

A N A T O M Y O F T H E S H I P



BATTLESHIPS *YAMATO* AND *MUSASHI*

Complete with more than **1020 scale drawings**
and **350 colour 3D views**

Janusz Skulski and
Stefan Draminski

B L O O M S B U R Y

ANATOMY OF THE SHIP

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Janusz Skulski,
Krakow, May 2016

Port-side view of the Yamato during trials in October 1941. This photo was found by chance three years after the end of the war and was the first portrait of the battleship published – up until then the only known photographs were US aerial pictures taken during the attack on the ship.



INTRODUCTION

In 1988 Conway Maritime Press issued my first book on the Imperial Japanese Navy battleship, *Yamato*, the most powerful and most mysterious warship of the Second World War.

This new book is a significant update, based partly on drawings and partly on my own reconstructions from newly available sources – archival photographs and documentary drawings, all accessed with the invaluable help of my Japanese friends.

In researching the original edition I discovered many details about the ship that it was not possible to reconstruct at the time. But that book led me to new contacts in Japan, including an expert on the ships of the Imperial Japanese Navy. Thanks to him, I gained access to much new material that formed part of the navy yard documentation, including photographs and other documents.

Three expeditions were crucial in finding out more about the ships: the second expedition to the sunken *Yamato* made by the Japanese TV company, Asahi (the first, in 1985, was not fully successful), the expedition by the French ship *Ocean Voyager* in December 1999, and the sensational discovery of the remains of the *Musashi* by the Paul G. Allen expedition in March 2015 after eight years of research.

Since finishing the first book, I have continued my research and study of the *Yamato*, collecting much new material, making new drawings and building study models of the battleship fragments. After this, all done

in consultation with Japanese experts, I started to make completely new views of these magnificent ships. It is now possible for the first time to show the beauty and terrible force of these strategic battleships of the Second World War and, as was the case the first time, to make real, not approximate, working plans.

Thanks to my friend Mr Stefan Damiński, creator of the splendid 3D pictures that accompany the plan drawings, it is now possible to show more clearly the architecture of the ship and equipment.

Of course these splendid battleships will never be able to reveal all their secrets, mainly because a large part of the inner construction and technical achievements will be never be known. Staff of the Imperial Japanese Navy were ordered to destroy all drawings and photographs before the surrender, while the condition of both battleships at the bottom of the sea, as a result of huge explosions at the time of their sinking, is tragic.

And finally, some more interesting, though not official, information. In the years after I finished the first edition I was in contact with still-living members of the *Yamato* crew, from whom I remember two facts. First, during the *Yamato* full-power trials in October 1941 it was announced in an official statement to the crew that the ship had increased its speed to 30 knots. Second, in the middle of her last battle on 7 April 1945, it was announced that the ship had been hit by 16 torpedoes. Please look at the hit scheme on page 43.

YAMATO AND MUSASHI – SUPERBATTLESHIPS

Post-war Allied censorship probably diminished the achievements of the Japanese in the construction of their battleships. The ships, often named superbattleships or strategic battleships, were built mainly to oppose US battleships – with the capability to annihilate them in battle – but the US never in fact fought against them. *Yamato* and her sister ship *Musashi* were sunk by the planes of the US carrier forces. As a result of revolutionary changes in sea warfare tactics, these carrier planes had become the fleet's main force of attack, giving battleships in some measure an auxiliary function. When the Japanese Bureau of Naval Construction began to make plans for the new battleship in 1934, there was no forewarning of the near supremacy of naval air forces and so she more strongly reflected the Tsushima tradition and the sea battles of First World War.

These superbattleships, built by the supreme efforts of their constructors and the naval architects of the Imperial Japanese Navy, were extremely costly and, due to developments in research and new technology, were obsolete almost from the time they were accepted into service – seven years after the first design emerged.

On 16 December 1941, when *Yamato*, the first of four projected ships, entered service, the world's most powerful battleships were:

UK	<i>King George V</i> class	227.1 m long 38,000–44,460 tons displacement
USA	<i>North Carolina</i> class	222.1 m long 38,000–46,770 tons displacement
France	<i>Jean Bart</i>	247.8 m long 42,806–49,850 tons displacement
Italy	<i>Littorio</i> class	237.8 m long 41,377–45,963 tons displacement
Germany	<i>Bismarck</i> class	(252.0 m long 42,900–52,600 tons displacement).

(*Musashi* was completed on 5 August 1942; *Shinano* was converted into an aircraft carrier and completed on 19 November 1944; the fourth ship, No 111, was cancelled about a third of the way through its construction.)

Yamato exceeded those listed above not only by her 69,100–72,809 tons displacement and the calibre of her guns, but also by the shape and construction of her hull, her armour protection, her gunnery and her optics. By any standards she was a tremendous achievement for the Japanese naval engineers and architects.

Yamato's 46cm (18in) guns, with 42–44km range and superior optical equipment, were the largest and most modern naval guns ever mounted and far exceeded the quality and construction of those of other nations. Her 15.5m rangefinders gave tremendous precision to the main gunfire; her armour protection was a maximum 650mm thick and the side armour plate 410mm thick; and the shape of her hull reduced water resistance to a minimum. All in all, her construction was an extremely difficult and expensive enterprise, significantly outstripping the difficulties encountered building the typical dreadnought.

Yamato and her sister ships *Musashi* and *Shinano* were considered the strategic weapons of the Imperial Japanese Navy; their design and construction were top secret and carefully guarded against recognition.

Unfortunately, just before the Japanese surrender, when the three ships lay on the seabed, orders were given to destroy any documentation about them – including all the drawings and even photographs of the *Yamatos* – which had been deposited in the Japanese Naval Archives.

The special services carried out this task to the letter, so that for many years after the war, the only surviving records of the ships were the aerial photographs taken by US Navy aircraft during their attacks on the giant ships. It was not until 1948 that the first photograph of *Yamato*'s portside, discovered by chance, was published; the most recent was published in 1981. Only fragments of the original documentation have survived, and, became partly available to the public between 1995 and 2015.

It is likely that the explosions on both battleships were ignited partly by 15.5cm, 12.7cm and 25mm rounds, causing the explosion of the powder magazine, and partly by the shells of the 46cm guns when the ships rolled over. With the explosion of *Yamato*'s aft magazines it is possible that the fire that arose after the bomb struck the rear turret of the 15.5cm gun was not extinguished.

DESIGN

The 1922 Washington Treaty, with its prohibitions on the building of new battleships, brought a halt to the 8–8 Project for the development of the Japanese fleet, which comprised the building of eight modern battle cruisers and eight large modern battleships. This was quite a blow for the Japanese, particularly for their designers. Then came a change in the concept of



Starboard view of Yamato from trials in October 1941

warship construction. The designers and engineers wanted to increase the quality of the new units. They already considered the US Navy a potential opponent and wanted to ensure that their ships would be stronger and better armed than their US counterparts.

Despite treaty prohibitions, the Bureau of Naval Construction carried on with their studies and research and preparations for building the battleships reached a new phase of development at the beginning of 1930, although work was limited to preliminary studies until 1934. It was in October 1934 that the Bureau of Naval Construction received from the Naval General Staff the order to produce a design study of a new battleship with 46cm guns and a speed of 30 knots (US battleships then had a speed of 24–25 knots and maximum 40.6cm guns).

The first finalised design was completed on 19 March 1935 under the designation A-140. The planned ship was to be bigger than the actual *Yamato*: length 294m, beam 41m, 69,500 tons displacement, 200,000hp turbine engines, speed 31 knots. But this was too large for the Japanese strategists, who reduced the speed requirement to 27 knots.

It was a difficult decision because, until then, they had attached great importance to high speed. The Bureau of Naval Construction's three groups of outstanding naval designers – Fujimoto, Hiraga and Fukada – had drawn

up as many as 23 preliminary designs up to March 1937. After 1 April 1935, when the penultimate design stage had been completed, the naval designers suggested a mixed propulsion system of diesel and turbine engines.

The turbines, with a total of 75,000hp, would drive two propellers; the diesel engines, with a total of 60,000hp, would drive two other propellers. After the second design stage it became the norm in all other versions to install diesel engines as the main machinery.

But, at that time the Japanese Navy had a powerful two-cycle, double-acting diesel engine providing more than 10,000hp. These engines had been used successfully as the main propulsion for the submarine tenders *Taigei*, *Takasaki* and *Tsurugizaki* (all these three were converted into aircraft carriers) but at the time the Japanese did not possess any of the 30,000hp diesel engines that were to be used in *Yamato*.

For machinery of the same propulsive power, the diesel had the advantage of appreciably lower fuel consumption than the turbine by about 68 per cent, although the diesel was slightly heavier – about 1.07 per cent.

About two months after the provisional plans had been completed, in July 1936, the designers came across an unexpected difficulty, which caused drastic changes to be made.

Yamato's engine rooms were to be covered with 200mm thick armour-



Quarter view of *Yamato* running builder's trials on 30 October 1941. The boat stowage hangar, catapult and lattice antenna mast on the crane platform are clearly visible.

plating which was an integral element of the hull's armoured box. The plating was not only protective, but an integral part of the ship's structure, so after the diesel engines were installed it would have been impossible to replace them if they happened to cause problems. The designers had to return to their original plan and use 150,000shp turbine engines as the propulsion plant. In March 1937, the final design was drawn up by Dr Hiraga, the leading naval architect of the Imperial Japanese Navy.

On 4 November 1937, the first battleship's construction began and the keel was laid down in the dry dock of the Kure Kaigun Kōshō shipyard. 'Warship No.1' was later given the name *Yamato* – a mystic and especially potent name for the largest and most powerful battleship ever built.

Yamato is Japan's oldest poetic name, the name of the territory on which the first seed of the Japanese state was sown, and it later became the name of the province on the Kii peninsula, in south-western Honshu, whose capital is Nara.

Throughout the Second World War, *Yamato* was not only Japan's most modern new-generation battleship, it was also the pride and symbol of its Imperial Navy. Her loss in the operation 'Ten ichi go', in April 1945, became a symbol of the downfall of the Japanese Empire and was a final confirmation of the eclipse of the world's floating fortresses. Originally built to oppose US battleships – with the capability to annihilate

them in battle – *Yamato* and her sister ship *Musashi* never in fact fought against them.

Both these giant battleships were sunk by the planes of the US carrier forces – as revolutionary changes in sea warfare tactics, these carrier planes became the fleet's main force of attack, giving battleships in some measure an auxiliary function.

When the Bureau of Naval Construction began to make plans for a new battleship in 1934, there was no forewarning of the near supremacy of naval air forces and so she was designed to more strongly reflect the Tsushima tradition and the sea battles of the First World War.

In the Fifth Replenishment Program of 1942 two new warships No.798 and No.799 were projected. They were to have been battleships of a new design, armed with 50.8cm (20 inch)/45cal guns. The last version (Design A-150) featured 50.8cm guns in three twin turrets and many 10.0cm/65 cal HA guns as a secondary battery. The giant gun was constructed in early in 1941 in Kure Navy Yard and tests were made in the same year. The AP shell would have weighed about 2000kg. Battleship No.798 was to have been built at Yokosuka and No. 799 at Kure and laid down in late 1941 or early in 1942, with a total building period of some five years. They were in some ways similar to the *Yamato* class, but the design drawings were destroyed after surrender.

BUILDING HISTORY

Work on the *Yamato* project began with the development and modernisation of four selected shipyards – Kure, Nagasaki, Yokosuka and Sasebo – in which the future ships were to be built, because at that time none of the Japanese

shipyards could undertake the building of such gigantic hulls.

Yamato was built in Kure Kaigun Kōshō in Kure naval yard’s drydock which was extended by a metre and protected by a special roof on one side to screen her from view from the nearby hill. A gantry crane straddling the dock was used to lift parts weighing more than 100 tons.

A new dock in Yokosuka was built for *Shinano*.

Musashi was built in the Nagasaki naval yard. A sisal rope curtain hid the slipway on which the hull was built from view; the rope was 2710 km long and weighed 408 tons.

Musashi’s launch – her hull weight on the slipway was 35,737 tons – was second only to the 37,287 tons of the British passenger liner *Queen Mary*.

The fourth battleship, No.111, which was never completed, was laid down in a new dry dock at Sasebo naval base.

The gigantic 46cm guns and their turrets, manufactured at Kure, were transported by the *Kashino*, a ship built specially for the purpose (displacement 11,000 tons, dimensions 135.0m x 18.8m x 6.7m).

The design works began in October 1934, and in March 1937 the design was finalised.

HULL STRUCTURE

The research and design work was carried out simultaneously with the hull model tests, the main aim of which was to reduce hull resistance and increase propulsive efficiency.

As many as 50 experimental hull models were built and tested in the experimental model basin of the Naval Technical Research Centre in Tokyo. This was then the largest basin of its type in Japan with a length of 245.5m, a width of 12.5m and a depth of 6.5m.

The results of these experiments led to the adoption of a gigantic bulbous bow of such a size and shape that it was unique in the contemporary world. The stern part of the hull was based on the sharp geometric form of the oldest Japanese battleships.

I discovered this sharp form from photographs analysed in about 1995, and the expedition in 1999 confirmed this shape, as did Paul G. Allen’s last examination of the *Musashi*.

Principal dimensions of <i>Yamato</i> in 1941	
Length overall	263.0m
Length waterline	256.0m
Length between perpendiculars	244.0m
Beam	38.9m max
Beam waterline	36.9m
Draught (trial)	10.4m
Draught (full load)	10.86m
Displacement:	65,000 tons standard
	69,100 tons trial
	72,809 tons full load
Shaft horsepower	153,553 (astern 45,000)
Speed	27.46 kts
Oil fuel capacity	6300 tons
Range in action	7200 nm at 16 knots
Propulsion plant	4 steam turbines
Steam pressure	25kg/cm²
Temperature	325°C
Armour	75–410mm side belt
	200–230 deck
	190–650 main turrets
	380–560 barbettes
	50mm secondary turrets
Armament	9 x 46cm (18.1in) triple turrets
	12 x 15.5cm (6.1in) triple turrets
	12 x 12.7cm (5in) twin mountings
	24 x 25mm MG triple mounting
	4 x 13mm MG twin mountings
Aircraft	6 (max7) floatplanes
Crew	2500

Thanks to a unique solution, the hull resistance was reduced to 8.2 per cent at a speed of 27 knots, and by improving the fitting of the shaft bracket and the bilge keel, a further reduction was achieved. In terms of effective horsepower, the former alteration resulted in a saving of 1900ehp and the latter in one of 475ehp. Altogether, including the reduction in hull resistance by use of the bulbous bow, sharp stern shape, the saving totalled 7910ehp, or 15,820shp.

