamburg					
Deck beam	B2	midships	1579-1589	Germany, Belgium or the Nether- lands					
Deck beam	B3	midships	1586-1588	Hamburg					

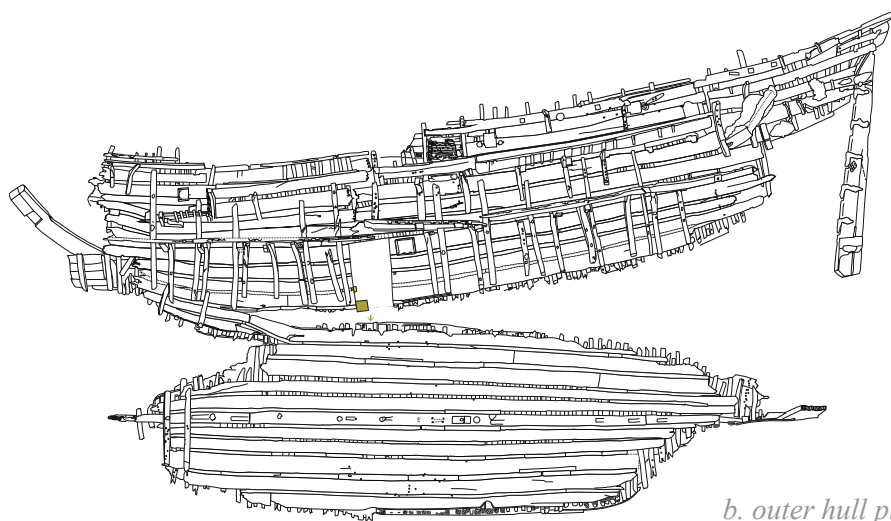
Appendix III

Element	find nr.	Location	Date	Provenance	-1569	1570-1579	1580-1589	1590-1599	1600-
Deck beam	B5	midships	1587-1603	Westphalia/ Twente					
Waterway	101	midships	after 1548	Germany, Lower Sax- ony	→				
Waterway	L1	midships	after 1571	Westphalia/ Twente		→			
Floor rider	KS2	bow	1590 ±1	Southern Norway					
Futtock rider	ST1	midships	after 1510	-	→				
Futtock rider	ST2	midships	1590 ±1	Southern Norway					
Futtock rider	S2	midships	1589-1590 autumn/ winter	Southern Norway					
Futtock rider	S3	midships	1589-1590 autumn/ winter	Southern Norway					
Futtock rider	S5	midships	1589-1590 autumn/ winter	Southern Norway					
Bulkheads/ panelling	SO1 14701, 14702, 24077, 24093	upper deck	1587-1596	Baltic, Poland					
Bulkheads/ panelling	SO1 14876, 14877, 14879.01	upper deck	1584-1596	Baltic, Poland					



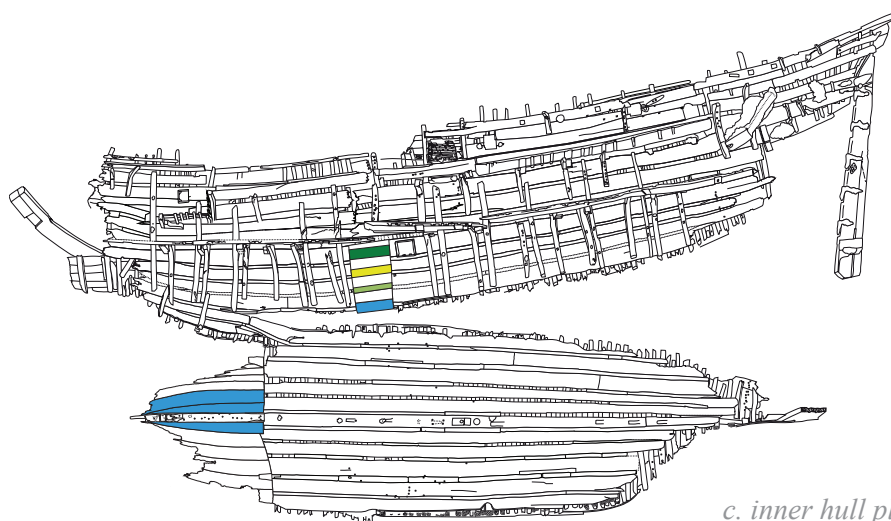
a. keel

■ Westphalia/Twente
■ Germany
■ Unidentified



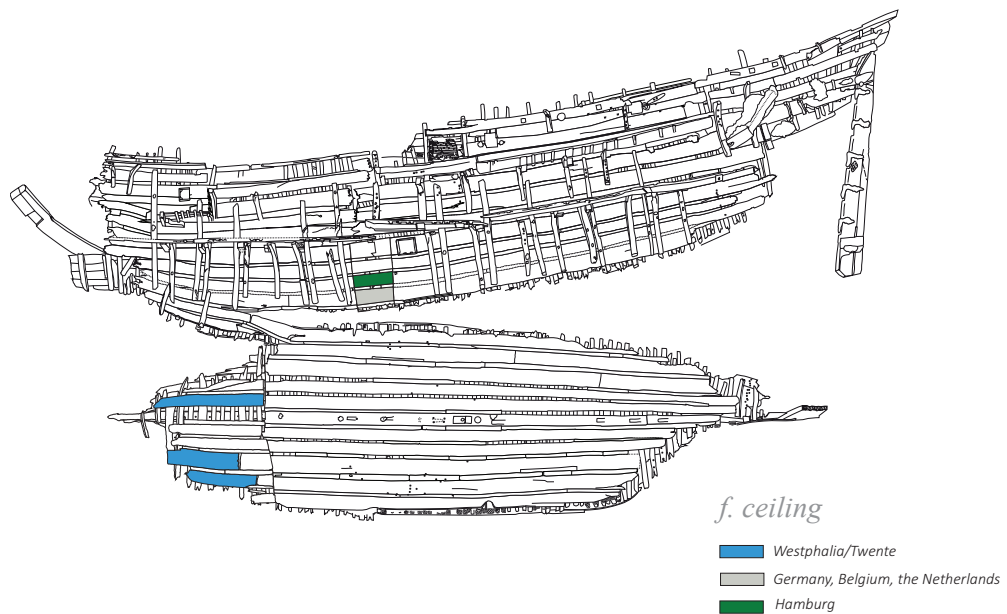
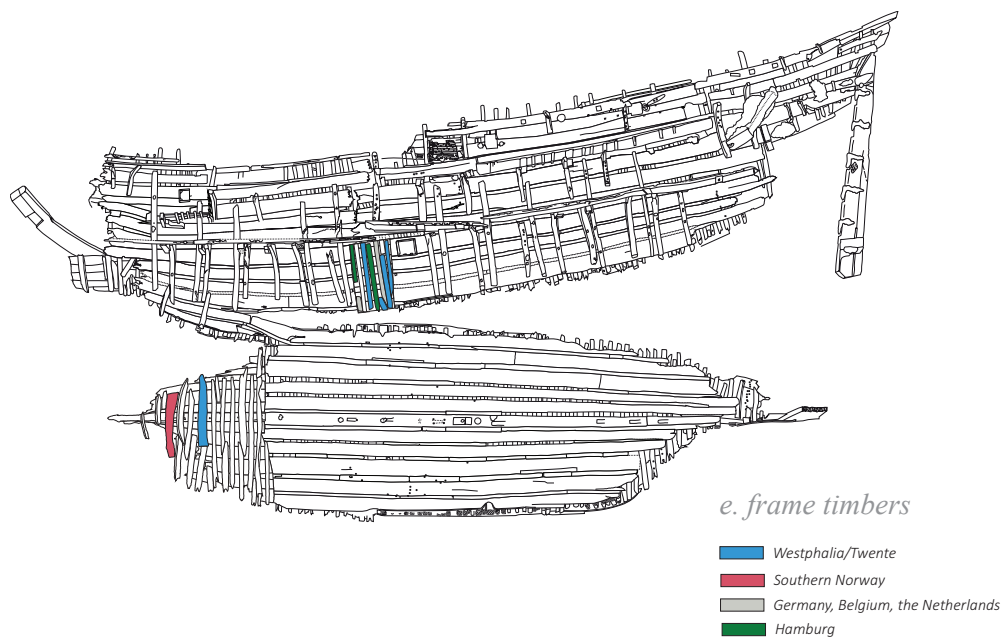
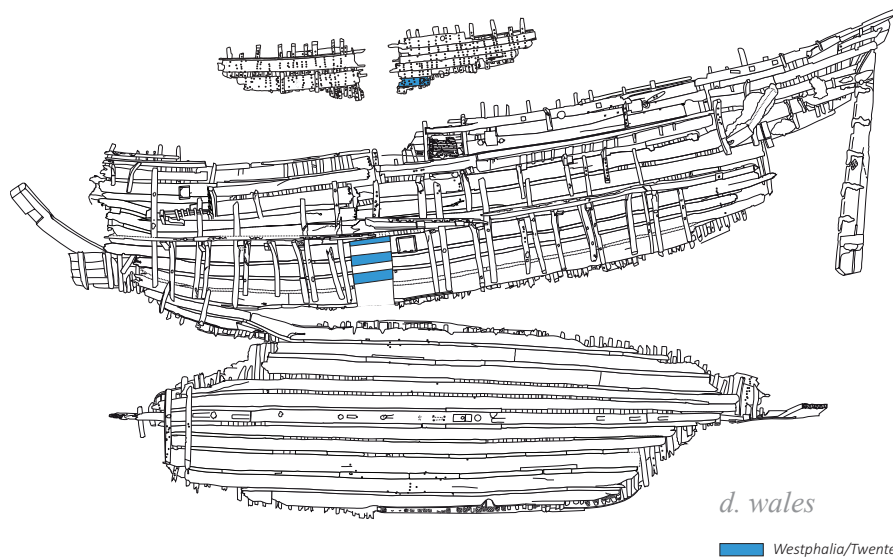
b. outer hull planking