In the full-power trial run the 69,100 ton ship, powered by 153,533shp, reached a speed of 27.46 knots (Japanese sources from the late 20th century



Yamato during her full-power trial on 20 October 1941, outside Sakumo Bay. According to information from crewmen, several years after the war, perhaps at that moment the battleship had reached a speed of more than 30 knots.

increased the power of the *Musashi* to 166,520shp and her speed to 28,50 knots).

Yamato's hull was broad and had a relatively shallow draught for a ship with such large displacement (10.86m fully loaded). It meant that the *Yamato* class ships could use the naval bases and dry docks of the Imperial Japanese Navy without extra money being spent dredging or rebuilding.

Another very important feature of *Yamato's* hull was the method by which the shell plating was joined – namely, the extensive use of lap joints amidships. The butt joint had long been used in shell plating to make the shell surface smooth, reducing its frictional resistance. However, a serious defect had been found in the outer bottom plates of the *Isuzu* class light cruiser and *Fubuki* class destroyers which gave cause for concern over the use of butt-jointed plates in *Yamato*. It was discovered that frictional resistance was greatly affected by the surface of the fore and after parts of a ship where the water pressure was greater than at amidships.

Based on this finding, butt-joint plating was used only in the fore and after parts of *Yamato*, the remaining sections being covered by lap-joint plating. The method proved very effective when the ship was completed.

In the course of constructing *Yamato's* huge hull, two factors – apparently contradictory – played an important part. The designers wanted to increase

its strength and at the same time reduce the hull weight, for which the introduction of new methods was required. Dr. Hiraga applied the method that had earlier been used for the heavy cruiser *Furutaka*, whereby the armour-plating not only served as protection against hits, but was also an integral part of the hull construction. The thickness and rigidity of the armour-plating reinforced the hull strength considerably compared with traditional methods in which the armour merely was added on. This unique method was quite an innovation in international warship-building circles at the time.

Another considerable saving in hull weight was achieved by using electric welding extensively and on a large scale except in such important features as longitudinal members. The technique had not been fully adopted because welded joints on smaller warships built earlier had been found to be weak in comparison with the traditional riveted joints. The Japanese Navy was relatively early in its adoption of electric welding. It was used more widely in the construction of *Yamato's* upper structure and superstructure than in the hull.

- The largest welded block was 11m high and weighed 80 tons.
- On the hull, the length of the welded joints was 343,422m – and the number of electrodes 5,995,611.
- On fitting and equipment – 120,347m / 1,511,298 electrodes.
- Protection – 15m / 636 electrodes.
- Total length of welded joints was 463,784m / 7,507,536 electrodes.
- Number of rivets used was 6,153,030. For example in building the battleship *Mutsu*, 3,733,753 rivets, were used and in battleship *Hiei* 2,874,622.

Another feature was that the main portion of the longitudinal structure was made with Ducol steel (DS) – the central longitudinal bulkhead was constructed in duplicate – to support the heavy 200–230mm plates plus 9mm DS deck plating. The deck extended to a width of 38.9m – the maximum width of the ship. To ensure the reliability of the electric services, the central ring main electric circuit ran through the watertight compartment inside the central bulkhead.

The weather deck – flush, with an untypical bottle-shape in plan – had its own uniquely characteristic undulating profile. The extremely effective idea of using longitudinal framing – it minimised the structural weight – was another of Dr. Hiraga’s innovative methods which had been applied for the first time to the heavy cruiser *Furutaka*.

The characteristic shape of *Yamato*’s bow came from the necessity of moving the hawse pipe away from the ship’s centre line and as far forward as possible in order to protect the bulbous bow from being damaged by anchors. The lowering of the deck, starting from frame 110 towards the bow, was also connected to the reduction in weight and to the ship’s profile.

The boat hangars, which were installed on both sides of the hull aft, were equipped with a single girder crane to lower boats directly to the water and gave the hull a modern and unusual appearance for that time. The middle part of the weather deck was covered with wooden 140mm-wide planking. The planks were made from Japanese ‘hinoki’ cypress.

The aircraft deck, starting from frame 177 towards the stern, was covered by steel plate partially chequered and reinforced by concrete (under steel plates).

The metal decks – including the anchor deck, part of the superstructure decks and the stern deck were all covered with chequer plating. The chequered plates of the anchor deck were not painted but made of zinc-galvanised steel plates.

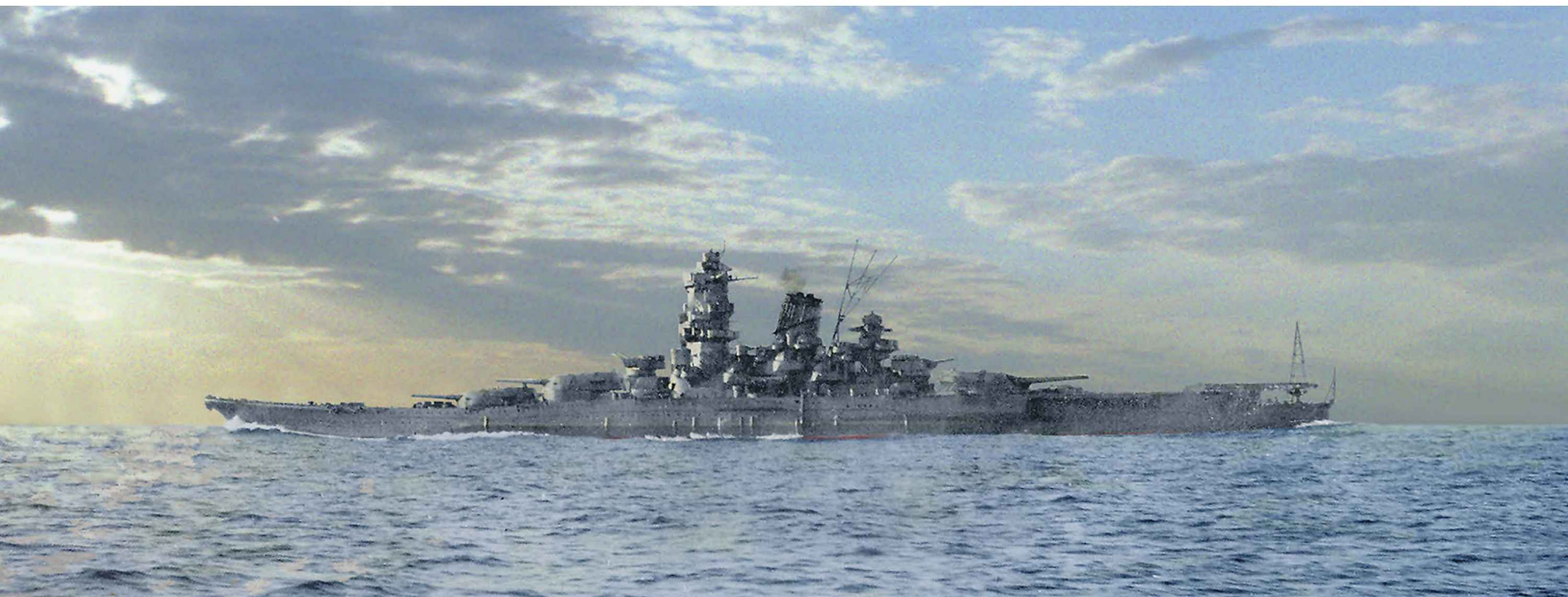
The characteristic feature of the decks compared with other battleships was that they were ‘empty’ – without equipment. This was because of the terrific blast from the 46cm guns.

Ventilators and ventilation openings were constructed and placed in such a way as to avoid or reduce the effect of the blast. The necessary equipment, such as boats, planes and paravane, was kept in completely protected magazines or hangars. The construction and shape of the superstructure sides, the lack of platforms plate supports, and the protection of anti-aircraft batteries and observation and machine-gun control positions by shields were also to reduce blast for its crew. Later on, the open HA and MG stands were manned only when the main 46cm guns were not in action.

Blast pressure (kg/cm²) relative to gun distance				
Calibre	15.5cm		46cm	
Distance	1 barrel	3 barrels	1 barrel	3 barrels
5m	2.1	2.5	10.0	20.0
10m	0.95	1.6	5.8	11.0
15m	0.5	1.15	3.1	7.0

Yamato in 1942; this photo was found about 50 years after the end of the war.





Yamato during a trial run on 26 October 1941.

A blast pressure of 0.28kg/cm² was capable of destroying the boats on board ship and a blast pressure of 1.16 kg/cm² was strong enough to tear the clothing from crew and render them temporarily unconscious. These pressures (1.16 kg/cm³) were felt 30m away from the one-barrel 46cm guns and 50m away from the three-barrel 46cm guns.

Yamato weight breakdown, trial conditions			
	Tons	Tonnes	Percentage
Hull	20,212	20,536	29.2
Armour	21,266	21,807	30.8
Protection	1,629	1,665	2.4
Gun	11,661	11,849	16.9
Machinery	5,300	5,385	7.7
Fittings	1,756	1,784	2.5
Fixed equipment	417	424	0.6
Consumable stores	641	651	0.9
Navigation and optical	95	97	0.1
Electric	1,108	1,125	1.6
Aircraft	111	113	0.2

	Tons	Tonnes	Percentage
Pressurised water in boilers	297	302	0.4
Fuel oil	4,210	4,278	8.1
Reserve feed water	212	215	0.3
Lubricating oil	61	62	0.1
Light oil	48	49	0.1
Total	69,100	70,209	100

SUPERSTRUCTURE

The superstructure was positioned like an island on the huge deck of the battleship.

Its shape differed considerably from the superstructures of the older ships of the Imperial Japanese Navy. The tower – the characteristic ‘pagoda mast’ – was built as a result of the modernisation and rebuilding of the front tripod mast, which formed the core of their construction.

On the *Yamato* three features rose from the streamlined lower part of the superstructure with sloping sides – the tower bridge under the 15.5m rangefinder, the funnel uptakes and the after tower under the 10m rangefinder. The tower bridge and after tower were constructed around concentric cylinders; the tower bridge from three and rear tower from two.

The inner 1.5m diameter cylinder of both towers was made of 20mm thick DS, inside of which ran the communication lines. On top of these cylinders were Type 98 'Hoiban' low-angle directors in non-rotatable armoured mounting with three 12cm binocular stands and a periscope tower on top. In the space between the cylinders were fitted passages, staff briefing rooms etc. *Yamato's* tower bridge area was 159m² (front) and 310m² (side) and was smaller than 'pagoda masts' on older Japanese battleships.

The tower bridge posts and rooms had been tested on the battleship *Hiei* – it was especially for that purpose that the 'pagoda mast' was rebuilt, as a prototype for the *Yamato* class. After the necessary alterations, the tower bridge for the battleship was finally designed.

The main parts of the superstructure and tower bridge were protected by

A view of Musashi from the anchor deck during trials in May–June 1942.

20mm armour-plating capable of withstanding the force of projectiles from enemy aircraft.

ARMOUR

The weight of *Yamato's* armour protection was 22,895 tons – the heaviest armoured ship ever built and a record that has not yet been broken. Her main section was protected by a sort of colossal armoured box. The box sides were protected at the top by 410mm Vickers hardened (VH) armour-plating, which was designed to withstand 46cm armour-piercing (AP) projectiles fired from distance of more than 20,000m. The front and back of the box were protected by 340–300mm VH steel armour. From above the armour deck (on the middle deck of the ship), made of MNC (New Vickers – non-cemented) steel armour-plating 200–230mm thick, formed protection against 46cm AP projectiles fired from a distance of 30,000m and could be penetrated only by a 1000kg AP bomb dropped from a height of 3400m or more.



Another feature was the 9mm DS plating that extended 700mm beneath the armour deck. Its purpose was to protect against possible splinters such as those from armour bolts and rivet heads when the armour deck was hit by a bomb or projectile.

Even part of the fore and after weather deck, in addition to the armoured main section, was protected by 35–50mm CNC (copper alloy – non cemented) steel which was sufficient to repel a 250kg bomb dropped by an enemy dive-bomber. The real achievement of *Yamato*'s design was the fact that the constructors managed to reduce the length of the main box-protected section vitals to 53.5 per cent of the total length. Despite her lower ratio, *Yamato*'s stability in damaged conditions was designed to be better than that of other Japanese capital ships. Heavy armour also protected two steering-engine rooms – for the main and auxiliary rudders – which were situated outside the main armoured section of the ship. They consisted of two armoured boxes: the sides of the main rudder room were protected by 350–360 VC armour, the top part by 200mm MNC and the auxiliary rudder by 250–300mm VC.

Another feature was the fact that the floors of the ammunition magazines were protected by 50–80mm armour-plating which extended from the bottom of the magazines across watertight compartments above the double bottom of the hull shell. The idea was to protect them from explosion from a hostile torpedo or mine beneath the ship.

A new method of armour protection was also adopted for the boiler uptakes. Funnel gases escaped through perforated plates that were adopted after careful tests proved that they reduced the weight of armour compared with conventional grating armour. The 380mm armour-plating was perforated with holes of 180mm diameter (the total area of the holes being less than 55 per cent of the whole plating area). In addition, the inclined surfaces of the funnel were protected by 50mm armour which would detonate bombs before they reached the surface of the perforated plating.

As mentioned previously, *Yamato*'s armour protection was designed to resist the terrific kinetic energy of 46cm projectiles weighing 1460kg and travelling at approximately 500m/sec.

This was the calibre of both *Yamato*'s own, and her sister *Musashi*'s, artillery that was never actually employed on other ships. Such requirements demanded the perfection of new technologies to avoid the increase in thickness of the armour-plating. The builders could not apply the type of steel that had been used before; it took as many as ten years of research and development to solve the problem. An extremely hard surface was a requisite requirement for the armour-plating, but the ordinary method of cementation was expensive and could not achieve the desired plate thickness. A special

method was adopted to harden the surface of the thick armour plates, which proved very effective: not only could it harden a portion as far as 140mm into the plate, it also greatly reduced production costs.