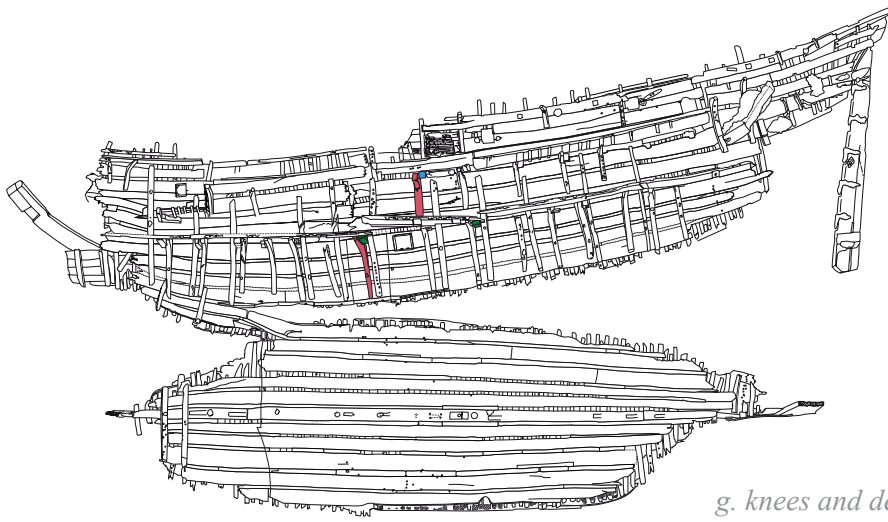
■ Baltic, Lithuania
■ Baltic



c. inner hull planking

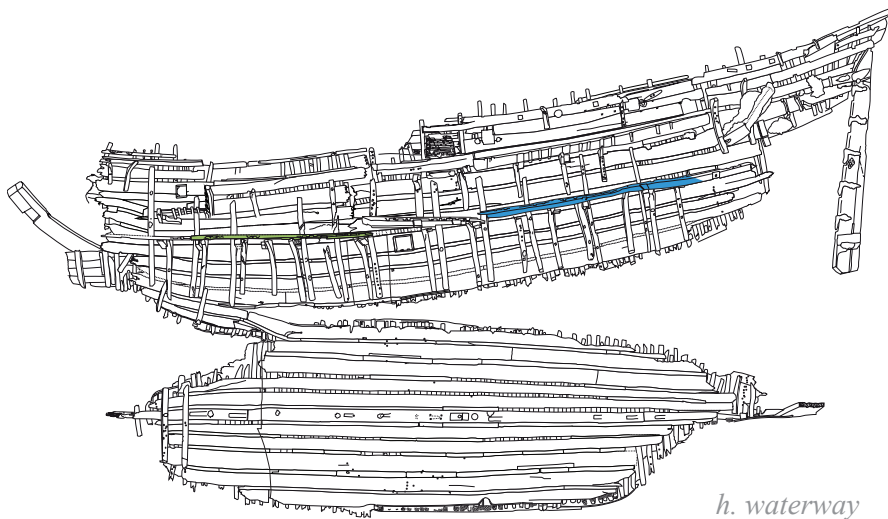
■ Westphalia/Twente
■ Lower Saxony
■ Baltic
■ Hamburg





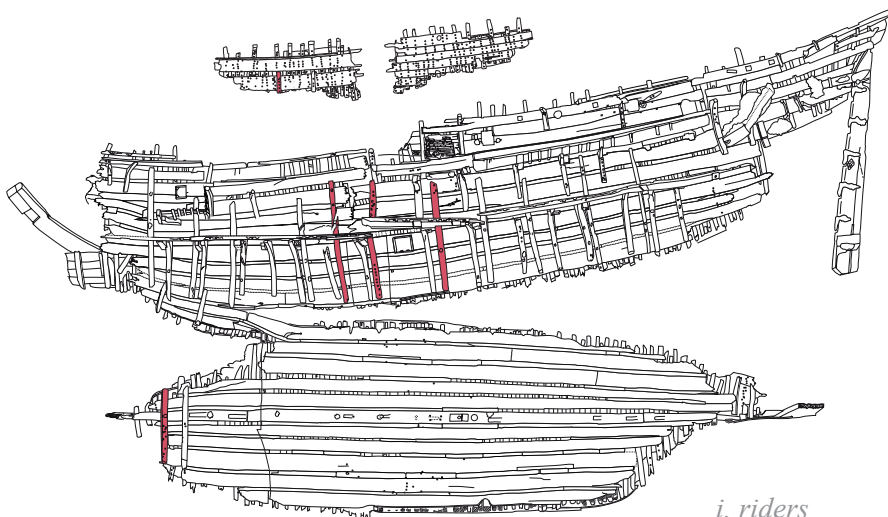
g. knees and deck beams

- Westphalia/Twente
- Southern Norway
- Hamburg
- Germany, Belgium, the Netherlands



h. waterway

- Westphalia/Twente
- Lower Saxony



i. riders

- Southern Norway



Appendix IV – Enkhuizer contracts

Appendix IV

Date	Type	Keel	Rake stem	Rake stern	Wijnkoop	total length (sum components)	total length (spec. in contract)	
1593-02-3	buis	37	13,5	9	<i>none</i>	59,5	<i>unknown</i>	
1594-02-21	buis	46	16	11,5	+0,5 (keel)	74	<i>unknown</i>	
1594-04-22	buis	<i>unknown</i>	15	11	+0,5 (<i>unclear</i>)	<i>unknown</i>	<i>unknown</i>	
1595-04-6	boeier	<i>unknown</i>	<i>unknown</i>	<i>unknown</i>	<i>none</i>	<i>unknown</i>	72	
1588-06-23	boot	54	16	12	+0,5 (keel)	82,5	<i>unknown</i>	
1589-11-6	boot	51	15	12	+0,5 (stem)	78,5	<i>unknown</i>	
1591-02-10	boot	unclear (46?)	14,5	12,5	+ <i>unclear</i> (keel)	<i>unclear</i>	<i>unknown</i>	
1591-08-31	boot	<i>unknown</i>	<i>as required</i>	<i>as required</i>	<i>none</i>	<i>unknown</i>	70	
1591-09-18	boot	50	13,5	12,5	<i>none</i>	76	76	
1591-12-14	boot	<i>unknown</i>	<i>as required</i>	<i>as required</i>	<i>none</i>	<i>unknown</i>	75	
1591-12-14	boot	49 [48, but becomes 49 in return for -0.5 depth]	<i>unknown</i>	<i>unknown</i>	+0,5 (<i>unclear</i>)	<i>unknown</i>	72,5	
1591-12-31	boot	<i>unknown</i>	<i>unknown</i>	<i>unknown</i>	<i>none</i>	<i>unknown</i>	<i>unknown</i>	
1592-01-29	boot	50,5	15	10	<i>none</i>	75,5	<i>unknown</i>	
1592-03-30	boot	<i>unknown</i>	<i>as required</i>	<i>as required</i>	<i>none</i>	<i>unknown</i>	70	
1592-05-9	boot	50,5	16,5	13	+0,5 (keel)	80,5	<i>unknown</i>	
1592-08-30	boot	<i>unknown</i>	<i>to the commissioner's preferences</i>	<i>to the commissioner's preferences</i>	+0,5 (<i>unclear</i>)	<i>unknown</i>	75,5	
1593-01-16	boot	56	14	11	+0,5 (keel)	81,5	<i>unknown</i>	
1593-03-20	boot	50	14,5	12,5	+0,25 (stem or stern)	77,25	<i>unknown</i>	
1593-04-14	boot	51	<i>unknown</i>	<i>unknown</i>	<i>none</i>	<i>unknown</i>	78	
1593-05-29	boot	50	16	12	<i>none</i>	78	<i>unknown</i>	
1593-06-1	boot	51	16	13	<i>unclear</i>	80	80	
1593-07-13	boot	53	15	12	<i>none</i>	80	<i>unknown</i>	
1593-07-20	boot	51,5	18	12,5	<i>none</i>	82	<i>unknown</i>	
1593-10-12	boot	50	15	12	+0,5 (stem or stern)	77,5	<i>unknown</i>	
1593-12-11	boot	<i>unknown</i>	<i>to the commissioner's preferences</i>	<i>to the commissioner's preferences</i>	<i>none</i>	<i>unknown</i>	71	
1594-01-19	boot	50	15	13,5	+0,5 (keel)	79	<i>unknown</i>	
1594-01-26	boot	50	16	12	+0,5 (keel)	78,5	<i>unknown</i>	
1594-11-18	boot	52	16	12	+0,5 (keel)	80,5	<i>unknown</i>	
1594-11-23	boot	<i>unknown</i>	<i>unknown</i>	<i>unknown</i>	<i>none</i>	<i>unknown</i>	75	
1595-01-11	boot	47	16	12	<i>none</i>	75	<i>unknown</i>	
1595-03-7	boot	55	17,5	11	<i>none</i>	83,5	<i>unknown</i>	