The next step was the adoption of armour-plating of larger dimensions, a development connected with the reduction in the number of edges and joints exposed to projectile hits.

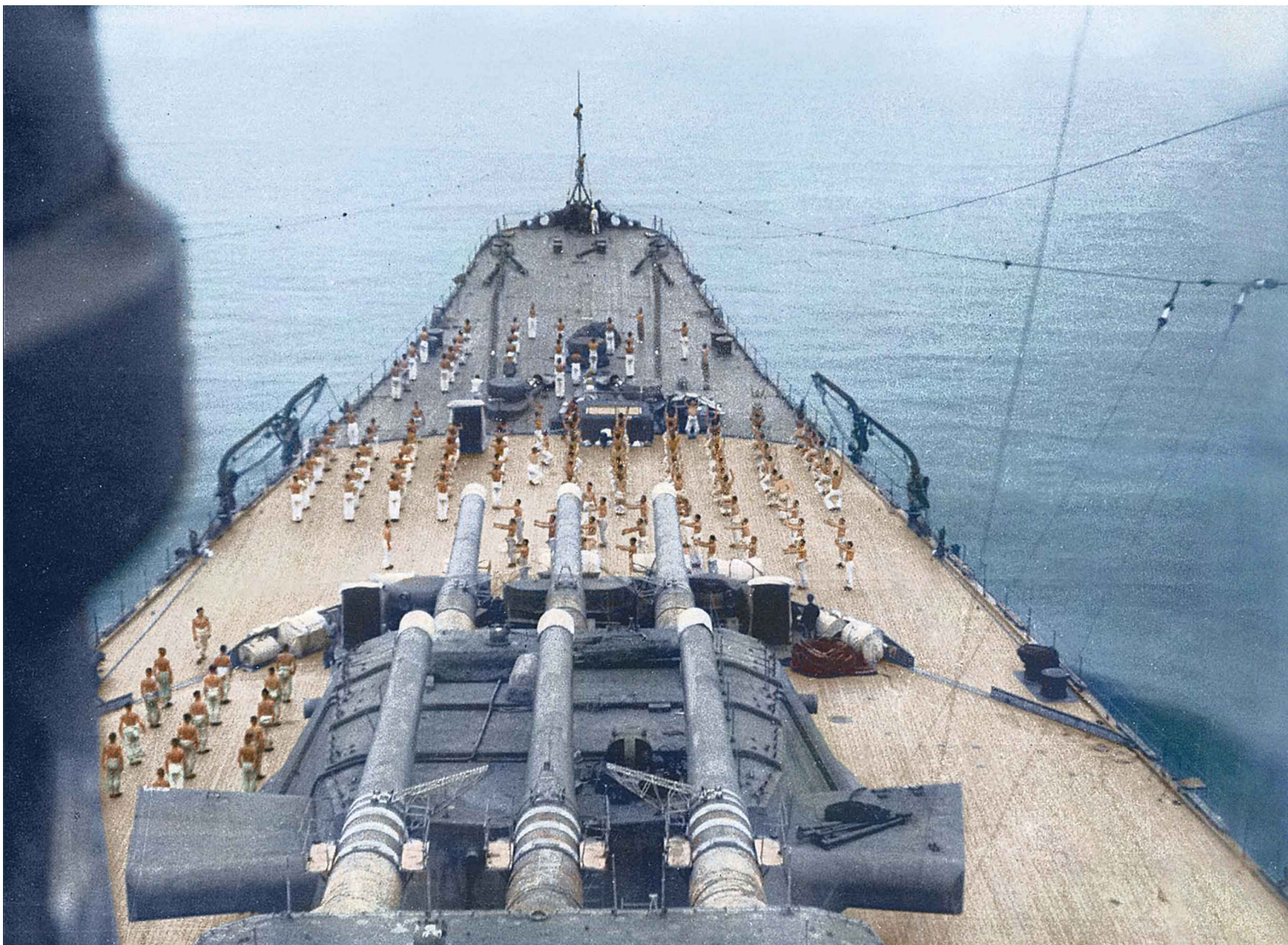
The Japanese Navy ignored the expense involved in expanding the necessary facilities to manufacture larger pieces of armour for the *Yamato*-class battleships. According to records, about \$10,000,000 (US) were spent on expanding steel-plate manufacturing facilities. As a result, the dimensions of the side armour plates were: thickness 410mm; length 5.9m; width 3.6m = 21.2m²; weight 68.5 tons.

Another problem was the emplacement of the armour, particularly the lower edge of the 410mm side armour, so that it could withstand a hit. Side armour was equipped so as to drive a wedge with an angle of 10° at its lower edge when struck by the shock of a hit, but in the event this method proved insufficient after she was commissioned into service. The underwater protection system was based on a lot of tests carried out on 1:3 scale models by means of well-chosen explosive charges. The last test was carried out in 1939 on a full-scale mock-up of *Yamato* that was attacked with 400kg charges. The holding bulkhead did not remain watertight but was not split open. The principal weakness was at the bottom connection between the holding bulkhead and the shell, and this section was redesigned for *Yamato*.

Prior to construction, however, considerations of underwater projectile trajectories meant that the bulkhead was radically increased in thickness. As installed, it was 200mm thick at the top (the connection with the lower edge of the 410mm main side belt) to 75mm at the bottom connection with the shell – the entire system being designed to withstand an attack by a 400kg charge.

The biggest problem with the change in design was the method for connecting the main armour belt with the newly designed lower torpedo-holding bulkhead. The decision was an unsatisfactory compromise reached over the objection of several officers who felt a delay in completion of the ship was warranted in view of the problems already apparent in the design.

The design of the joint was based primarily on the ability of steelmakers to produce the special shapes required in a reasonable amount of time. That joint was the weak point – and a significant design error – as it was entirely dependent for transfer strength on the shearing strength of tap rivets and three-ply rivets. The joint itself did not give adequate support in the transverse direction.



View from Musashi's tower bridge to the anchor deck, forecastle deck and main gun turrets no.1 and no.2. On the left is part of the 1.5m navigation rangefinder. Small trusses on the left and right barrels and small platforms were fitted temporarily for precise adjustment of the guns.

The aforementioned fears were confirmed by damage to *Yamato* from a single torpedo hit on the starboard quarter, from a torpedo fired from a submarine, on 25 December 1943. A hole about 5m deep, extending downward from the top of the bulge connection (of the armour), and 25m

long, between frames 151 and 173, was produced. Water flooded into the No.3 turret upper magazine from a small hole in the longitudinal bulkhead caused by the caving in of the waterline armour.

As a result of the Japanese investigation into this damage, the Fourth Section, Ship Construction, authorised the installation of a 45° sloping plate across the corner of the upper void between the two inboard bulkheads during the January–April refit.



View from Musashi's tower bridge to the funnel, main mast and aircraft deck in May 1942, during finishing works; the two boats visible were fitted only temporarily.

Yamato's hull was divided into 1147 watertight compartments (WTC) that comprised 1065 below the armour deck (middle deck) and 82 above. The maximum extension of the WTC increased her buoyancy. Her reserve buoyancy reached as much as 57,450 tons (c.f. 29,292 tons for *Nagato*, 21,300 tons for *Fusō*) – this was 80 per cent (67.6 per cent for *Nagato*, 55.2 per cent for *Fusō*) of her trial displacement. The battleship was also designed to remain fairly stable when in a damaged condition.

In the event of her bow or stern sections, other than the armoured citadel,

being flooded, it was believed that she could maintain her stability until she listed to 20°, and that her trim capacity would enable her to function with her freeboard forward reduced to 4.5m – *Yamato's* fore freeboard was 10.0m, amidships 8.6m, and after 6.4m – even if her fore part was completely destroyed and flooded.

FLOODING AND PUMPING SYSTEM

The flooding and pumping system was designed to fulfil the following requirements:

1. The resultant list and trim from the first torpedo hit should be reduced to under 4° list and 2.3m difference in draught fore and after within five minutes of the damage control system going into action.

2. The resultant list and trim from the second torpedo hit should be controlled within thirty minutes, to the above-mentioned standard.

By flooding the opposite damage control tanks, the battleship could also be heeled by 13.8° maximum, and another 4.5° list could be added by shifting fuel to the opposite fuel tanks. Altogether, it was believed that the system could enable the battleship to return to almost even keel from a list of 18.3°.

MACHINERY

The designers abandoned mixed propulsion (diesel plus turbine) in the last phase of the project.

The battleship was equipped with 150,000hp turbine propulsion machinery using 25kg/cm² and 325°C steam. Twelve boilers, each of 12,500hp, were set up in four rows, three per row, and each located in a separate room. Three boilers in a row propelled each turbine. The Kampon-type boilers were of a standard Japanese Navy design. The banks were nineteen tubes deep with superheaters – which were of the two-pass four-loop type – between inner boiler rows 7 and 8. A peculiarity of Japanese naval boilers was the narrowing of the bank of tubes between the furnace and superheaters. The centre-to-centre length of the first inner rows was 4.25m and rows 4 to 7 were reduced so that the distance between the the superheaters and beyond the passage was only 3.263m. *Yamato*'s boiler rooms had a floor area of 798m² and an engine room floor area of 640m² = 238shp/m². The ship's prismatic coefficient was 0.612 and the block coefficient 0.596.

At maximum speed, when all twelve boilers were in operation, the consumption of fuel oil amounted to 62.700kg/hr = 1233 kg per 1000m of the distance steamed.

Using full power of 153,553shp she reached a maximum speed of 27.46 knots; at a standard (economic) speed 16.47 knots she used 18,596shp with a maximum radius of 7200 nautical miles – all with 4,210 tons of fuel oil on board.

All this data concerning maximum propulsion by steam turbines and maximum speed became available to the public several years after the end of the war. More than 12 years ago new data was published: maximum power 166,520shp with a maximum speed of 28.1 knots for *Yamato*'s sister ship *Musashi*.

The last preliminary design for the superbattleship A-140-F3 – just before the design of the *Yamato* class – reached 135,000shp, 65,200 tons trial displacement, dimensions of the hull the same as *Yamato* – maximum speed 27 knots.

Maybe the previously mentioned speed of over 30 knots during trials in December 1941 is not merely a report and can be assumed to be real.

TURNING ABILITY

The ship's turning ability was also superior compared with other battleships. *Yamato*'s tactical diameter was 640m, the advance diameter 589m, giving a maximum heel of 9° when the ship was turned by the maximum rudder angle of 35° at a speed of 26 knots. The small heeling angle in a turn (necessary from the point of view of evading bombs and torpedoes, and for stability and fire control) was attributed to her metacentric height – GM = 2.88m during trials. Her rolling period was an impressively steady 17.5 seconds.

The battleship had two rudders – main and auxiliary – respectively 46m² and 17m², instead of the twin-rudder system of ordinary large warships. Originally it was planned to install two rudders, one each fore and aft, but the plan was later changed to fit the auxiliary rudder about 15m ahead of the main. In the trial run, however, an unexpected attribute of the auxiliary rudder was discovered, to the disappointment of the designers: so great was the turning momentum of the ship once she had begun to alter course that the auxiliary rudder alone could not reduce the momentum sufficiently to make her resume her course.

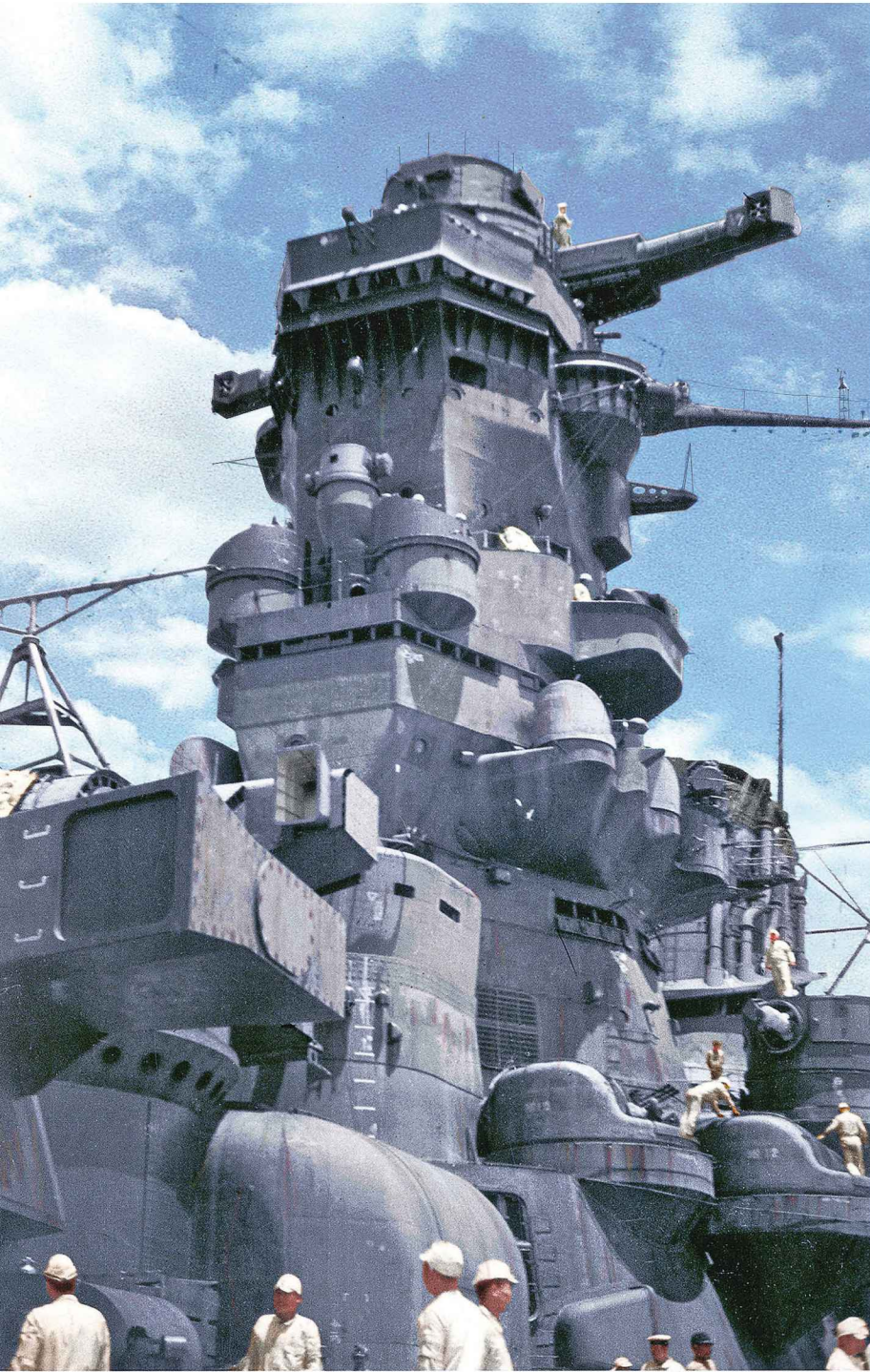
ARMAMENT

Main armament – Type 94 46cm/45 calibre guns

The 46cm (18.1in) guns with which *Yamato* and *Musashi* were supplied were the only modern guns of this calibre ever mounted in a ship and represented quite an achievement for the Imperial Japanese Navy. Up to that time 40.6cm (16in) guns were the largest in general use, the only exception being the British battlecruiser *Furious* that was equipped for a short time with two single turrets with 45.7cm Model 1915 guns. Japanese designers had been interested in using very large guns since 1920; the 13–16 class battleships from 8–8 Project's cancelled programme were to be equipped with 46cm guns and at the same time they were testing 48cm (18.9in) guns. In 1934 the building programme for modern 46cm guns was restarted with a view to the new superbattleships. The new guns – being perfected by the engineer C. Hada's team – were ready in 1939 and their production started in 1939–40.