	Width	Depth	Proportions (L-W-D ratio)	Price (Car. guil.)	Time (max.)	Source (WA, 1685, Enkhuizen)	Historical identification
	19	11 (depth)	3,13 : 1 : 0,58	1360	unknown	29 inv. nr. 828, scans 39-40.	
	22,5	13,5 (depth)	3,29 : 1 : 0,6	2300	unknown	65 inv. nr. 829, scans 136-137.	
	21	12 (depth)	? : 1 : 0,57	1700	unknown	66 inv. nr. 829, scans 203-204.	
	21	unknown	3,43 : 1 : ?	1900	3 months and 3-4 weeks	72 inv. nr. 830, scans 217-218.	
	27	to the commissioner's preferences	3,06 : 1 : ?	3740	4 months and 1 week	21 inv. nr. 823, scans 187-188.	
	27	to the commissioner's preferences	2,91 : 1 : ?	2880	unknown	43 inv. nr. 824, scan 154.	
	23	unknown	3,20 : 1 : ?	2055	3 months and 3 weeks	63 inv. nr. 825, scan 247-248.	
	24,5	11 (lower deck)	2,86 : 1 : 0,45	1510	unknown	67 inv. nr. 826, scan 126.	
	25	unknown	3,04 : 1 : ?	2450	unknown	44 inv. nr. 826, scan 138.	
	"Boom van Amsterdam"	to the commissioner's preferences	Unknown	2275	unknown	22 inv. nr. 825, scans 192-193.	
	24	11 (depth)	3,02 : 1 : 0,46	1865	unknown	23 inv. nr. 826, scans 202-203.	
	-	unknown	Unknown	1760	4 months and 0-2 weeks	64 inv. nr. 826, scan 223.	
	25	12 (lower deck)	3,02 : 1 : 0,48	2380	unknown	45 inv. nr. 827, scans 26-27.	Den Bonte Craey, 80-100 last (Winkelman 1977: 157, nr. 210; Huygens Instituut s.d.)
	23 and a palm	to the commissioner's preferences	3,01 : 1 : ?	1510	unknown	68 inv. nr. 827, scans 78-79.	
	26,5	12 (lower deck)	3,04 : 1 : 0,45	2320	unknown	26, inv. nr. 827, scan 103.	
	25,5	to the commissioner's preferences	2,96 : 1 : ?	935	unknown	7 inv. nr. 827, scans 179-180.	
	23,5	10,75 (lower deck)	3,47 : 1 : 0,46	2150,3	unknown	28 inv. nr. 828, scans 24-25.	
	25	12,5 (depth)	2,83 : 1 : 0,5	2150	3 months and 1-3 weeks	47 inv. nr. 828, scans 99-100.	
	26	12,5 (depth)	3,00 : 1 : 0,48	2531	unknown	48 inv. nr. 828, scans 126-127.	
	26	11,75 (lower deck)	3,00 : 1 : 0,45	2500	unknown	49 inv. nr. 828, scans 173-174.	
	26	12,5 (lower deck)	3,08 : 1 : 0,48	2900,5	unknown	50 inv. nr. 828, scans 178-179.	
	26	12,5 (lower deck)	3,08 : 1 : 0,48	3050	unknown	51 inv. nr. 828, scan 209.	
	27	12,5 (lower deck)	3,04 : 1 : 0,46	3000	unknown	52 inv. nr. 828, scan 220.	
	26	11,25 (lower deck)	2,98 : 1 : 0,43	2480	unknown	53 inv. nr. 829, scan 22.	
	24	to the commissioner's preferences	2,96 : 1 : ?	2520	6 months and 2 weeks (but cancelled)	70 inv. nr. 829, scans 61-62.	
	26	12,5 (depth)	3,038 : 1 : 0,48	2714,1	unknown	54 inv. nr. 829, scans 103-104.	
	26	11,75 (depth)	3,02 : 1 : 0,45	2882,5	3 months and 0-2 weeks	55 inv. nr. 829, scans 109-110.	
	26	unknown	3,10 : 1 : ?	3250	unknown	56 inv. nr. 830, scans 58-59.	
	25	unknown	3,00 : 1 : ?	2360	unknown	57 inv. nr. 830, scans 62-63.	
	25,5	12,5 (depth)	2,94 : 1 : 0,49	2750	unknown	34 inv. nr. 830, scans 121-122.	
	28,5	12 (lower deck)	2,93 : 1 : 0,42	2840	4 months and 0-1 week	36 inv. nr. 830, scans 174-175.	Den Ruyter, 100 last (Winkelman 1981: 104, nr. 154)

Appendix IV

Date	Type	Keel	Rake stem	Rake stern	Wijnkoop	total length (sum components)	total length (spec. in contract)	
1595-03-21	boot	50	16,5	13,5	<i>none</i>	80	78	
1595-04-18	boot	51	16,5	12,5	<i>none</i>	80	<i>unknown</i>	
1595-06-8	boot	51	17,5	13	<i>none</i>	81,5	<i>unknown</i>	
1595-11-17	boot	<i>unknown</i>	<i>unknown</i>	<i>unknown</i>	+1 (<i>unclear</i>)	<i>unknown</i>	79	
1599-02-16	boot	<i>unknown</i>	<i>unknown</i>	<i>unknown</i>	+1,5 (keel and stem or stern)	<i>unknown</i>	85,5	
1599-08-12	boot	<i>unknown</i>	<i>unknown</i>	<i>unknown</i>	<i>none</i>	<i>unknown</i>	<i>unknown</i>	
1596-05-22	karveelschip	<i>unknown</i>	<i>unknown</i>	<i>unknown</i>	<i>none</i>	<i>unknown</i>	61	
1586-07-13	schip	50	15	13	+0,5 (keel)	78,5	<i>unknown</i>	
1590-12-13	schip	55	12	10	<i>none</i>	77	77	
1591-08-26	schip	55	14	11	<i>none</i>	80	80	
1591-11-14	schip	72	16	11	<i>none</i>	99	<i>unknown</i>	
1592-07-16	schip	72	17,5	12,5	-1 (keel +0,5, stem -1,5)	101	<i>unknown</i>	
1592-07-26	schip	51	18,5	10	<i>none</i>	79,5	<i>unknown</i>	
1593-03-19	schip	54	18	12	+0,5 (keel)	84,5	<i>unknown</i>	
1593-03-23	schip	53	17	10	<i>none</i>	80	<i>unknown</i>	
1593-04-2	schip	48	16	10	<i>none</i>	74	74	
1593-07-15	schip	<i>unknown</i>	<i>to the commissioner's preferences</i>	<i>to the commissioner's preferences</i>	+1 (stem or stern)	<i>unknown</i>	76	
1593-07-15	schip	<i>unknown</i>	5	5	<i>none</i>	<i>unknown</i>	<i>unknown</i>	
1594-12-2	schip	<i>unknown</i>	<i>unknown</i>	<i>unknown</i>	<i>unclear</i>	<i>unknown</i>	80	
1595-01-3	schip	<i>unknown</i>	<i>unknown</i>	<i>unknown</i>	+0,5 (<i>unclear</i>)	<i>unknown</i>	<i>unknown</i>	
1595-02-12	schip	70,5	7	5,5	<i>none</i>	83	<i>unknown</i>	
1596-04-2	schip	67	18	11	+0,5 (stem)	96,5	<i>unknown</i>	
1598-04-7	schip	<i>unknown</i>	<i>to the commissioner's preferences</i>	<i>to the commissioner's preferences</i>	<i>unclear</i>	<i>unknown</i>	80	
1599-05-8	schip	65,5	18	12	+0,5 (keel)	96	<i>unknown</i>	
1593-02-26	Lanck schip	<i>unknown</i>	<i>to the commissioner's preferences</i>	<i>to the commissioner's preferences</i>	<i>unclear</i> (width added)	<i>unknown</i>	80	
1593-11-13	Lanck schip	58	14	12	+0,5 (stem)	84,5	<i>unknown</i>	
1594-05-27	Lanck schip	<i>unknown</i>	<i>unknown</i>	<i>unknown</i>	+0,5 (<i>unclear</i>)	<i>unknown</i>	98	
1594-06-26	Lanck schip	<i>unknown</i>	<i>unknown</i>	<i>unknown</i>	<i>none</i>	<i>unknown</i>	97	
1594-11-10	Lanck schip	<i>unknown</i>	<i>unknown</i>	<i>unknown</i>	<i>none</i>	<i>unknown</i>	100	
1595-09-19	Lanck schip	<i>unknown</i>	<i>unknown</i>	<i>unknown</i>	+1 (stem or stern)	<i>unknown</i>	87	

	Width	Depth	Proportions (L-W-D ratio)	Price (Car. guil.)	Time (max.)	Source (WA, 1685, Enkhuizen)	Historical identification
	26	12,5 (depth)	3,00 : 1 : 0,48	3802,5	<i>unknown</i>	58 inv. nr. 830, scans 193-194.	Sint-Jan, 65-70 last (Winkelman 1977: 442, nr. 638; Huygens Instituut s.d.)
	25,5 or 26	<i>to the commissioner's preferences</i>	3,14/3,08 : 1 : ?	2900	3 months and 2-3 weeks	59 inv. nr. 830, scan 239.	
	27,5	12 (lower deck)	2,96 : 1 : 0,44	3300	<i>unknown</i>	60 inv. nr. 830, scans 281-282.	
	24,5	<i>to the commissioner's preferences</i>	3,22 : 1 : ?	2350	4 months and 2 weeks	61 inv. nr. 831, scans 71-72.	
	23,5	11,5 (lower deck)	3,64 : 1 : 0,49	2362,5	<i>unknown</i>	20 inv. nr. 833, scans 197-198.	
	24,5	11,5 (depth)	? : 1 : 0,46	1450	<i>unknown</i>	62 inv. nr. 834, scans 27-28.	
	19	7 (depth)	3,21 : 1 : 0,37	1128	4 months and 3 weeks	39 inv. nr. 831, scan 316.	
	25	17,5 (depth)	3,14 : 1 : 0,7	2000	3 months and 2-3 weeks	42 inv. nr. 822, scans 256-257.	
	20,5	10 (lower deck)	3,76 : 1 : 0,49	1865	<i>unknown</i>	1 inv. nr. 825, scan 191.	
	26	<i>to the commissioner's preferences</i>	3,08 : 1 : ?	3000	<i>unknown</i>	2 inv. nr. 826, scans 120-121.	't Fortuyn, 100 last (Winkelman 1977: 375, nr. 540)
	24	12 (lower deck)	4,13 : 1 : 0,5	2825	less than 6 months	4 inv. nr. 826, scan 177	
	30	12 (lower deck)	3,37 : 1 : 0,4	4150	<i>unknown</i>	27 inv. nr. 827, scans 147-148.	
	23	<i>unknown</i>	3,46 : 1 : ?	1150	<i>unknown</i>	46 inv. nr. 827, scan 151.	
	26	<i>unknown</i>	3,48 : 1 : ?	3280	<i>unknown</i>	31 inv. nr. 828, scan 97.	
	26	10,75 (lower deck)	3,08 : 1 : 0,4	3350	<i>unknown</i>	32 inv. nr. 828, scans 101-102.	
	24	11 (lower deck)	3,08 : 1 : 0,46	2190	3 months and 2-3 weeks	10 inv. nr. 828, scan 117-119.	
	22	<i>to the commissioner's preferences</i>	3,45 : 1 : ?	1035	<i>unknown</i>	11 inv. nr. 828, scan 212-213.	
	21	11,5 (lower deck)	? : 1 : 0,55	1945	<i>unknown</i>	69 inv. nr. 828, scan 214.	
	26	<i>unknown</i>	3,08 : 1 : ?	3365	<i>unknown</i>	15 inv. nr. 830, scan 66.	Die Leeuw, 90 last (Winkelman 1977: 186, nr. 253)
	22	10,5	? : 1 : 0,48	2250	4 months	71 inv. nr. 830, scan 107.	
	<i>unknown</i>	<i>unknown</i>	<i>unknown</i>	2887,5	4 months and 2-4 weeks	35 inv. nr. 830, scans 153-154.	
	29,5	<i>unknown</i>	3,27 : 1 : ?	4820	<i>unknown</i>	38 inv. nr. 831, scans 258-259.	
	25	<i>unknown</i>	3,20 : 1 : ?	1887,5	<i>unknown</i>	19 inv. nr. 833, scan 39.	
	30	13,25 (depth)	3,20 : 1 : 0,44	4100	<i>unknown</i>	40 inv. nr. 833, scans 242-243.	
	24	<i>unknown</i>	3,33 : 1 : ?	1815	3 months and 1 week	9 inv. nr. 828, scan 74.	
	<i>unknown</i>	16,5 (depth)	<i>unknown</i>	2815	3 months and 1 week to 4 months	33 inv. nr. 829, scans 42-43.	
	28	<i>unknown</i>	3,50 : 1 : ?	4700	<i>unknown</i>	13 inv. nr. 829, scan 266.	Die Witte Valck, 140 last (Winkelman 1977: 337, nr. 482)
	28,5	<i>to the commissioner's preferences</i>	3,40 : 1 : ?	4235	<i>unknown</i>	12 inv. nr. 829, scan 265.	
	29	<i>unknown</i>	3,45 : 1 : ?	4500	5 months and 3 weeks	14 inv. nr. 830, scans 55-56.	
	26,5	<i>to the commissioner's preferences</i>	3,28 : 1 : ?	3650	<i>unknown</i>	16 inv. nr. 831, scans 16-17.	

Appendix V – Glossary

This glossary was established by taking definitions from other glossaries, including those by Van Beylen (1985)⁽¹⁾, Steffy (1994)⁽²⁾ and Hoving (2012)⁽³⁾. If a definition was copied from one of these glossaries, the respective superscript number (1, 2 and/or 3) was added. If the definition was adjusted or created by the author⁽⁴⁾, superscript number 4 was added. When terms from the glossary are used in a definition, they are underlined to indicate that a definition is available. When applicable, the Dutch translation of the English term is included. When no appropriate English translation for a Dutch term is available, the Dutch term is included in the glossary in alphabetical order among the English terms.

Adding a buik (*een buik om scheepszijde leggen*):
see buik.

Air course board (*vullingsplank, luchtweger*)¹:
Plank which fits in the opening of the air strake and is used to cover it, for example when bulk cargo such as grain is transported.

Air strake (*luchtgang*)^{1, 4}: Open space underneath the deck clamp, allowing to vent the area behind the ceiling. The air strake can be closed off by an air course board, for example to avoid cargo (such as grain) to fall below or behind the ceiling. In the case of an open ceiling, air strakes are present in between all ceiling strakes. These can be closed off by filling strakes.

Angle of repose (*stortingshoek, rusthoek*)⁴: The angle between the surface and the top of deposited bulk goods, without the commodity sliding any further. A commodity with a low angle of repose, such as grain or salt, will result in a more flat pile when it is deposited. Commodities with a low angle of repose are more likely to move and tend to behave like a liquid. This can cause a free surface effect for which commodities with a low angle of repose can jeopardize ship stability.

Beakhead (*galjoen*)^{3, 4}: A partly ornamental, partly functional construction on the fore part of the ship. It served as a platform for working the rigging of the foresail and spritsails and as a privy for the crew. When a hull was converted, the beakhead was often adjusted as well to maintain proper balance.

Beam (-): *see width.*

Bilge (*kim*)^{1, 2}: The location where the hull's bottom transitions into the hull's sides. The bilge is what the ship would rest on when grounded, which is part of the reason it is often made of more pronounced planks. A very abrupt transition from bottom to side results in a sharp bilge and is often referred to as a chine.

Bilge ceiling (*kimweger*): *see bilge stringer.*

Bilge futtock (*zitter*)^{3, 4}: Frame timber fitted in the turn of the bilge, in between or alongside the floor timbers and futtocks. The Dutch word *zitter* is used in reference to the bilge futtock as well as the bilge rider.

Bilge rider (*zitter*)⁴: Part of the rider assembly, located on the inside of the turn of the bilge between or alongside the floor rider and futtock rider. The Dutch

word *zitter* is used in reference to the bilge rider as well as the bilge futtock.

Bilge stringer (*kimweger*)^{1, 4}: Bilge ceiling. These are two or three ceiling strakes which are located along the inside of the turn of the bilge and are generally of more pronounced dimensions than the other ceiling strakes. They contribute to the longitudinal strength of the hull as well as the strength of the bilges.

Bilge water (*ruimwater, lenswater*)¹: Water that collects in the hull due to leakage, rain, anchor drip-page or other means.

Binding strake (*schaarstok*)^{3, 4}: Thick longitudinal strake that formed part of the typical Dutch construction of the deck planking, running from bow to stern on both sides of the hatches, mast partners and bitts. They are characterized by rabbets to fit over the deck beams along the bottom side (or they could fit in rabbeted deck beams) and rabbets to house the deck planking and deck ledges along the top side.

Bitt (*beting*)³: A strong, upright frame in the fore part of the ship on which the anchor cable is belayed.

Boat (*boot*)^{1, 4}: A generic name for (smaller) watercraft that can be oared or sailed, but in the sixteenth to eighteenth centuries also the name for a specific type of seagoing vessel. Based upon late sixteenth-century shipbuilding contracts there was no clearcut division between the dimensions of a boat or a ship, although the boat was generally somewhat smaller than a ship. Its length-to-width ratio generally approaches 3:1. The specific characteristics of a boat compared to other contemporary seagoing vessels are unclear.

- (**Boevenet**)^{1, 4}: Initially a sort of netting to cover the area between forecastle and quarterdeck (the so-called waist or *kuil* of the ship), in order to protect the ship against enemies boarding when under attack. Eventually, the netting was replaced by a more permanent deck structure in the form of a wooden grid. Such (partly) open deck must have been common in the late sixteenth-century Netherlands. Often it was the quarterdeck or forecastle deck which was outfitted with an open grid structure, yet examples are known in which the entire upper deck was made of an open grid as well.

Bolt (*bout*)³: An iron rod that fastens together heavy parts of the ship.

Bottom (*vlak*)⁴: Floor. The lowest part of the hull located in between the turn of the bilges and which, for merchantmen, is the area on top of which the cargo is stored in the hold. In late sixteenth-century shipbuilding, the shape of the bottom was defined by its width, deadrise and “lying bottom”.

Bottom-based (-)⁴: One of three main conceptual approaches of conceiving a ship, next to frame-first shipbuilding and shell-first shipbuilding. In Bottom-based shipbuilding, the ship’s bottom is first constructed as a separate unit, after which the rest of the hull is built upon this unit. The medieval cog is an example of bottom-based shipbuilding, and also the Dutch flush tradition can be considered a manifestation of bottom-based shipbuilding.

Bow (*boeg*)³: The entire front part of the ship, including the planking on both sides of the stem.

Boyer (*boeier*)^{1, 4}: the boyer was a coastal trader which first appeared in the Netherlands around the mid-fifteenth century. Its introduction has been associated with the introduction of carvel shipbuilding in the Netherlands, and the Dutch name *boeier* presumably derived from the term *boeien*, which referred to adding flush hull planking. In the sixteenth and seventeenth century, Dutch boyers sailed all over western and northern Europe. Boyers were often outfitted with a spritsail, yet they could also be square rigged. Such square-rigged boyers were referred to in Dutch as *raboeiers*.

Breasthook (*band*)^{3, 4}: A piece of compass wood placed in the forward and/or afterword section of the ship to strengthen the construction.