Twenty-seven guns were built, of which 18 – six complete turrets – were mounted in *Yamato* and *Musashi*. The maximum weight of a triple turret was 2774 tonnes – about as heavy as a big destroyer. The AP projectile's 1460kg weight was one and a half times the weight of the 40.6cm projectiles.

Building these modern guns was extremely expensive and the designers had to solve a lot of new technical problems. However, the Japanese naval strategists' policy was to make each individual ship so powerful that even the resource-rich industrial United States would scarcely be able to match them.



The tower bridge of Musashi during finishing works in May–June 1942. This photograph was taken from the main deck.

Shell rooms, hoists and ram mechanisms

The number of projectiles per gun was 130 rounds, of which 60 projectiles were stowed in the turret rotating structure, making 180 projectiles in the turrets (3 x 60). The remainder – 70 projectiles per gun, 210 per turret – were located in the shell rooms. So altogether the ship had 1170 projectiles and the same amount of 330kg powder charges.

It was considered that 60 projectiles per gun was sufficient for battle; while fighting, it was possible to supply the turret rotating structure with projectiles from the shell room, but it was quite a time-consuming process. The projectiles were moved by means of 'push-pull' gear: the projectiles in the turret were moved directly to the hoist (a simple 'pusher type' on a 5° downward-tilting platform for transfer to the hoist proper). The hoist door closed automatically by a spring-loaded crank activated by the weight of the projectile entering the hoist mechanism, and the projectile was seated on the hoist, which was fitted with a set of three lifting and retaining pawls, back and front respectively. When the projectile reached the top of the hoist, it was carried into the tilting bucket (tilted 8° upwards) and held in the bucket by clips. When the projectile was ready, it was moved from the bucket into the waiting tray before its transfer into the shell-loading bogie and rammer. The loading bogie moved forward on rails, at the same time lowering into the gun load angle of 3°. After the gun had been loaded the shell rammer (chain) was taken back and the powder charge loaded.

Magazine and cordite handling room

Each of the three turrets had two cordite magazines. The lower room had one transfer bogie and one hoist servicing the centre gun; the upper room had two bogies and two hoists for the left and right guns. The entire propellant charge weighed 330kg – six charges each of 55kg.

These were stowed in magazines in flash-tight stowage canisters (two charges per canister) from where they were removed and passed through flash-tight scuttles controlled by the cordite roller chute and into the turret rotating structure. A full charge (six 1/6 charges) was then transferred to the cordite hoist cages via the transfer bogie pivot tray. Each end of the hoist had a flash-tight door that was operated by a combination of cams and hand levers.

Opening the upper flash door freed the rammer control. The cordite hoist was a flash-tight 2870 x 950mm trunk equipped to take one cordite cage. The cordite cage was supplied with a flash-tight container for the entire charge (330kg) that was opened at the same time as the charge was loaded into the gun chamber by a cordite rammer (similar in construction to the shell rammer). At low elevation (~20°) a 28-second firing cycle was possible, and 40 seconds for the maximum 45° elevation.

Train and elevation engine

Each turret was equipped with two sets of training gears, only one being used at a time. Contrary to previous Japanese practice, a worm gear was rejected because of space limitations and a rack and pinion system adopted. Each turret was equipped with two 500hp hydraulic motors for train drive – one for each set of gears.

Each gun was fitted with elevating and shifting cylinders. The rotation rate was 2°/sec, elevation rate 10°/sec, maximum elevation +45°, loading and underway (normal) position +3°, and minimum elevation –5°.

Each turret was equipped with auxiliary hoists with overhead travellers and chain purchase for emergency handling in the gunhouse. Hydraulic winches were used to move the projectiles to the hoists in emergencies; hydraulic valves allowed the magazines to be flooded completely in 20 minutes. Each powder magazine and shell room was equipped with sprinklers.

Gunhouse

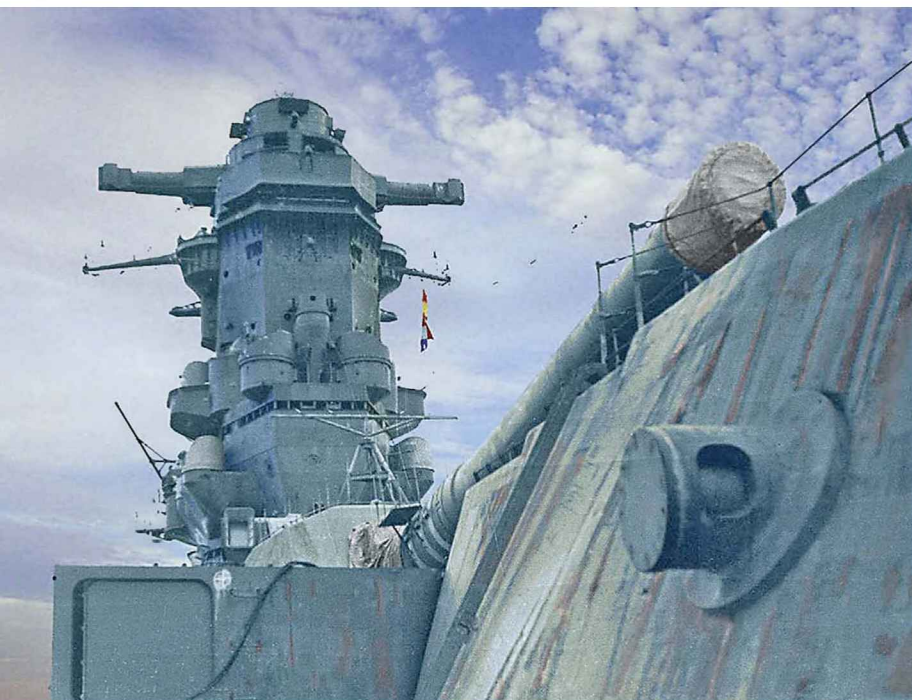
Each turret was divided into four compartments, each comprising three guns plus equipment placed in a separate cell. The separate compartment behind the gunhouse was occupied by a 15m turret rangefinder. The armour protection was as follows:

Gunhouse: front 650mm, side 250mm (minimum), back 190mm, roof 270mm.
Barbette: 560mm – 380–440mm after parts.

46cm gun performance		
Elevation	Range (m)	Projectile flight time (sec)
10°	16,843	26.05
20°	27,916	49.21
30°	35,826	70.27
40°	40,700	89.42
45°	42,026	98.60

Power against targets at various ranges		
Range (m)	20,000	30,000
Gun elevation	12° 34’	23° 12’
Striking angle	16° 31’	31° 21’
Striking velocity	522m/sec	475m/sec
Penetration vertical plate	566mm	467mm
Penetration horizontal plate	416mm	230mm

Gun data	
Designation	Type 94 46cm/45cal
Calibre	46cm (18in)
Length in calibres	45
Length overall	21,300mm
Construction type: wire wound radially expanded muzzle	4 layers
Breech	5 layers
Breech type	screw
Rifling	
No. of grooves	72
Twist uniform	1 in 28cal
Groove depth	4.6mm
Bore cross-section	1698cm²
Projectile range	17.59m
Chamber volume	480 litres
Diameter of turret rollers (axle)	12.274mm
Distance from centre of rotation to trunnions in fore and aft line	3520mm
Height from centre line of guns to roller path	4400mm
Distance between centre line of guns	3050mm
Recoil length	1430mm
Ventilation	Three 2.5hp fans for supply and five 5hp exhaust fans
Turret rangefinder	15.5m base, elevation +10° and free train 160 milsec right, 130 milsec left
Local sight	One 10cm telescope per gun
Spreads	Normal spreads in 4- or 5-gun salvos at maximum range, about 500–600m; somewhat larger in broadside firing



Note the details of the No.1 main gun turret; periscope of the right gun and the 15.5m turret's rangefinder arm with closed opening and a sliding steel screen.

46cm gun mount data (weight in tonnes)	
Rotating turret structure:	
Three guns with breech mechanisms	495
Remainder of elevating parts	228
Turntable minus elevating parts and armour	350
Remainder of training parts below turntable	647
Gunhouse armour	790
Total weight	2510
Total weight with ammunition	2774

Projectiles

Three basic types of projectile were used in 46cm guns:

1. Armour piercing (Type 91). This weighed 1460kg and was designed to enter the water short of the target, maintain its trajectory and penetrate the hull's torpedo defence system. The projectile nose was given a hydrodynamic shape so its trajectory would not alter drastically on entry. The Japanese had been quite impressed by the damage caused by rounds falling short on their partially completed battleship *Tosa* in firing experiments.

2. 46cm type common 'San Shiki' Model 3. This was originally constructed and designed as AA, acting as an incendiary 'shotgun' projectile. It was fitted with 900 incendiary tubes (rubber thermite) and 600 steel stays. The projectile was supplied with a time fuze set to go off at suitable height when the contents of 1500 incendiary tubes and stays exploded in a cone shape in an angle of about 20° towards any incoming aircraft. In a fraction of a second after firing, the projectile shell was destroyed by a bursting charge, increasing the quantity of shell splinters. The incendiary tubes ignited about half a second later and burned for five seconds at 3000°C, giving a flame about 5m long.

3. Type HE (high explosive). This weighed 1360kg and contained 136lb of tri-nitro-anisole (TNA).

46cm projectile data	
Muzzle velocity (AP projectile)	780m/sec
Muzzle velocity ('San Shiki', HE projectile)	805m/sec
Maximum range (AP projectile)	42,050m
Maximum altitude	11,900m
Barrel life (approx)	200–250 service rounds
Bore pressure	32kg/mm ²

Secondary Armament

This consisted of 'Nendo Shiki' (Third Year Type) 15.5cm/60cal guns. Engineer C. Hada designed the 15.5cm guns (as well as the 46cm guns) in 1932 as the main armament for 'B' class cruisers; they were also mounted in the *Mogami* class cruisers. These guns were the finest in use during the Second World War. *Yamato* and *Musashi* originally had four 15.5cm gun turrets. These triple turrets were made available by the conversion of four *Mogami* class cruisers, which were given twin turrets with 20.3cm guns in place. The triple turrets after modernisation were installed in a diamond arrangement, the turrets in superfiring positions over the main battery fore and aft, and the two others were in wing positions, one on each side. The wing turrets were removed to provide space for additional 12.7cm AA guns for *Yamato* in January 1944 and for *Musashi* in April 1944.

The gun mounts and turrets were operated by electro-hydraulic power with mineral oil as the pressure medium (two 100hp motors per turret). Each turret had six hoists – one shell hoist and one powder hoist per gun. The shell handling room and powder hoist equipment were essentially a scaled down version of large-calibre equipment. The hoists were activated by hydraulic motors supplied by the common ring.

15.5cm gun data	
Bore calibre	15.5cm (6.1in)
Length	60cal
Barrel length (overall)	9615mm
Construction	Monoblock radially expanded
Breech mechanism	Normal swinging – hand or hydraulic
Weight with breech	12.7 tonnes
Groove number	40, twist uniform: 1 in 28cal
Chamber length	1129mm
Chamber volume	38 litres
Muzzle velocity	980m/sec
Bore pressure	34kg/mm ²
Barrel life	250–300 rounds
Firing rate	7–5 rounds/min
Maximum range (45°) AP	27,400m
Maximum range (common)	26,500m
Maximum altitude	12,600m
Elevation/depression	55°/ – 10°
Projectile weight	55.87kg (all types)
Charge weight	19.5kg
Normal ammunition supply	150 rounds per gun (max 270 per gun)
One 8m rangefinder per turret	

High Angle Guns

As completed, *Yamato* and her sister ship *Musashi* carried twelve Type 89 Model A-1-3 40cal 12.7cm guns in six twin-enclosed mountings. The original shields were enclosed to reduce the effect of the terrific blast from the main 46cm guns. During the ship’s refit in January – April 1944 *Yamato* received an extra twin mounting (Type 89 Model A-1 12.7cm/40cal without anti blast protection – it is on open stands) that were installed on existing Model A-1-3 position. The guns with enclosed mountings (towers) were moved to both sides on fitted new superstructure base.

The same modernisation was planned for the *Musashi*, but by the time of the war, difficulties meant that although she had received the additional superstructures on both sides as bases for the 12.7cm and 25mm guns, the six new double 12.7cm guns were not installed, and in its place were fitted six triple 25mm MG on open stands.

The loader’s two platforms moved up and down with the elevation of the mounting. The battery was semi-automatic using a spring-operated rammer.

There were fuze setters on the right side of each mount. Simple dredger-type hoists were used to lift the fixed ammunition to the gun platform.