- (**Buik**)⁴: The term *buik* appears in early modern Dutch sources in reference to both the hull of the ship in general, as well as to the ship’s sides specifically. When a *buik* was added to an existing ship, this meant that the ship’s beam was increased by adding additional timber or hull planking to the ship’s sides. This was done to improve the ship’s stability. Adding a *buik* is an expression which mainly occurred in the south of Holland, especially in relation to improve the stability of naval vessels when line-of-battle tactics were first introduced. The practice of adding a *buik* reminds of the English practice of girdling, and also is associated with the Dutch practice of *verdubbelen* or doubling. In the past, *buik* has been translated to English as “bulge” in reference to the present-day practice of bulging.

Bulging (-)⁴: The present-day practice of expanding the beam of a vessel. This is done in both commercial and naval contexts. Reasons can be protection of the hull, improving stability or increasing carrying capacity. It can be considered the equivalent of former practices of furring, doubling, girdling or adding a buik.

Bulkhead (*schot, beschot*)^{1, 2, 4}: A vertical partition which is applied to divide the hold or decks in separate spaces. Bulkheads were often lapstrake constructions made of thin, wainscot planks. (Part of) the bulkheads could be torn down and reorganized in between voyages, to alter the spaces aboard.

Bulwark (*verschansing*)²: The side of a vessel above its upper deck.

Bulwark fairlead (*Visser, halsgat*)^{1, 4}: A round hole in the bulwark to pass the sheets, which are the ropes which allow to control the lower corners of the sail.

Buss (*buis*)^{1, 4}: The buss was a vessel used for hering fishing, but was also employed as merchant vessel. It finds its origin in the twelfth century *buza* from Flanders. The actual buss appears in the fifteenth century and was heavy built. Some busses were outfitted with a *bun* or “fish box”. This waterproof box was built-in into the hull and was punctured so that water could enter the box. The herring was stored in this box to keep it alive while at sea.

Camber (*bocht*)^{1, 3}: A measurement indicating the curvature of the top side of a beam, especially a deck beam. Camber added strength to the deck and improved drainage.

Caravel (*karveel, karveelschip*)¹: The name for large, flush-planked seagoing vessels in the Netherlands in the late fifteenth century. The earliest reference to a caravel built in the Netherlands is in 1439 in Brussels. Caravels were characterized by a rounded stern, relatively high upper works and a protruding forecastle. In the sixteenth century, caravels were also built with a transom. They generally had three masts. While the caravel can be seen as a type of ship, the term was sometimes used more generally to refer to carvel-built vessels too.

Carrack (*kraak*)¹: Nao. A relatively large, heavy-built merchant ship with multiple wales and a relatively round hull. It featured a protruding forecastle and high rising upper works.

Carling (*karvielhout, klamaai*)^{3, 4}: Part of the deck construction. A timber which was placed in longitudinal direction between two deck beams to support the ledges.

Carvel (*karveel, karveelbouw*)^{1, 4}: Shipbuilding method in which the hull planks are laid flush to one another, as opposed to lapstrake shipbuilding where the hull planks overlap one another. Carvel-built vessels have often been associated with frame-first shipbuilding, yet it can also occur in bottom-based or shell-first shipbuilding. The flush-planked hulls of vessels built in the Dutch flush tradition can be considered carvel.

Caulking material (*breeuwsel*)^{2, 4}: substance such as moss, oakum or animal hair which was driven in the seams of the hull and in between different structural elements, in order to waterproof the hull. The type of caulking material can change per shipbuilding region.

Ceiling (*wegering*)^{2, 4}: Internal planking of a vessel, fitted against the inboard face of the framing system.

Centre of buoyancy (*drukkingspunt*)⁴: The point through which the upward buoyant force works. It is the geometric centre of the volume of fluid displaced by the hull. The relation of the centre of buoyancy to the centre of gravity determines a vessel's stability.

Centre of gravity (*massamiddelpunt, zwaartepunt*)⁴: The point through which the weight of the vessel and all of its contents act as a downward force. It can be seen as the balance point of a vessel. Adding, removing or displacing content, will therefore affect the centre of gravity. The relation of the centre of gravity to the centre of buoyancy determines a vessel's stability. Generally, a lower centre of gravity will result in better ship stability.

Chine (*scherpe kim*): *see bilge*.

- (**Clampreet**)⁴: An expression which occurs in late sixteenth-century shipbuilding contracts in relation to properly finishing the construction of a hull. Presumably, it refers to the removal of the temporary cleats in Dutch flush shipbuilding. As such, *clampreet* could be translated as “cleat ready” or “free of cleats”.

Clinker (*overnaads werk*)^{1, 2, 4}: A vessel of which the hull planking overlaps. From the keel upwards, each next strake is generally fastened against the outboard face of the previous strake. When the next strake is fastened to the inboard face of the previous strake,

this is referred to as “reverse clinker”. The overlapping part between both strakes is referred to as “land”. Some scholars use the term clinker explicitly for overlapping strakes which are fastened together by means of rivets. Overlapping hull planking which is not rivetted together, is in that case referred to as lapstrake.

Cog (*kogge*)^{1, 4}: A medieval merchant vessel, also used for naval warfare. The cog was used in western-Europe in the period 1150–1500 and was the dominant cargo carrier of the Hanseatic league. It was a bottom-based vessel, with a flush-planked bottom and lapstrake sides. Cogs were single masted and square-rigged.

Converted-clinker (-)⁴: a clinker-built vessel which is (partly) outfitted with a second, carvel layer of hull planking. Thus, a double-planked hull of which the first layer is clinker-built and the second layer is carvel-built.

Covering board (*potdeksel, potdek, schandek*)⁴: A narrow plank placed on top of the top timbers in order to close off the ship’s sides.

Crank (*rank, nauw*)⁴: crank-sided. A vessel which has difficulties maintaining its upright position and rolls too much. The stability of a crank vessel can be improved, among others, by lowering the centre of gravity, for example by adding ballast, or by widening its beam, for example by furring. The term crank is often used interchangeably with the term tender or tender-sided.

Crutch (*zogstuk*)³: A Y-shaped piece of wood forming the floors of the aft frames.

Cutwater (*snijwater*): *see gripe*.

Dale (*daal*)³: A sluice or channel that conveyed water from a pump and discharged it through the side of the ship.

Deadrise (*vlaktilling*)⁴: Rising of the floor. The height difference between the keel rabbet and the beginning of the turn of the bilge, which determines how flat or sharp the ship’s bottom is.

Deck beam (*dekbalk*)⁴: Transverse beam supporting the deck structure, including the waterway, ledges, carlings and deck planking. The deck beam itself was supported by deck knees along the sides and a

stanchion in the centre. Deck beams also add lateral strength to the hull.

Deck clamp (*balkweger*)⁴: a more pronounced ceiling strake located along the vessel’s sides just underneath the deck beams. The deck clamp supports the deck beams and adds to the hull’s longitudinal strength. The top side of the deck clamp can be notched to house the deck beams

Deck knee (*dekknie*): *see knee*.

Deck planking (*dekplanken*)⁴: The planking which forms the walkable area of the deck. In the late sixteenth-century Netherlands, the deck planking was often made of coniferous wood. The deck planking was supported by deck beams, ledges and carlings.

- (*Deel*)⁴: In the late sixteenth-century Netherlands, a *deel* referred to a sawn, coniferous plank. The actual word “plank” was used in reference to a sawn, oak plank.

Depth (*holte*)³: The distance between the top of the keel and the height of the lower deck, measured at the sides and thus without the camber of the deck beam. Also the height of the scupper or watershed.

Dottle (*deutel*)^{1, 4}: a small, pyramid-shaped peg which was driven in the outboard face of a treenail to expand it and tighten the fastening. On the inboard face of the treenail, the same was done with a small wedge. Sometimes, after a construction was completed, or when repair work had been executed, treenails were redotted (*herdeuteld*) a second time.

Double Dutch (-)⁴: former term referring to the use of double hull planking in early modern Dutch shipbuilding, in which both layers were flush-planked and made of oak. The term implied that the use of double hull planking was a typical Dutch feature and reflected a transitional phase in Dutch flush shipbuilding, during which larger seagoing vessels were initially built with two layers of flush hull planking. In fact, double hull planking should be associated with the conversion of a vessel after its initial construction. It is a practice which was not limited in time, nor was it limited to the Netherlands. Therefore, the term double Dutch is no longer tenable. See also lengthening and doubling.

Doubling (I) (*dubbeling, verdubbelen*)⁴: Adding a second layer of oak hull planking to part of the hull or the complete hull, in order to improve the vessel’s

stability. A practice related to furring, girdling and adding a buik. In the case of doubling, though, the second layer of hull planking could start from the keel upwards and cover the vessel's bottom.

Doubling (II) (*dubbeling, verdubbelen*)⁴: The addition of a thin layer of coniferous planking against the underwater part of the hull, to protect it against shipworm.

Drop strake (*verloren gang*)^{2, 4}: A strake of hull planking that is discontinued near the bow or stern because of decreasing hull surface area. It is similar to a stealer, yet placed central in the hull.

Dutch flush (*karveelbouw op z'n Hollands*)⁴: bottom-based approach for creating a carvel vessel, typical for shipyards in northern Holland and the *Noorderkwartier* in the early modern Netherlands. The term Dutch flush was introduced in reference to a series of diagnostic features to identify this shipbuilding method in the archaeological record. In some cases, especially for smaller watercraft, Dutch flush can also refer to a shell-first approach for creating a carvel vessel.

False keel (*loze kiel*)^{1, 2}: A separate plank, timber or timbers, applied to the bottom face of the keel over its entire length in order to protect it from damage, *e.g.* when grounding. On large ships, false keels were sometimes made quite thick in order to increase the size and strength of the keel.