12.7cm gun data	
Designation	Type 89 HA 12.7cm/40cal
Length	40cal
Muzzle velocity	725m/sec
Projectile weight	23.05kg
Charge weight	4.0kg
Maximum range	14,800m
Maximum altitude	9400m
Barrel life	800–1500 service rounds
Rate of fire	14 rounds/min maximum 8 rounds/min sustained
Maximum elevation/depression	90°/–8°
Construction	Monoblock autofrettaged
Rifling	36 grooves, uniform twist – 1 in 28cal
Ammunition supply (normal)	300 fixed rounds per barrel
Ammunition supply (max)	560 fixed rounds per barrel

Light Anti-Aircraft Guns – Type 96 25mm machine guns

Both battleships were armed with a very successful anti-aircraft gun – Type 96, 25mm/60cal triple machine guns of 1941 design, and after 1943 with single 25mm MG of 1943 design. The guns were similar in construction to the French Hotchkiss type and constituted the main AA weapon of the Imperial Japanese Navy. The triple gun mount was manned by a crew of nine, the single (a free-swinging moveable mount) by a crew of three. The usual ammunition supply was 2000 rounds per gun (one barrel) but by some sources the maximum number of rounds per one barrel in 1945 was 10,000. The 15-round magazines were brought up by hoist to the level of the machine gun platforms, and stowed after in ammunition boxes.

25mm machine guns mounted on <i>Yamato</i>		
1941	as completed: 8 x III = 8 closed mounts	24 guns
Sept 1943	4 new triple open mounts = 4 x III + old 8 x III	36 guns
Jan–Apr 1944	12 new triple mounts and 26 new single mounts = total 24 x III + 26 x I	98 guns
July 1944	5 new triple mounts = 5 x III = total 29 x III + 26 x I	113 guns
Jan 1945	21 new triple mounts fitted and 24 single mounts removed = total 50 x III = 2 x I	152 guns
April 1945	4 single mounts fitted = total 50 x III + 2 x I + new 4 x I	156 guns

25mm machine guns mounted on <i>Musashi</i>		
1942 as completed	8 x III = eight triple enclosed mounts	24 guns
July 1942	4 x III = twenty new triple open	36 guns
April 1944	18 x III plus 25 x I new mounts (30 x III + 25 x I)	115 guns
June 1944	5 x III new mounts (35 x 3 + 25 x I)	130 guns

25mm machine gun data	
Designation	Type 96 'Shiki' 25mm/60cal MG
Length	60cal
Gun length overall	2420mm
Muzzle velocity	900m/sec
Projectile weight	0.25kg
Maximum range	6800m
Maximum altitude	5000m
Rate of fire	220 rounds/min
Maximum elevation/depression	90°/ – 10°

Type 93 13mm machine guns

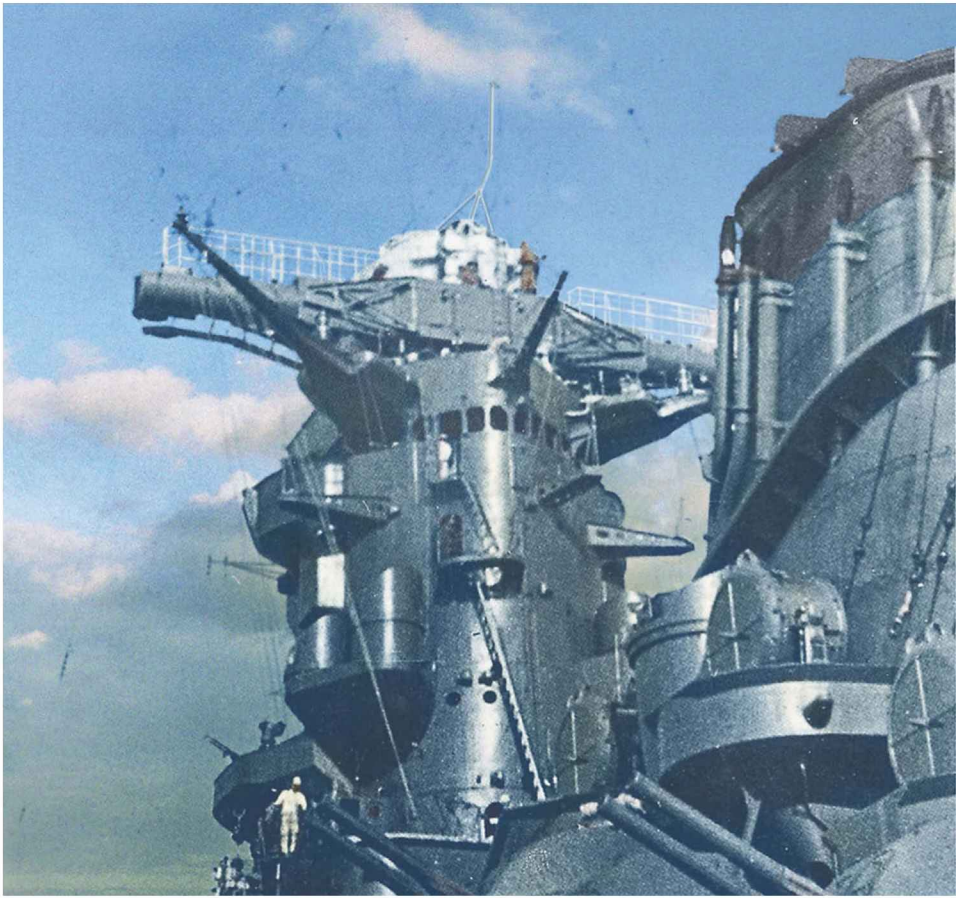
Two twin 13mm machine-gun mounts were installed on both sides of the tower bridge and were similar in construction to the Hotchkiss type, with a horizontal range of 6000m, vertical range of 4500m, rate of fire 450 rounds per minute and ammunition supply of 2500 rounds per gun. In 1944 *Musashi* carried twin rocket launchers each armed with 28 12cm AA common rockets and four depth charge launchers located on both sides on the stern deck.

Fire control system

Main battery

Both battleships were equipped with the Type 98 low angle fire control system – the ultimate in Japanese low angle fire control installation and specially designed for the *Yamato* class battleships. The principal parts of this installation were as follows:

Four 15.5m rangefinders, one on top of the tower bridge and the remaining three in 46cm gun turrets, and one 10m rangefinder on the top of the after tower. The one on top of the tower bridge was a triple rangefinder with one stereoscopic set. Special attention should be paid here to the high quality of Japanese optics and at the same time to the unusual base length of the 15.5m rangefinders which allowed exceptional range estimation and consequently a high degree of accuracy in shooting, usually bracketing the target with early salvoes.



A rear view of Musashi's funnel, tower bridge and searchlight platform in September 1942 after fitting Type 21 radar antennas on both arms of the 15.5m rangefinder. Note the white painted 'Hoiban' LA director and antennas – dating from the middle of 1942 to the end of 1943.

Type 98 low angle 'Hoiban' directors were situated in two completely enclosed towers – one on top of the main 15.5m rangefinder and second on top of the 10m rangefinder. They were manned by a control officer who operated the main telescope searchlight and three others: layer, trainer and cross-leveller. Level and cross-level corrections were handled by a 'match the pointer' system. The director gave train and elevation orders to the guns.

Type 98 'Sokutekiban' was a component of the Japanese fire control system unknown in Western navies. It was a section of the computer and received its information from the directors. It gave target course and target speed information to the computers.

Type 98 'Shagekiban' low angle computer was the latest Japanese fire control table and the first low angle computer with an automatic electrical-mechanical follow-up system.

Type 98 firing device consisted of two components:

1. Trigger time limiting device: limited the time of two or more guns to 0.08–0.2 seconds after the firing circuit was activated.
2. Firing time separator: reduced interference in flight; two guns could not be fired at the same instant.

The battleship's main battery and her fire control system were also adapted for use as anti-aircraft fire.

Secondary guns

15.5cm guns were equipped with an 8m turret rangefinder and a fire control system. This was the same type as used in the main battery system with 4.5m instead of the 15.5m and 10m rangefinders.

12.7cm high angle guns: These were controlled by the Type 94 'Kōsha Sōchi' HA fire control system.

25mm machine-gun batteries: These were controlled by the Type 95 'Shageki Sōchi' short range HA director. It was a simple course and speed system that was not up to Western standards, though all triple 25mm guns had the advantage of remote control.

Sensors

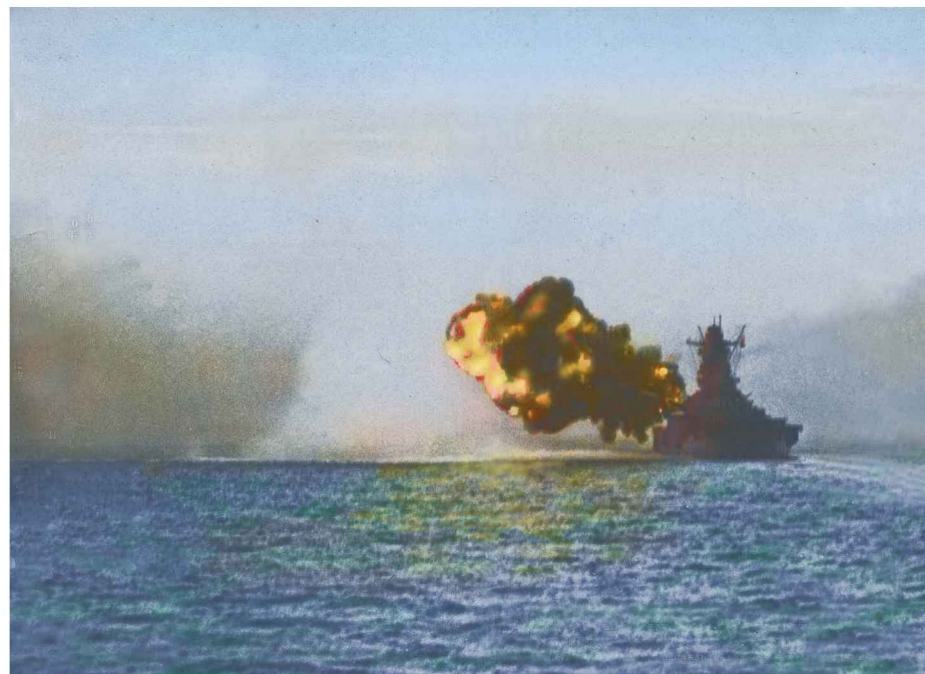
Yamato and *Musashi*, as the most modern and strategically important battleships of the Imperial Japanese Navy, were supplied with the latest radar and electronic equipment.

Type 21

The first radar was installed on *Musashi* in September 1942 and on *Yamato* in July 1943. It was the Type 21 Gō Dentan Kai 3 air and surface search radar. Two Type 7 Gata radar antennas of 'mattress' pattern with combined transmit and receive arrays were installed on both arms of the 15.5 m rangefinder. The Type 21 Kai 3 radar's wave length was 1.5m, power 25–30kW and range 120km (aircraft group), 70km (single aircraft).

Type 22

Surface search/gunnery control radar Type 22 Gō Dentan Kai 4 was installed on *Yamato* in February 1944 and on *Musashi* two months latter in April 1944. The radar antenna comprised two electromagnetic horns – upper for receiving, lower for transmitting. Two Type 22 radars were installed on the sides of the upper part of the tower bridge. The radar was not adapted for fire control. Its characteristics were wave length 10cm, power 2kW, maximum detection range 35 km + – 700m (battleships), 20km (cruisers), 17km (destroyers), bearing error + – 5°.



The Musashi's main gun salvo during firing research on the impact of the blast, at Setona-ka in Iyo Nada on 26 July 1942.

Type 13

The type 13 Gō Dentan air search radar was fitted on *Yamato* and *Musashi* at the same time as the fitting of Type 22 radar. Two ladder-type antennas were located on both sides of the main mast. The characteristics of the radar were a separate set for transmission and receiving, wave length 2.0m, power output 10kW, maximum detection 100km (aircraft group), 50km (single aircraft), range error + – 2–3km, bearing error + – 10°.

Sonar

Both battleships were equipped with Type '0' sonar arrays that could detect a submarine when the ship was dead in the water or proceeding at low speed.

AIRCRAFT AND CATAPULTS

Yamato and *Musashi* were designed to carry a maximum of seven floatplanes of the Mitsubishi F1M2 Type '0' (allied code 'Pete') and Aichi E13A1 (allied code 'Jake') types. But on both battleships only Mitsubishi F1M2 floatplanes were actually used.

Aircraft were launched into the air by two 19.5m long catapults of Type Kure Shiki 2 G 5 Gata and a 6-ton crane with a 20m long arm was used to lift them out of the water. The floatplanes were stowed in a hangar and before flight were moved across the aircraft deck by a system of trucks and rails to the catapults.

Principal specifications of the Mitsubishi F1M2 two-seat general-purpose floatplane	
Power plant	875hp
Span	11.0m
Length	9.5m
Height	4.0m
Speed (max)	370km/h
Cruising speed	193 km/h
Range max/norm	740km/442km
Weight (max)	2856kg
Ceiling	9440m
Armament	3 x 7.7mm MG + 60kg bombs
Wing area	29.54 m²

BOATS

Yamato and *Musashi* were designed to carry 16 boats but usually carried 14. All the boats were kept in hangars because of the terrific blast from the main battery. They were lowered and raised by an overhead travelling crane (side hangars) or by a 6-ton aircraft crane (boat hangars on the stern deck – UD). The boats consisted of two 17m ceremonial barges with 150hp drive, one 15m ceremonial barge with 150hp drive, one 11m motorboat with 60hp drive, four 12m motor launches with 30hp drive, four 9m cutters unpowered, one 8m and one 6m sampan (unpowered).

SEARCHLIGHTS

After completion, *Yamato* and *Musashi* each carried eight 150cm director controlled searchlights for night fighting. Their number was reduced to six in 1944 and next to four in 1945 on *Yamato*. AA control positions were installed in their place (on *Musashi*, two rocket launchers). Both battleships also carried four 60cm and two 40cm signalling searchlights.

INTERIOR COMMUNICATIONS

These were based on three principal methods: voice tube (146 installed), telephone (491 installed), pneumatic air chute (14). Each ship carried 40 radio receivers and 17 transmitters, with operating frequencies ranging from low frequency (LF) to very high frequency (VHF). Most of the equipment operated at LF, MF and HF.

The Navy Type 2 infrared communications were developed in 1942.

COMPLEMENT

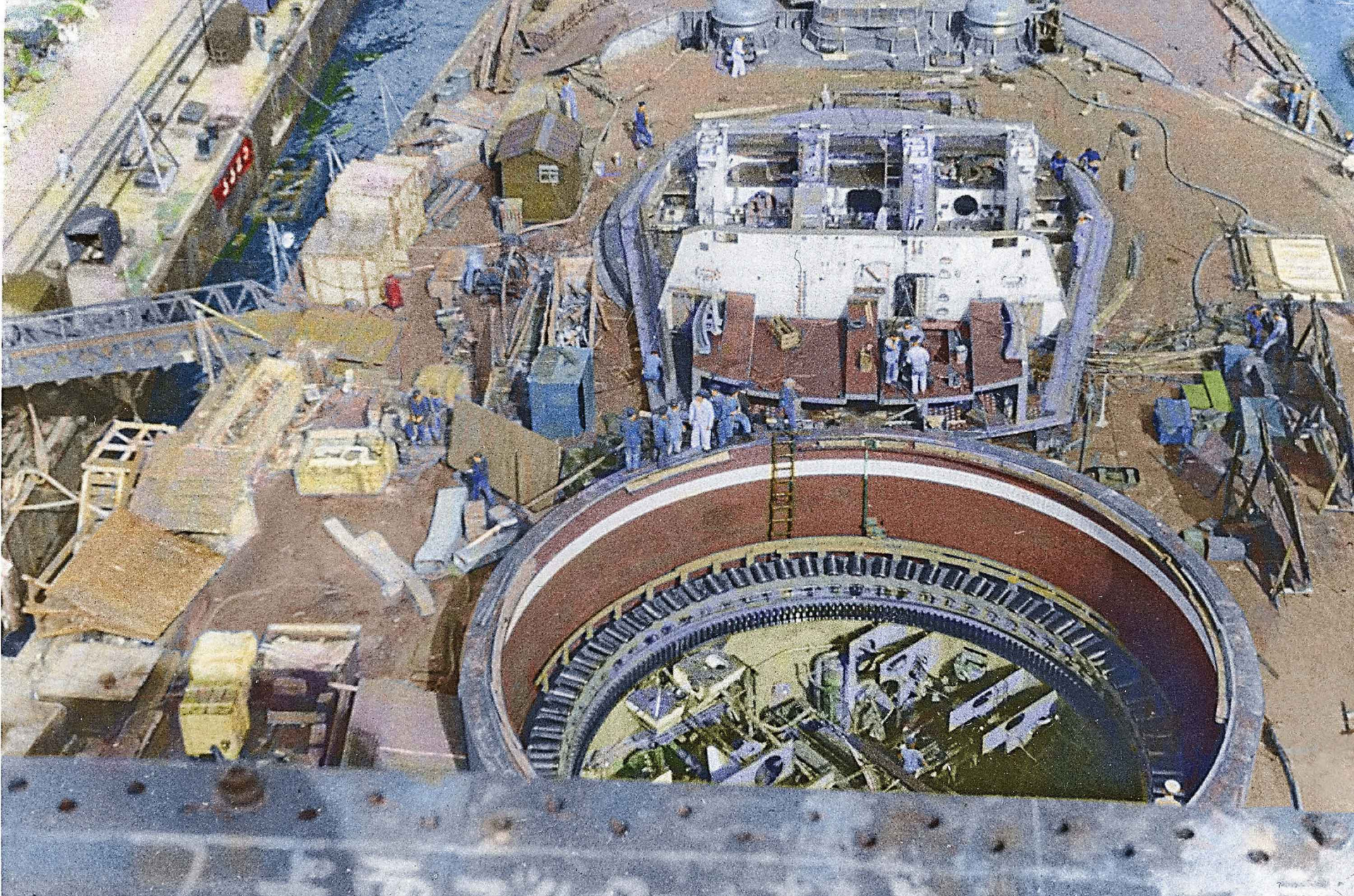
The crews of *Yamato* and *Musashi* as completed were planned as 2500 officers and men, but during service this number was increased by fitting additional armaments and equipment. In April 1945 the number of crew on *Yamato* was increased to 3332 sailors (from this number only 23 officers and 246 men survived on 7 April 1945).

Japanese sources give *Musashi*'s complement on 24 October as 2399 officers and men, and in comparison to *Yamato* the crew looks very understated. Maybe only the number of lost – 1023 officers and men – was correct.

Additionally, on the last cruises of both battleships squads of maritime regiments were transported, but the starting number and number lost were unknown.

WARTIME COLOUR SCHEMES

1. Gold was used for the 120cm diameter chrysanthemum crest on the bow.
2. The hull colour of the Imperial Japanese Navy ships varied in shade, although it was based on regulation colours. The basic grey (medium grey) was made up according to a Paint Mixture Standard Formula and consisted of 15 per cent black, 75 per cent white, 6 per cent brown, 4 per cent blue. This colour was used for the above-water part of the hull, the superstructures, gun turrets, the topside fittings, metal decks and sides of the boats.
3. A reddish-tinged brown was used on the underwater part of the hull, and consisted of 20 per cent red, 65 per cent brown, 10 per cent black and 5 per cent white.
4. White was used for the azimuth scales of the AA rangefinders, the upper part of the tower bridge – above the 15.5m rangefinder (Hoiban, Type 21 radar antenna) – from the middle of 1942 to the end of 1943, the chrysanthemum on both sides of the funnel in April 1945, the stripes of the circular railings of the open triple 25mm gun mounts, the 200mm high numbers on the base of the deck 25mm MG enclosed mounts, the stripes on the edge of the hull – end of 1944–45 – and the inner surfaces of the rangefinder and gun rangefinder openings.
5. Brown (canvas) was used for the blast bags and the gun muzzle covers.
6. Yellowish-brown (like milk chocolate) was used for the non-slip linoleum strips on the aircraft deck (with 20mm brass strips attaching it to the deck surface).
7. Black was used for the upper part of the funnel and mast.



8. The chequered steel plates of the anchor deck were zinc coated not painted and were a light grey colour.

9. The wooden deck (main part of FD) was unpainted 'hinoki' cypress wood in a grey tint with a little brown. The planking was made of 140mm wide planks.

10. Aircraft: Upper surface sea green N-1, lower surface gull grey N-2, orange stripes on wing's leading edge (middle part), white-red stripes on floats. White stripes on tailplanes and number codes on fins. The Hinomaru was red with white borders.

The forecastle of Yamato during construction on 3 June 1940, No.1 main armament gunhouse is nearing completion, and on the barrette of No. 2 main turret are visible rollers with training rack and upper rotating shell stowage and shell and cordite hoists.

11. Wooden decks and probably roof of turret No.1 of main guns were painted black for the night breakthrough in the San Bernardino Strait. This hastily applied camouflage was mainly based on soot from stacks used on both *Yamato* and *Musashi* (18–24 October 1944).

YAMATO AND MUSASHI SUMMARY OF SERVICE

IJN YAMATO

The Bureau of Naval Construction's three groups of outstanding naval designers – Fujimoto, Hiraga and Fukada – had drawn up as many as 23 preliminary designs up to March 1937.

March 1937: The final design was drawn up by Dr Hiraga, the leading naval architect of the Imperial Japanese Navy.

4 November: Construction began on 'Battleship No.1' – the keel was laid down in the dry dock of the Kure Kaigun Kōshō shipyard.

September–November 1939: main engines fitted.

May–October: Boilers fitted.

8 August 1940: Launched.

May–July 1941: Main guns fitted.

12 August 1941: Departs Kure for trials.



Admiral Yamamoto (front row, sixth from left) and his staff aboard the Yamato early in 1942. The photo was taken at the after end of the superstructure on the port side. The rear part of the 15.5cm gun turret (turret No.2) is visible in the left background.

5 September 1941: Kure – Battleship No.1 is being fitted out.

8 December: The attack on Pearl Harbor; at the opening of hostilities, Battleship No.1 is still fitting out in Kure.

16 December 1941: Battleship No.1 is completed and registered in the Kure Naval District as *Yamato*. She then joined the First Battleship Division part of the Combined Fleet, which consisted of *Nagato* and *Mutsu*, and began intensive training, next stay at anchor at Hashirajima – Inland Sea.

12 February 1942: *Yamato* became the flagship of Admiral Isoroku Yamamoto, Commander-in-Chief of the Combined Fleet.

20-23 February: The Chief of Staff of the Combined Fleet Rear Admiral Ugaki conducts a series of war games aboard *Yamato* to test plans for the second-stage operations.

9 March 1942: Admiral Yamamoto issues orders to the fleet to prepare for Operation 'C', a raid into the Indian Ocean.

March 1942: Inland Sea – trainings and gunnery practice.

April 1942: Captain Arima, the Chief Equipping Officer of *Yamato*'s sister ship *Musashi*, pays an orientation visit with members of *Musashi*'s fitting-out crew.

April–May 1942: Training and gunnery practice.

Early May 1942: Admiral Yamamoto conducts war games aboard *Yamato* to test plans for the invasion of Midway.

23 May 1942: Returns to Hashirajima.

29 May: Operation 'MI' was begun, at 06.00 *Yamato* departed Hashirajima with the First Fleet, serving as Admiral Yamamoto's flagship as the command centre in the battle. It was intended to use her main artillery at Midway. After the defeat and loss of four aircraft carriers she returned to the Inland Sea. The battle once more confirmed the supremacy of aircraft carriers in war. At that time a decision was made to convert the third battleship *Shinano* (then being built) into a heavy aircraft carrier.

10 June 1942: 1200 miles SE of Tokyo an unidentified submarine fires two torpedoes at *Yamato* and both torpedoes miss.

5 August 1942: *Musashi*, her sister ship, entered service and joined the First Battleship Division.



Kure – 20 September 1941 – Yamato is shown during her final phase of fitting out. The steel mesh supports for the canvas blast bags can be seen above and below the nearest gun barrel, and splinter armoured protection below the gun

barrel elevated to its maximum elevation of 45 degrees. The aircraft carrier to starboard is the Hōshō, and in the background is the stores ship Mamiya.

August 1942: During operations in the Solomon Islands, *Yamato* went to Truk Island to support a series of operations to recapture Guadalcanal Island, but did not take part in the campaign.

28 August 1942: *Yamato* was attacked by the submarine USS *Flying Fish*, and next arrived in Truk where she served there as headquarters and flagship of the Combined Fleet.

9 September 1942: The Combined Fleet main units were transferred to a new anchorage south of Summer Island.

17 October 1942: Truk – oiler *Kenyo Maru* arrived empty, and *Yamato* and *Mutsu* each transferred 4,500 tons of fuel oil to her to refuel IJN warships that were involved in the Guadalcanal operations.

1 November 1942: Aboard *Yamato* was a festive dinner to celebrate the victory at the battle of Santa Cruz.

22 January 1943: *Musashi* arrived at Truk to join *Yamato*.

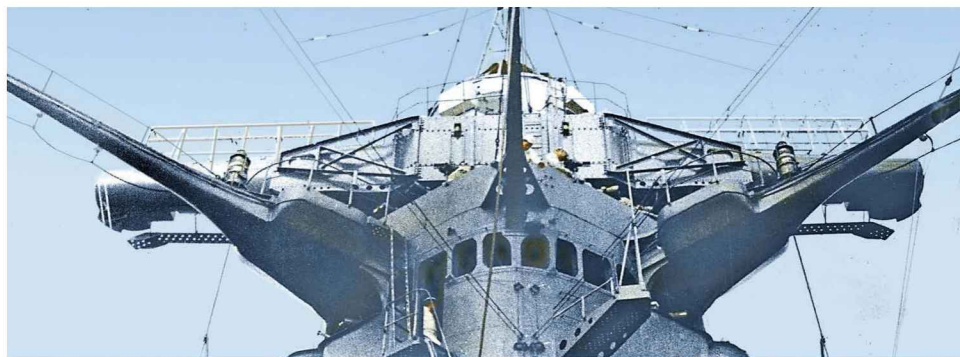
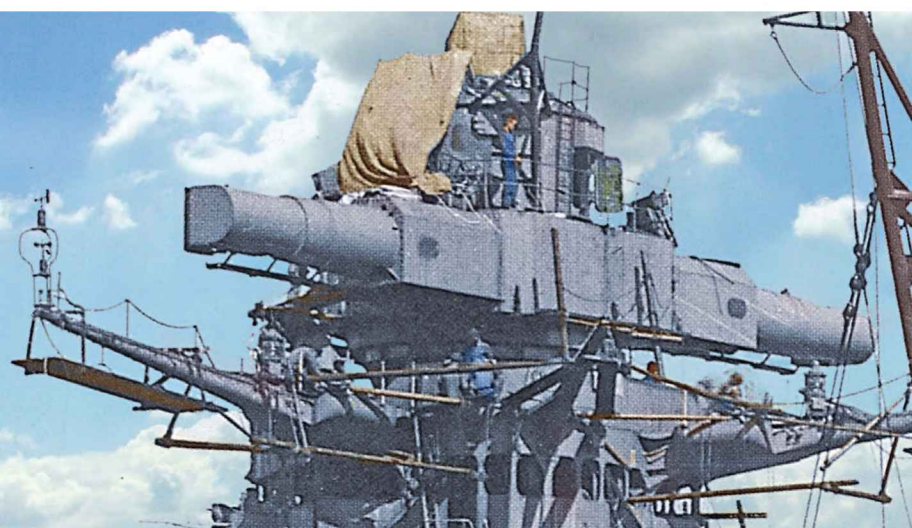
11 February 1943: *Musashi* became the flagship of Admiral Yamamoto. In the meantime the situation around the Solomon Islands went from bad to worse. The Japanese had to abandon Guadalcanal.

18 April 1943: Admiral Isoroku Yamamoto was killed (his aircraft was shot down over Bougainville Island) and *Musashi* became the new flagship of Admiral Mineichi Koga, successor to Admiral Yamamoto.