False stem (*loze voorstevan*)^{1, 2, 4}: An outer timber fixed to the forward face of the stem and which is not an active part of the actual hull structure. A false stem can protect the actual stem, but also can act as a gripe. Based upon late sixteenth-century shipbuilding contracts, the term could also be used in reference to the apron or inner stempost, applied to the aft face of the stem.

False sternpost (*loze achterstevan*)^{1, 2, 4}: An outer timber fixed to the aft face of the stern and which is not an active part of the actual hull construction. A false sternpost can protect and reinforce the actual sternpost and skeg, it can improve navigability, and can be notched to apply gudgeons.

Filling piece (*vulstuk*)^{2, 4}: A single timber, or multiple smaller pieces of timber, used to fill out an area, such as the spaces in between frames to maintain

rigidity, or the space between hull planking and frames or first and second layer of hull planking.

Filling strake (I) (*vulling*)¹: strake of hull planking located in between two wales.

Filling strake (II) (*vullingsgang, luchtweger, zweetweger*)⁴: the narrow strakes which are fitted in between the strakes of an open ceiling to close it off.

Floor rider (*kattespoor*)⁴: a heavy, transverse timber, applied to the inboard face of the ceiling to strengthen a hull. The floor rider serves the same role in the rider assembly as the floor timber does in the framing system. Sometimes, the floor rider is referred to as rider.

Floor timber (*buikstuk, legger*)^{3, 4}: Floor. The lowest part of the framing system, lying transverse over the ship's bottom on top of the hull planking, perpendicular to the keel.

Fluyt (*fluit, fluitschip*)^{1, 4}: A merchant ship which first appeared in the late sixteenth-century Netherlands and was the main freighter throughout the seventeenth and eighteenth centuries. The fluyt was characterized by its length-to-width ratio of 4:1, which at the time of its development was innovative. It also was characterized by a strong tumblehome, narrow upper deck and rounded stern, giving it a pear-shaped appearance. Fluyts had three masts. The main mast and fore mast were square rigged, while the mizzen mast was rigged with a lateen sail. Due to its shape, the fluyt was a stable merchant ship with a high capacity, which could be sailed by a small crew. Due to its efficiency, it was soon copied by foreign shipbuilders.

Flyboat (*vlieboot*)^{1, 4}: A merchant ship from the sixteenth and seventeenth centuries which developed from the *dogboot* and was initially employed in the seaway Vlie, between the islands of Terschelling and Vlieland. They were built with a transom and rigged with a spritsail. Flyboats had a capacity of 30 to 70 last.

Foot (*voet*)⁴: length unit which was common in early modern shipbuilding, and which was subdivided in a certain number of inches (*duim*) The length of one foot varied per city, as did the number of inches it represented. Even within the same city, different sorts of foot could be employed. Within shipbuilding and timber trade, the so-called *houtvoet* was often used, which was generally smaller than the foot used for

other applications in the same city. The Amsterdam foot was 28.31 cm and was subdivided in 11 inches of 2,57 cm. The Amsterdam foot was commonly used in shipbuilding.

Forecastle (*bak*)^{1, 3}: Upper works in the forward part of the upper deck, covered by the forecastle deck. Here, the crew performed some of their daily duties.

Forecastle deck (*bakdek*)¹: Deck covering the fore-castle. Part of the rigging could be handled from this deck.

Frame-first (*spant-eerst, skelet-eerst*): Skeleton-first, skeleton construction, frame-based. One of three main conceptual approaches of conceiving a ship, next to shell-first shipbuilding and bottom-based shipbuilding. In frame-first shipbuilding, the internal framing system is first erected and as a consequence the frames will define the shape of the hull. The hull planking is afterwards fastened to the pre-erected frames.

Frame timber (*spant*)⁴: Timber. The timbers constitute the frame as a whole. They are named after their location within the frame, including floor timber, bilge futtock, futtock and top timber. In frame-first shipbuilding, where the framing system is pre-erected, the timbers are timbers can be interconnected. When timbers are fastened after the hull planking is applied, as is the case in Dutch flush shipbuilding, the timbers are none-interconnected.

Free surface effect (*vrij vloeistofoppervlak*)⁴: Free surface effect occurs when a commodity aboard a vessel displaces when the vessel heels. The weight of the displaced object will alter the centre of gravity towards the heeling side of the vessel, and jeopardize the vessel's stability. It could lead to capsizing of the vessel. Especially liquids, or commodities with a low angle of repose, when able to move in the hold (because it is not completely filled or shifting boards were not used) can lead to a free surface effect.

Furring (-)⁴: A repair method in Early modern England in which the hull was converted to expand its beam, in order to improve ship stability. The main furring method was to remove the hull planking along the vessel's sides and to add additional timbers to the frames. These furring timbers would increase the vessel's beam, after which hull planking was applied again. Another method was referred to as plank-up-on-plank furring, which presumably was similar to the practice of doubling in the Netherlands. Although

furring was often required after a new hull had been built, the common need for furring was frowned upon by contemporaries. See also buik and girdling.

Futtock (*oplang*)^{3, 4}: The lower vertical part of the frame, located between the bilge futtock and top timber. If more than one futtock was needed to construct the vessel's sides, the lower futtock was referred to as the first futtock, the next one as the second futtock, and so on.

Futtock rider (*steunder*)^{3, 4}: A heavy vertical timber, running from bilge to upper deck on top of the ceiling. It could be part of the rider assembly, yet it could also be applied without the other parts of the rider assembly. Futtock riders were often applied to naval vessels, to reinforce the hull between gunports. They were also applied to vessel's which were considered to be old or weak. They also may have been added to mitigate torsion of the hull, and they could be added to lengthened vessels. Futtock riders were often bolted to the wales, which added considerable strength to the hull.

- (*Gaïng*)⁴: A term which appears in the Netherlands in the 1580s in reference to different types of vessels which, similar to the fluyt, must have had a more slender hull shape than other contemporary vessels. References are known to "Hoornse gaings or fluyts", "yachts or gaings" and a "gaingbuss". It has been suggested that the term *gaïng* is related to the practice of lengthening, yet instead of referring to the conversion of a hull to make it longer, it may refer to a type of vessel which was built to a more slender shape. Possibly, the first fluyts were a specific type of gaïng, and in some sources the term *gaïng* is used interchangeably with the term *fluyt*.

Garboard strake (*kielgang, zandstrook*)⁴: The first strake of hull planking next to the keel, fitted in the keel rabbet. The garboard strake is part of the streek and runs to the aft of the sternpost.

Girdling (-)⁴: A repair method in Early modern England in which additional timber was fastened to the widest part of the hull, in order to increase its beam and improve ship stability. The name derives of the resulting girdle around the vessel's beam. The practice relates to furring, yet it must have been cheaper and faster to realize.

Graving piece (*halfhout, spont*)²: A wooden patch, or insert, let into a damaged or rotted plank.

Green wood (*groenhout*)⁴: Timber which was not seasoned or dried after the tree was felled, and therefore contains a higher percentage of moisture compared to seasoned timber. Green wood may be easier to process as it is softer and more bendy, yet when used in a construction it may tear, shrink, move and change weight once it starts drying.

Gripe (*loefbijter, snijwater, bitstuk*)⁴: Cutwater. A forward protrusion of the stem below the waterline, in order to decrease the leeward tendency of a vessel. See also lee helm and weather helm.

Gudgeon (*vingerling*)²: A metal bracket attached to the sternpost into which the rudder pintle was hung.

Hanging knee (*hangende knie, hangknie, balk-knie*): see *knee*.

Hatch (*luik*)³: an opening in the deck.

Heel (*hiel, hak*)¹: The aft part of the keel, on top of which the sternpost rests. The heel often protrudes oblique to the aft, where the rudder is missing a part in a corresponding shape. This is done to avoid ropes or weeds to get stuck between sternpost and rudder.

Heeling (*hellen, overhellen*)^{1, 4}: When a ship is pushed sideways through the forces of wind or waves, and temporarily is not positioned in an upright position. When a ship remains in this position, due to an asymmetric hull or movement of cargo, the heeling is referred to as list, which affects the vessel's stability.

Hold (*ruim*)^{1, 4}: The space underneath the decks where cargo and/or ballast is stored.

- (*Houtvoet*): see *foot*.

Hull planking (*huid, scheepshuid*)⁴: The planks that constitute the shell of the hull, against which the frames rest on the inside. The hull planking can be flush (carvel) or lapstrake (clinker).

Inch (*duim*)⁴: Subdivision of one foot, a length unit which was common in early modern shipbuilding. Both the length of one foot and the number of inches representing one foot varied per city. One foot could be either 10, 11 or 12 inches. The Amsterdam inch was 2.57 cm, and 11 Amsterdam inches made one foot of 28.31 cm. The Amsterdam foot was commonly used in shipbuilding.

Initial stability (*aanvangsstabiliteit*)^{1, 4}: Primary stability. The stability of a vessel in relatively neutral conditions, and its resistance to small movements in the centre of buoyancy and centre of gravity. A vessel with low initial stability is considered crank or tender-sided.

Keel (*kiel*)^{2, 3}: The main longitudinal timber of most hulls. It is the backbone of the ship, carrying the stem, stern and frames.

Keel rabbet (*kiel sponning*): see *rabbet*.

Keelson (*kolsem, zaathout*)^{2, 4}: An internal longitudinal timber or line of timbers, mounted atop the frames along the centerline of the keel, that provided additional longitudinal strength to the bottom of the hull. An internal keel. At the level of the mast step, side keelsons can be added.

Knee (*knie*)^{2, 4}: An angular piece of timber used to reinforce the junction of two surfaces of different planes, usually made from the crotch of a tree where two large branches intersected, or where a branch or root joined the trunk. Deck knees reinforced the junction between the vessel's sides and the deck structure. They also supported the deck beams. The orientation of a knee can vary. A hanging knee is vertically oriented and supports a deck from underneath. A lodging knee is horizontally oriented.