8 May 1943: Sailed from Truk to Yokosuka.

13 May 1943: Departs Yokosuka for Kure.

The upper part of *Yamato*'s tower bridge with 15.5m rangefinder, Type 98 LA Director 'Hoiban', with its periscope tower covered by canvas, and signal yards with wind indicators fitted.



Close-up of the top of *Musashi*'s tower bridge and main rangefinder from aft. The lattice structure on the rear wall of the rangefinder may have been strengthening to carry the weight and wind resistance of the radar aerials. On the signal yards are visible platforms for 60cm searchlights, and 2kW daylight signal lanterns.

21–30 May 1943: Drydocked for inspection and repairs.

12 July 1943: *Yamato* drydocked at Kure and was equipped with Type 21 Mod 3 radar. Twelve 25mm MG (4 x 3) were fitted on the forecastle deck before and aft 15.5cm side gun mounts (turret No.3 and 4), and 15.5cm guns were provided with coaming armour and their barbets with 28mm thick additional armour. *Yamato*'s fuel storage was reduced and her main and auxiliary rudder controls were improved.

16 July 1943: *Yamato* was visited by the German naval attaché to Tokyo Konteradmiral Paul Wenker, (a former Commanding Officer of the pocket battleship *Deutschland/Lützow*). He was not able to see or understand the real calibre of the main turrets during a one-hour visit on *Yamato*. He described the main gun calibre as 40cm. Permission to visit *Yamato* was given in response to a special request made by Adolf Hitler and Admiral Karl Dönitz in reciprocation of Admiral Naokuni Nomura's visit aboard the battleship *Tirpitz* in March 1941.

16 August 1943: *Yamato*, loaded with troops and supplies, departs Kure with *Fusō*, *Nagato* and Destroyer Divisions 16's *Amatsukaze* and *Hatsukaze* next stops at Yashima anchorage.

17 August 1943: *Yamato* departed Yashima via Yokosuka for Truk in task group: *Fusō*, *Nagato*, carrier *Taiyō*, 4' squadron *Atago* and *Takao* and destroyers *Akigumo*, *Yūgomo*, *Ushio*, *Amatsukaze* and *Hatsukaze*.

23 August 1943: The task group arrived at Truk.

17 October 1943: *Yamato*, *Musashi*, *Nagato*, *Fusō*, *Kongō*, *Haruna* with three aircraft carriers, seven heavy cruisers and three light cruisers and destroyers, left Truk to face US forces which were planning a raid on Wake Island.

19–23 October 1943: Japanese forces arrived at Brown Atoll, Eniwetok

26 October 1943: Forces returned to Truk after no contact with enemy forces.

17 December 1943: arrived at Yokosuka.

25 December 1943: *Yamato* was hit by a torpedo fired by the US submarine USS *Skate* near Truk. The torpedo hit her starboard hull near No.3 Main turret (frame 165) with the result that about 3000 tons of water flooded into the upper powder magazine through the small hole in the side armour joint. She arrived in Truk that day for emergency repair.

10 January 1944: Departed Truk for Kure with three destroyers.

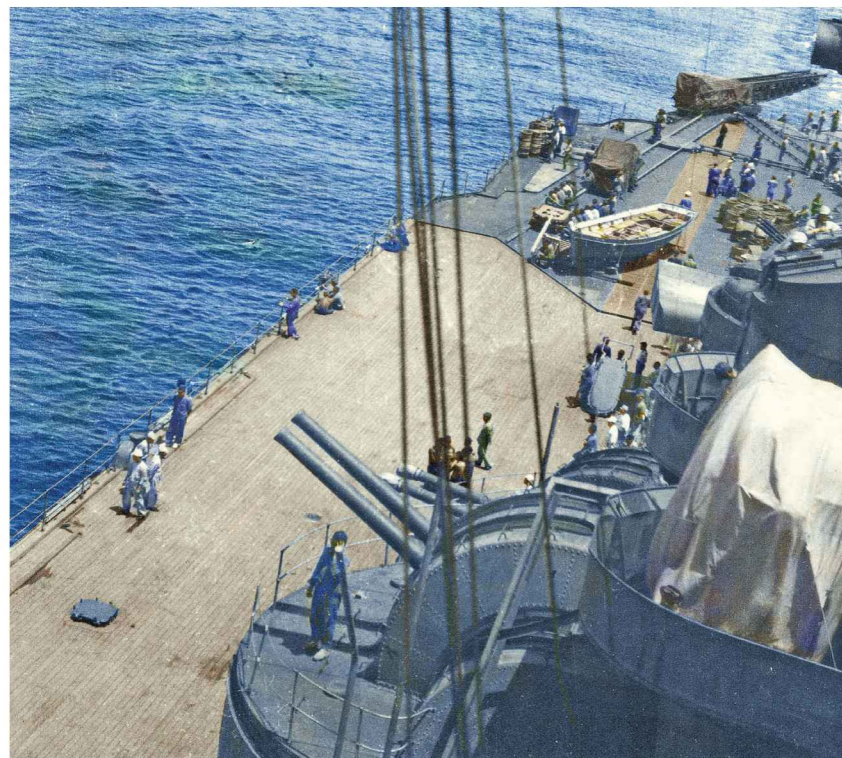
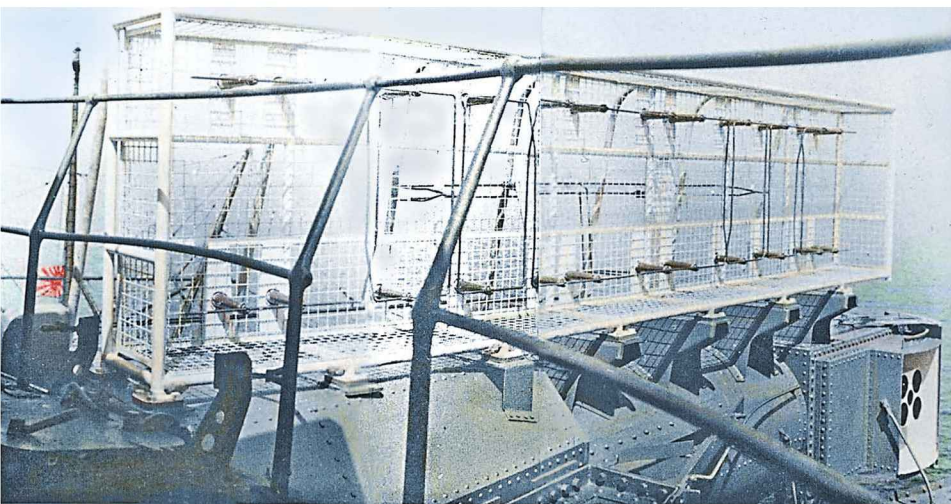
16 January 1944: *Yamato* arrived in Japan and was drydocked at Kure for necessary repairs and modifications to the bracket structures of her armour. At the same time her anti-aircraft armament was modernised. In place of two 15.5cm broadside turrets, which were removed, six twin 12.7cm closed turrets were reinstalled. In place of six 12.7cm closed turrets were fitted six new open mounts with 12.7cm guns. Twelve triple and twenty-six single 25mm MG were mounted on her weather deck. Type 22 and Type 13 radar were installed and the construction of the main mast was changed. Two 150cm searchlights were removed and later installed ashore at Kure. Repairs and modernisation lasted until 18 March, when she was undocked.

31 March 1944: Admiral Koga was killed and the new Combined Fleet Commander, Admiral Soemu Toyoda, was appointed.

11 April 1944: *Yamato* departed Kure for trials in the Iyo Nada and returned to Hashirajima that evening.

17 April 1944: Returned to Kure to load supplies.

Details from front of the port-side 15.5m rangefinder arm with the Type 21 (21 Gō) radar mattress type antenna fitted firstly on Musashi in September 1942 (on Yamato eight months later).



The division between the wooden deck and the steel aircraft deck is clearly visible in this view of Musashi from July 1942. Note the twin 12.7cm HA gun mount in the foreground and the canvas-covered 150cm searchlight.

A Mitsubishi F1M2 floatplane aboard Musashi seen from under the aircraft crane, January 1944. The new type MG control tower can be seen on the left, and in the right foreground the sisal rope curtain that closed off the boat stowage.





24 June 1943. An Imperial visit to Musashi anchored in Yokosuka. In the centre sitting is Emperor Hirohito with his brother Prince Takamatsu and Admiral Koga.

21 April 1944: Departed Kure for Okinoshima, loaded troops.

22 April 1944: Departed Okinoshima with cruiser *Maya* and destroyers *Shimakaze*, *Yukikaze* and two other destroyers.

28 April 1944: Arrived at Manila, unloaded troops and supplies, then departed.

1 May 1944: Arrived at Lingga near Singapore.

3 May 1944: At Lingga she was designated the flagship of Vice Admiral Ugaki.

11 May 1944: Sailed with Vice Admiral Jisaburō Ozawa's Mobile Fleet from Lingga to Tawi Tawi.

14 May 1944: Anchored at Tawi Tawi.

May–June 1944: At Tawi Tawi anchorage – *Yamato* and *Musashi* participated in joint gunnery exercises at ranges of almost 22 miles. At that time the Combined Fleet was reorganised – the main part of the Fleet became a carrier striking force and the battleship group, including *Yamato* and *Musashi*, formed the support force for the aircraft carriers. The Commander-in-Chief of the Combined Fleet hoisted his flag on the light cruiser *Oyodo*. When the US forces landed on Biak Island, West New Guinea, towards the end of May 1944, the Imperial Japanese Navy decided to use two 46cm gun battleships to attack the enemy invasion force.

7 June 1944: Bongao, Tawi Tawi – *Yamato* received fresh provisions from the supply ship *Kitakami Maru*.

10 June 1944: Operation 'KON' – the relief of Biak. *Yamato* with *Musashi* and *Noshiro* and two destroyers departs Tawi Tawi for Batjan. The operation was not realised and both battleships were recalled on their way because of the imminent US invasion of Saipan Island. After the Mariana sea battle (A Operation, the twin battleships taking part in the battle as part of Admiral Kurita's vanguard group) they arrived on 22 June at Okinawa and 24 June at Hashirajima, going on 29 June to Kure to prepare for the next operation, the defence of the Philippines.

29 June–8 July 1944: Five additional triple 25mm MGs were installed on *Yamato*, making twenty-nine triple and twenty-six single 25mm MG at 113 barrels.

9 July 1944: Both battleships left Japan and, via Okinawa, hurried south to the Lingga anchorage.

16 July: Arrived at Lingga anchorage and underwent training. The surface force remained in the vicinity for three months conducting training and was immediately alerted.

18 October 1944: Black deck camouflage, intended for the night breakthrough in the San Bernardino Strait, is hastily applied to *Yamato* and *Musashi*. The main component was soot from the ships' funnels. On this day the battleships left the Lingga anchorage.

22 October 1944: Arrived at Brunei. After refuelling *Yamato* and *Musashi* left to make a daring dash eastward through the Philippines to launch an attack on the enemy in Leyte Gulf.

23 October 1944: In the early morning, when the surface force was passing northeast along Palawan Island, two heavy cruisers – *Atago*, the flagship of Admiral Takeo Kurita, and *Maya* – were sunk by submarine torpedoes from USS *Darter* and USS *Dace*. Admiral Kurita hoisted his flag on *Yamato*.

24 October 1944: *Musashi's* war career ended on the Sibuyan Sea. As result of air attacks she was hit by a minimum of twenty torpedoes and seventeen bombs and had more than fifteen near misses. And four-and-a-half hours after the last attack the battleship went down with 1039 officers and men.

Yamato was hit by three 1000lb AP bombs during the attack. The first bomb penetrated the anchor deck and demolished the port chain locker and exploded below the waterline. Two other bombs hit turret No.1's 46cm guns and the next penetrated the FD deck to the crew's quarters. These did little damage and she was easily repaired.

25 October 1944: *Yamato* broke through the San Bernardino Strait to the east of the island chain. In the Battle of Samar Gulf *Yamato's* 46cm guns opened fire on the US escort carriers and destroyers. It was the first and the last of her battles with enemy ships. She fired a total of 104 rounds of 46cm projectiles, as a result of which one escort carrier and



Yamato or probably Musashi at Hashirajima in 1943.

one destroyer were sunk. In the Philippines the Imperial Japanese Navy not only failed to prevent the US forces from capturing the islands, but also suffered irretrievable damage.

After the battle, *Yamato* returned to Brunei Bay in Borneo, but not for a long time because of air raids by the Allied forces. She lost twenty-nine crewmen during these battles.

28 October 1944: Arrived at Brunei and refuelled from oilers.

15 November 1944: Battleship Division was disbanded; *Yamato* was assigned as the flagship of the Second Fleet.

16 November 1944: *Yamato* left Brunei for Kure with *Kongō*, *Nagato* and escorts.

23 November 1944: *Yamato* arrived at Kure.

25 November 1944: Drydocked at Kure for battle damage repairs and refit. Twenty-four single 25mm MG were removed and twenty-seven triple 25mm MG mounts were fitted – a total of 152 25mm MG barrels.

28 November 1944: *Shinano* left Yokosuka and made her way to Kure, where her fitting-out was to be completed.

29 November 1944: On the way *Shinano* was hit by four torpedoes and sunk; incomplete watertight compartmentation was the cause of her loss.



Admiral Isoroku Yamamoto with staff on Yamato under main gun turret.

1 January 1945: *Yamato*, *Haruna* and *Nagato* were assigned to the reactivated Battleship Division 1 of Second Fleet.

3 January 1945: *Yamato* was undocked.

15 January 1945: *Yamato* went from Kure to Hashirajima.

15 March 1945: *Yamato* returned to Kure.

19 March 1945: Under way in the Inland Sea, *Yamato* sustained minor damage by a hit on the bridge by a Helldiver dive-bomber from US aircraft carrier *Intrepid*.

29 March 1945 at Kure *Yamato* received sailing orders. She took aboard a full supply of ammunition – 1170 rounds for her 46cm guns, 1620 rounds for 15.5cm secondary guns, 13,500 rounds for 12.7cm HA guns and 1,500,000 for 25mm MG. She received fuel from the destroyers *Hanazuki* and *Asashimo*, and the light cruiser *Yahagi* from the destroyer *Hatsushimo*. *Yamato* had enough fuel for a one-way trip only.