- (*Koebrug*)^{1, 4}: An additional deck which ran over the entire length of the hull, or over part of it. For (late) sixteenth- and seventeenth-century merchantmen, the *koebrug* deck ran in between part of the lower and upper deck. In seventeenth-century naval vessels, the *koebrug* deck referred to an additional deck in the hold, below the lower deck, also known as the orlop deck. The *koebrug* deck was generally positioned 5 feet above or below the lower deck.

Lapstrake (*overnaads*)⁴: hull planking in which the strakes overlap one another, as opposed to carvel building where the hull planking lies flush. See also clinker.

Last (*last*)^{1, 4}: A common term in the early modern Netherlands which could refer to both a unit of weight or volume. The weight or volume of one last varied per city or region, but also per commodity. The capacity of a vessel was often expressed in last, yet due to the ambiguous nature of the term it is difficult to determine the present-day equivalent of such capacity.

In Amsterdam, one last of grain was defined to have a volume of 3010 litres and a weight of 2000 kg. Yet, depending on the type of grain, the actual weight of one last could vary significantly.

Ledge (*rib, griet*)^{3, 4}: Support for the deck planks between the waterway and the binding strakes, laid parallel to the deck beams. In late sixteenth-century shipbuilding contracts, the term *ribben* is generally used in reference to the ledges. When referred to the ledges of the boevenet, the term *griet* is used, which may suggest a nuance between the terms *rib* and *griet*.

Lee helm (*lijgierig*)^{1, 4}: The tendency of a vessel to turn its bow away from the wind, to leeward. Causes of lee helm can include a vessel which has too much weight in the aft and is down by the stern, the positioning of the mast too much to the front, or heeling of the hull. It is the opposite of weather helm.

Lengthening (*verlengen*)⁴: The conversion of a vessel in order to increase its initial length. In order to lengthen a vessel, the hull was generally sawn in half and a new section of hull was added in between both halves. The lengthened section was often worked into the original hull with shifting butts, after which a second layer of hull planking was applied over the entire hull, resulting in a double planked vessel. In other instances, no hull planking was added in the lengthened section, but only a second layer of hull planking was applied, together with certain elements which added longitudinal strength (e.g. a new and longer keelson, additional bilge stringers and/or wales). The latter would result in a hull which is double planked in the fore and aft sections, yet single planked in the middle. The main purpose of lengthening a hull was to increase the vessel's capacity. Often, when a vessel was lengthened, the beam was also increased. The first reference to lengthening in the Netherlands dates to 1512. From at least the late 1580s onwards, lengthened vessels were referred to with the term *verlanger* or *verlenger*.

Line-of-battle (*slaglinie, slagorde*)⁴: Battle line. A tactic in naval warfare in which a fleet of vessels forms a line, allowing them to all fire in the same direction. The line-of-battle became a common tactic by the mid-seventeenth century. It required vessels to have a stable hull, which would allow to use cannon on multiple decks without water entering the gunports.

Limber (*vulling*)²: watercourse or channel alongside the keel or keelson, through which bilge water could drain into the pump well.

Limber board (*vullingsplank*)^{1, 2}: A short, loose ceiling plank, of which a certain number forms the first narrow strake on either side of the keelson. They limber board can be removed to clean the limbers and limber holes.

Limber hole (*loggat*)²: Apertures cut in the bottom surfaces of frames over, or on either side of, the keel to allow bilge water to drain into the pump well.

List (*slagzij*): *see heeling*.

Lodging knee (*liggende knie, slapende knie*): *see knee*.

Long ship (*lang schip*)⁴: In late sixteenth-century shipbuilding contracts, a long ship referred to a ship of more pronounced dimensions. There was, however, no clearcut difference between the dimensions of a ship and long ship.

Longitudinal (*langsscheeps*)^{1, 4}: The lengthwise direction of the ship, from bow to stern. Structural elements of the hull which run in longitudinal direction include keel, keelson, binding strakes and waterways. See also transverse.

Lower deck (*overloop*)³: The first deck running from bow to stern. The Dutch term is related to the English term "orlop deck" (see also koebrug), but different in meaning.

Lying bottom (*liggend vlak*)⁴: A term which occurs in late sixteenth-century shipbuilding contracts and which presumably refers to the longitudinal extent over which the bottom's maximum width and minimum deadrise is maintained.

Main frame (*hoofdspant, grootspant, hals*)^{1, 3, 4}: Master frame, midship frame. One or two frames which are positioned at the location where the hull's beam is at its widest, often at one third of the vessel's length as measured from the outside of the stem. The main frame contributed to determining the shape of the hull. In Dutch flush shipbuilding, the timbers of the main frame were the only ones which occasionally were interconnected.

Mast partner (*vissing, visser*)^{1, 3, 4}: partner. A reinforced opening in the deck through which the mast fitted. Placing the partner forward or aft determined the rake of the mast.

Mast step (*mastspoor, spoor*)²: A mortise cut into the top of a keelson or large floor timber, or a mortised wooden block or assembly on the floor timbers or keelson, into which the tenoned heel of a mast was seated.

Master frame (*hoofdspant, grootspant, hals*): see *main frame*.

Metacentre (*metacentrum*)⁴: The metacentre is the crossing point where the vertical line through the centre of buoyancy of a heeled vessel, would meet the vertical line through the centre of buoyancy of the same vessel when it is positioned upright. It is called metacentre as it is an abstract reference point. The metacentre is an important aspect of determining and calculating ship stability. The metacentre was first defined by French mathematician Pierre Bouguer in 1746. See also metacentric height.

Metacentric height (*metacentrische hoogte*)⁴: The distance between the metacentre and the centre of gravity. It is an important aspect of determining ship stability. The higher the metacentric height is, the more stable a vessel will be.

Moulded (-)²: The various dimensions of timbers as seen from the sheer and body views of construction plans; the dimensions determined by the moulds. Thus, the vertical surfaces (the sides) of the keel or the aft or forward faces of the frames. Normally, timbers are expressed in sided and moulded dimensions, while planks and wales are listed in thickness and widths. Moulded and sided dimensions are used because of the changing orientation of timbers, such as frames, where “thick” and “wide” or “height” and “depth” become confusing.

Nail (*spijker*)⁴: a relatively small, square-shaped, cast iron fastener. The use of nails was limited in Dutch flush shipbuilding. They occur to a limited extent in the garboards strake hull planking, and were also used as fasteners for the temporary cleats or to hold a structural element in place before it was properly fastened by means of treenails or bolts. Different types of nails were used for different purposes. The temporary clears, for example, were fastened with so-called *klampspijkers* (i.e. cleat nails). When temporary

nails were removed, the nail holes could be filled with small wooden plugs, which were called *spijkerpennen*.

Oakum (*werk*)^{1, 2}: Caulking material made of old, unravelled rope, or of the inferior fibres of hemp which could not be used for making rope. The fibres were rolled and soaked in pitch before being driven into the planking seams.

Open ceiling (*open wegering*)⁴: Ceiling of which the individual strakes are placed at a small distance from one another. See also air strake.

Palm (*palm, handbreedte*): length unit which was common in early modern shipbuilding and which was based upon the width of the hand. One palm equalled ca. 9.5 cm.

Pinnace (*Pinas*)^{1, 4}: A medium-sized seagoing vessel with transom, from the late sixteenth and seventeenth centuries, used for both naval warfare and trade. It was a relatively fast vessel. It presumably was similar to the yacht, yet with a larger length-to-width ratio. It had two continuous decks, a quarterdeck and a forecastle.

Pitching (*stampen*)^{1, 4}: The up- and downward movement of the bow and stern of a ship around a transverse axis. See also rolling.

Planking tong (*boeitang*)⁴: a large plier, used to hold planking strakes together before they were fastened. Planking tongs were used in shell-first ship construction, such a clinker built hulls, or in Dutch flush shipbuilding, to assemble the bottom strakes.

Port (bakboord)³: the left side of a vessel when facing forward.

Quarterdeck (*halfdek*)³: a deck abaft the main mast. See also upper deck.

Rabbet (*sponning*)²: A groove or cut made in a piece of timber in such a way that the edges of another piece could be fit into it to make a tight joint. Generally, the term refers to the grooves cut into the sides of the keel, stem, and sternpost, into which the garboards and hooding ends of the outer planking were seated.

Rake (*valling, vallen*)²: The inclination of the stem and sternpost beyond the ends of the keel, also the inclination of the masts from the perpendicular.

Rider (*kattespoor*)^{3, 4}: An assembly of several timbers, constructed like a frame but fitted inside the ceiling, which reinforced the hull. Parts of a rider assembly could include the floor rider, bilge rider and futtock rider. Sometimes the term rider is used in reference to the floor rider specifically.

Righting arm (*richtende arm*)⁴: In ship stability, the righting arm is the distance between the centre of gravity and the vertical direction line of the centre of buoyancy. The distance between these two forces will create a lever which pushes the ship in its upright position again, a force known as the righting moment. A longer righting arm will create a larger righting moment, and a larger righting moment will result in better ship stability. When the righting arm exceeds its maximum distance, the righting moment will turn negative and the vessel will capsize.

Righting moment (*richtend koppel*): see righting arm.

Rolling (*rollen*)^{1, 4}: the circular movement of a hull to port and starboard around its longitudinal axis. Rolling can be caused by wind and waves, and can be increased by a high centre of gravity. Rolling can occur together with pitching.

Sapwood (*spint, spinthout*)^{1, 4}: The softer and lighter coloured part of a tree trunk towards the outer edges, located between the bark and the harder centre of the trunk. It is more easily subject to decay and therefore is often removed before the timber is used in ship construction. As the number of sapwood tree rings is limited, dendrochronologists can estimate a felling date of the tree when part of the sapwood is preserved. See also waney edge.

Scantlings (*maten*)^{1, 4}: the dimensions of a structural element of a hull, including moulded and sided dimensions.

Scarf (*las*)²: An overlapping joint used to connect two timbers or planks without increasing their dimensions.

Sheer rail (*rahout*)³: The uppermost wale, planed with a moulding.

Shell-first (*huid-eerst*)^{2, 4}: Shell construction, shell-based. One of three main conceptual approaches of conceiving a ship, next to frame-first shipbuilding and bottom-based shipbuilding. In shell-first shipbuilding,

all or part of the hull planking is erected before frames are attached to it. In pure shell-built hulls, the hull planking is self-supporting and forms the primary structure. The framework fastened to it forms the secondary, or stiffening, structure.

Ship (*schip*)^{1, 4}: generic term for a relatively large vessel. In the early modern Netherlands, a ship was also used in reference to a type of large, seagoing vessel with three masts. Late sixteenth-century shipbuilding contracts demonstrate that there was no clearcut division between the size of a boat, ship and long ship. Yet, a ship generally had a longer length-to-width ratio than a boat, for which it had a more slender hull shape.

Side keelson (*bijzaathout, zijzaathout*)^{1, 4}: Sister keelson. Beams which are positioned parallel and adjacent to the keelson at the level of the mast step. The side keelsons are positioned on opposing sides of the keelson and their top face ends at the same height of the keelson. They are added to the construction to spread the weight of the mast over a wider area.

Sided (-)^{2, 4}: The dimension of an unmoulded surface, for example the frames as seen from port or starboard side, or the forward or afterward surface of a stem or sternpost. See also moulded.

Skeg (*scheg*)^{2, 3, 4}: A triangular piece, placed aft of the sternpost and on top of the end of the keel, underneath the sternpost's rake, which straightened the aft side. The skeg could be composed of multiple timbers. Also, protruding part of the stem to act as a gripe.

Skeleton-first (*skelet-eerst*): see *frame-first*.

Smack ship (*smak, smakschip*)¹: Smack. A carvel built, coastal trader in the early modern Netherlands, used for the trade to Portugal, Spain, France and the Baltic.

- (*Spijkerpennen*): see *nail*.

Spirketting (*zetweger*)¹: heavy strake on top of the waterway which keeps the deck beams in place and adds longitudinal strength to the hull.

Square-rigged boyer (*raboeier*): see *boyer*.

Stanchion (*dekstut*)⁴: An upright post which supported the deck beam centrally. The stanchions supporting the lower deck beams were positioned on top of the keelson.

Starboard (*stuurboord*)²: the right side of a vessel when facing forward.

Stealer (*insteker*)^{1,4}: A shorter plank which was part of the hull planking near stem or stern, used to fill the open spaces which could not be filled by same amount of planks amidships without widening the planks. See also drop strake.

Stem (*voorsteven*)²: A vertical of upward curving timber or assembly of timbers, scarfed to the keel at its lower end, into which the two sides of the bow were joined.

Stern (*kont*)²: the after end of a vessel. In this dissertation, the term “stern assembly” is used in reference to the assembly of sternpost, skeg and false sternpost.

Stern pointer (*steker, steeker, verkeerde zitter*)³: Snake piece. A frame timber aft, specifically a futtock with an S-shaped curve.

Sternpost (*achtersteven*)²: A vertical or upward curving timber or assembly of timbers, stepped into, or scarfed into, the after end of the keel or heel.

Strake (*gang*)²: A continuous line of planks, running from bow to stern.

- (*Streek*)⁴: The extent over which the garboard strake and next one or two strakes of hull planking run along the sides of the sternpost and skeg, as far as the skeg's aft face. Based upon late sixteenth-century shipbuilding contracts, the term *streek* can refer both to the specific feature of these planks continuing to the aft, as well as to the length over which the planks run. As such, the *streek* is a quantifiable dimension specified in shipbuilding contracts, corresponding to the combined length of the bottom faces of sternpost and skeg. The lower part of sternpost and skeg were rabbeted to fit the *streek*. The *streek* is considered a feature typical for shipbuilding in the early modern Netherlands. When a second layer of hull planking was applied, this second layer too could feature a *streek*.

Tender (*rank, nauw*)⁴: Tender-sided. A ship which is slow in restoring its upright position and stays heeled over for long periods. The stability of a tender-sided vessel can be improved, among others, by lowering the centre of gravity, for example by adding ballast, or by widening its beam, for example by furring. The term tender-sided is often used interchangeably with the term crank or crank-sided.

Timber (*spant*): see *frame timber*.

Top timber (*stut*)^{2, 3, 4}: The uppermost member of the frame, the frame timber which follows above the futtocks and shapes the upper part of the hull and the bulwark.

Transom (*Spiegel*)^{1, 2, 3, 4}: Tuck, square tuck. The flat aft side of a hull, below the wing transom, in which the planks of the stern are positioned perpendicular to the sternpost. Types of vessels with a transom or square tuck include the pinnacle and yacht. The fluyt, on the other hand, did not have a transom but had a rounded stern.

Transverse (*dwarsscheeps*)^{1, 4}: width-wise direction of a hull, perpendicular to the longitudinal direction. Structural elements which are oriented in transverse direction include floor timbers and deck beams.

Treenail (*nagel, houten nagel*)⁴: Trunnel. Round and slightly tapering wooden fastener used to fasten different structural elements of the hull to one another, including hull planking, frames, ceiling and knees. In Dutch flush shipbuilding, treenails were the most common fasteners, while iron fasteners such as nails and bolts were used to a much lesser extent. To fixate a treenail and make it watertight, a dottle was often driven in the treenail from the outboard face, while its inboard face was wedged.

Tumblehome (-)²: The inward curvature of a vessel's upper sides as they rose from the point of maximum width to the bulwarks. Tumblehome reduced topside weight and improved stability.

Turn of the bilge (*kim*)⁴: The rounded transition from the hull's bottom to the hull's side. In late sixteenth-century shipbuilding, the turn of the bilge generally consisted of three planking strakes which were more pronounced than the rest of the hull planking. The inside of the turn of the bilge generally consisted of three bilge stringers, which were more pronounced than the rest of the ceiling strakes.

Upper deck (*verdek*): The second deck of a vessel, generally considered to run from bow to stern. Based upon late sixteenth-century shipbuilding contracts, the term *verdek* was also used when the second deck did not continue over the entire length of the hull, for example when it only ran to just fore or aft of the main mast similar to a quarterdeck.

Upper works (*vertuining*)³: The uppermost, clinker-planned part of the hull above the sheer rail.

- (*Verlanger, verlenger*): term which appears in the late 1580s in reference to lengthened vessels. A *verlanger* should not be considered a type of vessel, instead it is a term which refers to a specific conversion of different types of vessels.

Wainscot (*wagenschot*)^{1, 4}: relatively narrow, straight-grained, oak planks, which were radially sawn or cleft from a tree and therefore only featured waney edge and sapwood along one edge. Wainscot was often used to create bulkhead, for the ship's upper works, or for panelling cabins or other spaces aboard the vessel. Panelling is occasionally also referred to as wainscotting.

Wale (*berghout*)^{1, 4}: heavy and more pronounced strake of hull planking along the sides of the hull, which contributes strongly to the hull's longitudinal strength. Often, three or more wales were part of the hull construction. Deck knees and futtock riders could be bolted to the wales, through the frame timbers and ceiling strakes.

Waney edge (*wankant*)⁴: the natural, unprocessed outer edge of the tree, just underneath the bark. It is the outer tree ring of the sapwood part of the tree. When waney edge is preserved, it allows dendrochronologists to determine an exact felling date for the tree.

- (*waterloopsklos*)⁴: A stringer or plank along the sides of a deck which is slightly chamfered in order to drain bilge water away from the edges. It can be built into the deck, applied on top of the deck, or be an intrinsic part of the waterway. Often, the term *waterloopsklos* is also referred to as waterway in English.

Waterway (*lijfhout, waterboord, watergang, gangboord*)^{1, 4}: A heavy and more pronounced strake of the deck, fitted along the inboard face of the ship's sides against the frames. The waterway fastened to the ship's sides as well as to the deck beams. Its top face could be rabbeted to fit the deck ledges and deck planks, and its bottom face could be rabbeted to fit over the deck beams. The waterway contributed to the longitudinal strength of the hull. The term waterway can also be used in reference to the waterloopsklos.

Weather helm (*loefgierig*)^{1, 4}: The tendency of a vessel to easily turn its bow towards the wind. Causes of weather helm can include a vessel of which the mast

has too much rake to the aft, or of which the mast is positioned too much to the aft. Also poor ballasting can cause weather helm. It is the opposite of lee helm.

Width (*wijde, breedte*)⁴: beam, breadth. The maximum width of the hull, generally measured at its widest point inside the hull planking. It is one of the main dimensions of a hull, together with length and depth.

- (*Wijnkoop*)⁴: While a shipbuilding contract was composed and signed, both parties often had a meal together. Often, the meal was paid for by the commissioning party, in return for which the contracted shipbuilder added a small portion of length or width to the hull free of charge. This agreement is known as the wijnkoop.

Yacht (*jacht*)^{1, 4}: In the late sixteenth-century Netherlands, a yacht was a relatively small merchant vessel with a transom, three masts and light armament. It was similar to the pinnace, yet somewhat smaller. The term also refers to a small and fast sixteenth-century naval vessel which could be both sailed and oared.

Yawl (*jol, Staverse jol*)¹: A Frisian fishing vessel, mainly used in the eastern part of the Zuiderzee between ca. 1870 and 1950.



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