2 April 1945: *Yamato* left Kure for anchorage at the Mitajiri Bight.

3 April 1945: The Second Fleet received a special order from the Commander-in-Chief of Combined Fleet Admiral Soemu Toyoda alerting it about a sortie to Okinawa.

4 April 1944: Last AA gunnery training.

5 April 1945: Operation 'Ten-Ichi-gō' (Heaven Number One) began. Ships

received the order: 'the surface Special Attack Unit is ordered to proceed via Bungo Strait Channel at dawn on Y-1 day to reach the prescribed holding position for a high speed run-in to the area west of Okinawa at dawn on Y-day. Your mission is to attack the enemy fleet and supply train and destroy them. Y-day is April 8th.' It was a very unusual and grim mission – a suicide mission.

15:00hr: Capitan Ariga informed his assembled crew about the sortie. Sixty-seven naval cadets were sent ashore and the sick and some of the older sailors were disembarked.

Yamato's theoretical task was to destroy the invasion fleet using her artillery or to run the coast of Okinawa and support the Japanese Army. To reach the Okinawa coast or take part in an artillery battle without her own air umbrella and in the face of vast numbers of Allied forces in the air and on the sea was an almost hopeless task. The Commander of the Task Force, Vice Admiral Seichi Ito, was opposed to the operation, the idea for which came from Admiral Toyoda, Commander-in-Chief of the Combined Fleet. But the mission of *Yamato* and the ships accompanying her was to be realised. With her specially selected crew, Samurai traditions, Samurai flag, and the 'Kikusui' Chrysanthemum crest (the crest of Masashige Kusunoki, loyalist hero and 14th century martyr) on her funnel, *Yamato* started out on her final voyage.

6 April 1945: *Yamato* left Mitajiri for the Tokuyama for her last refuelling.

15:20hr: *Yamato* left Tokuyama escorted by Destroyer Division 43 and as far as the Bungo Strait, the Surface Special Attack Force consisted of *Yamato*, light cruiser *Yahagi* and destroyers *Isokaze*, *Hamakaze*, *Yukikaze*, *Kasumi*, *Hatsushimo*, *Asashimo*, *Fuyuzuki* and *Suzutsuki*. The force sailed at a speed of 20 knots.

18.00hr: *Yamato* was in a state of readiness: with one-third of the crew at battle stations, and the remainder sleeping in the vicinity of their stations because of the reported presence of US submarines off the Bungo Strait.

7 April 1945: At night the Special Attack Force, zigzagging at 22 knots on a southerly course, passed the Miyazaki Coast and reached the entrance to Ōsumi Kaikyō Channel and then reduced its speed to 16 knots.

14 Mitsubishi A6M Zeke fighters provided air cover for about three hours from 06:30hr and then returned to base on Kyushu. *Yamato*'s Mitsubishi F1M2 floatplanes were launched (at ~06:00hr) and returned to Kyushu.

07:00hr: there was a ceremonial breakfast, and at 10:00hr radar contact was made with US planes, a state of readiness commanded and the ship closed up for action, with all doors, hatches and ventilators closed; even the escape manholes in the lower portion of the watertight doors were clamped shut. This took about five to seven minutes, after which she was ready for battle in every respect.



Yamato's officers near after part of the superstructure, at right the lower part of the rear tower bridge is visible, on the left, the base of HA 12.7cm guns.

08:40hr: Attack Force sighted several Hellcat fighters but they were not seen by the escorting Zekes.

10:14hr: Attack Force sighted two Martin Mariner flying boats and then turned towards Sasebo.

11:07hr: The operator of Type 13 radar on *Yamato* reported contact with a large aircraft formation at his radio set's maximum range of 63 miles; subsequently all ships increased their speed to 25 knots.

Although the US planes continuously observed the striking forces, an attack did not take place for about two hours. At 11:15hr *Yamato* and *Yahagi* opened fire at a speed of 24 knots and commenced a series of evasive manoeuvres. The Japanese force turned its course towards Okinawa at 11:29hr.

12:32hr: The first attack started and the destroyer *Asashimo* was sunk by aircraft from the US carrier.

12:35hr: *Yamato* stopped zig-zagging, increased her speed to 24 knots and opened fire from her 46cm guns using common 'San Shiki' projectiles and all AA guns.

12:40hr: *Yamato* was hit by two AP bombs in the vicinity of the main mast. Next, two 1000lb AP bombs hit her – the first exploded in the crew's quarters abaft the Type 13 radar shack, the second penetrated the port side of the aft Command Station and exploded between the 15.5cm gun magazine and No.3 upper powder magazine. All detonated above the 200mm

thick deck. The 15.5cm gun turret was completely destroyed – with only one survivor from the gun crew – and the 12.7cm gun turret was destroyed and many 25mm MGs were knocked out.

12:43hr: She was hit by two torpedoes at frames 150 and 125 and probably by a third torpedo at frame 190. After the hits her port list angle of about 5–6° was reduced to 1° by counter-flooding.

13:02hr: The second series of attacks started. *Yamato* was hit by three torpedoes on her port side, on frames 143, 124 and 131, and by one torpedo on starboard frame 124, with a probable hit on frame 148, port side. A port list of about 15–16° was reduced to 5° by counter-flooding, and the bomb hits (one a 1000lb on the fore port superstructure) were negligible.

At that moment all possible starboard compartments had been flooded. The torpedoes striking on the port side caused immediate flooding of No.8 and No.12 boiler rooms, the port outboard engine room and the port hydraulic machinery room. Her speed was not more than 18 knots.

13:45hr: The third series of attacks started. The battleship received more torpedo hits: two hits on frames 135 and 154, and probably frame 164, all on the port side, and one hit on frame 150 starboard. Again the bomb hits were negligible. The initial list was severe: some 16–18° to port and increasing rapidly. The Executive Officer ordered the flooding of the starboard boiler rooms No.3 and No.11 and the hydraulic machinery room. It had some effect and for the time being stopped the ship's list. Her speed slowed to 12 knots.

The hit on the starboard side had caused a leak in the starboard outboard engine room, the two port hits flooding the inboard port boiler room No.10 and the other starting a leak in the port inboard engine room. Soon the list started to increase – the starboard outboard engine room was abandoned and flooded. Only some of the engine room crew managed to leave the compartment. The port list angle was about 22–23°.

Yamato's speed reduced to 10 knots. The effect of the two new starboard torpedo hits, despite the loss of buoyancy, was to make the counter-flooding problem easier to handle and delay *Yamato's* sinking. She was steaming in a large circle and shortly after 14:00hr all power was lost. Temperatures in the aft ammunition magazines were indicated at the danger level, but it was not possible to flood one by the destruction of pumping stations.

14:02hr: The Commanding Officer and Captain Ariga gave an order to prepare to abandon ship.

The Fleet Commander Vice Admiral Ito ordered that the mission was cancelled and directed the remaining ships to pick up as many survivors as possible. The Emperor's portrait was removed.

14:05hr: The light cruiser *Yahagi*, hit by 12 bombs and seven torpedoes sank.



Yamato – officers on aircraft hangar platform.

Listing heavily to port, *Yamato's* exposed hull was hit by several more torpedoes. She rolled slowly over her port side on her beam ends. The list was increasing at an alarming rate.

14:23hr: Soon after the abandon order she began to sink with a list of 90°. When she reached an angle of 120° a gigantic explosion in the fore ammunition magazines tore the ship into two parts and some seconds after there was a second underwater explosion of the rear ammunition magazines.

The huge mushroom of smoke reached a ceiling of 6000m and the fire could be seen by sentries on Kagoshima, more than 200 km away.

Vice Admiral Ito and *Yamato's* skipper Captain Ariga and 3055 of 3332 crewmen were lost. Only 277 men were rescued. From the remaining ships of the Attack Force, 1187 crewmen were lost (along with *Yahagi* and four destroyers).

Yamato sank in the East China Sea at 30–22N, 128–04E in water 350m deep.

31 August 1945: *Yamato* was removed from the Navy List



Yamato's officers near fore starboard part of the superstructure – end of 1944.

IJN BATTLESHIP *MUSASHI*

June 1937: Nagasaki Navy Yard was ordered to build the second gigantic battleship (hull No.800) provisionally designated 'Warship No.2'.

The slipway on which the hull was built was covered by a sisal rope curtain to hide it. The rope was 2710km long and weighed 408 tons.

29 March 1938: Japan's second superbattleship 'Warship No.2' is laid down in Mitsubishi Nagasaki Yard. The first section of the keel structure placed on the slipway No.2 is 21m long.

1 November 1940: Secret launching ceremony. The hull weighed 35,737 tons and was second only to the 37,287 tons of the British passenger liner *Queen Mary*. For security reasons Warship No.2's new freighter *Kasuga Maru* (later escort carrier *Taiyō*) was towed alongside the battleship to block her silhouette from any foreign eyes. A combined force of 1800 policemen, IJ Army Military Police (Kempeitai), and sailors of the Sasebo Sailor Corps patrolled near the shipyard to ensure maximum secrecy during the launch. Following the launch the battleship was moved off Mukojima for fitting out.

On this day the 'Warship No.2' was named *Musashi*.

29 December 1940: Preliminary hull weighing conducted to determine the centre of gravity.

26 May 1941: The fitting of the deck and side armour was completed.

1 July 1941: *Musashi* left Nagasaki Navy Yard for Sasebo under tow by seven tugs.



2 July 1941: *Musashi* arrived at Sasebo; until 21 July she was drydocked in No.7 dry dock, where the main rudder and propellers were attached and the bottom painted.

1 August 1941: *Musashi* departed Sasebo for Nagasaki towed by fleet oiler *Shiretoko*, and moored the next day at Mukojima wharf.

6 October 1941: IJN special ammunition ship *Kashino* arrived from Kure, carrying the first part of the 46cm guns and one turret. Once aboard, the turret and guns were covered by canvas to maintain secrecy. By 8 December, all nine guns in turrets were installed on *Musashi*.

20 April 1942: After the first bombing of Japan by a 'Doolittle raid', Captain Arima of *Musashi* was ordered to form a skeleton crew to man the AA guns in case of an emergency. All (some hundred sailors) were permanently stationed aboard the ship.

7 May 1942: The permanent crew was transferred to the *Musashi*.

20 May 1942: *Musashi* left Nagasaki for Kure, carrying 1700 crewmen and 1500 engineers and builders from the Mitsubishi yard. The 25mm MG triple mounts were test-fired while the ship was under way.

26 May–9 June 1942: *Musashi* was drydocked in Kure at No.4 dry dock.

18–26 June 1942: The first stage of acceptance and speed trials in Iyo Nada. On 22 June *Musashi* achieved 28.5 knots in an overloaded condition at 70,358 tons displacement on Sata Misaki mile. She returned to Kure after the tests of the counter-flooding system.

27 June–23 July 1942: Kure Navy Yard – twelve unshielded 25mm MG (4 x 3) were added on the forecastle deck (FD) forward and aft of the 15.5cm wing turrets.

24 July 1942: *Musashi* departed Kure for the second stage of trials in Iyo Nada in the calibration, firing and research of the blast of the main turrets, and on 30 July returned to Kure.

5 August 1942: *Musashi* completed and attached to Yokosuka Naval District.

Yamato (left) and *Musashi* (right) at Truk in May 1943.

The commissioning ceremony was held at 09:00hr. *Musashi* was assigned to the Combined Fleet's Battleship Division 1 with *Yamato*, *Nagato* and *Mutsu*, Captain Arima was the Commanding Officer.

10 August 1942: *Musashi* arrived at Hashirajima anchorage and departed on 18 August for Heigun Island in Iyo Nada, conducting additional exercises in the Inland Sea and returning to Hashirajima on 20 August.

3–23 September 1942: At Kure – Type 21 Mod.3 surface fire-control radar was fitted on the 15.5m rangefinder arms of the tower bridge. She returned to Hashirajima on 29 September.

2–22 October 1942: At anchorage at Hashirajima, *Musashi* departed for manoeuvring exercises.

28 October–1 November: *Musashi* participated in gunnery trials in Suō Nada Sea with *Nagato*, *Ise*, *Hyūga*, *Fusō* and *Yamashiro*, departing from Hashirajima for Kure.

In the next few days she undertook a series of radar-controlled gunnery exercises in the Suō Nada Sea, departing from Murozumi Bight on the Inland Sea

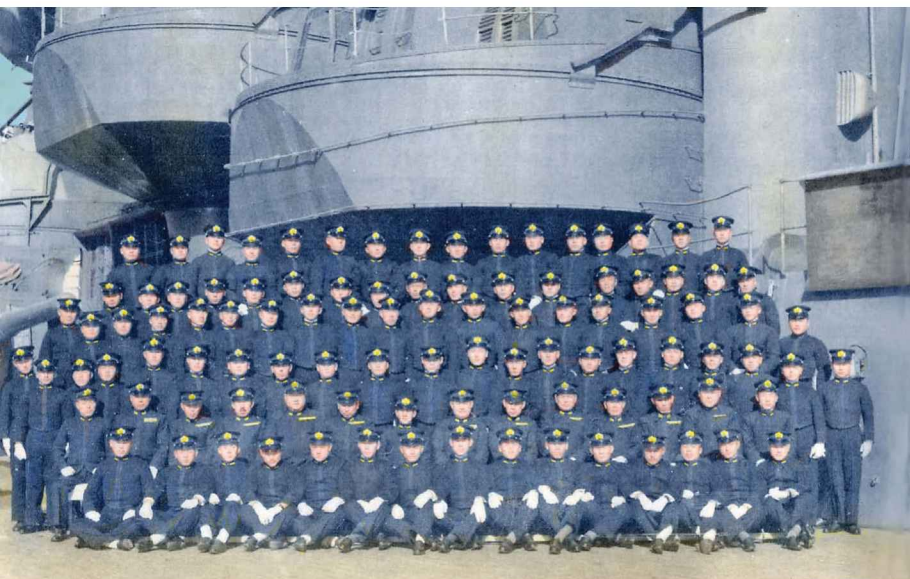
3 December 1942: *Musashi* returned to Hashirajima after several short trips between Tokuama Bay, Kure and Hashirajima.

18 January 1943: *Musashi* departed Kure for Truk with aircraft carriers *Zuikaku* and *Zuihō*, light cruiser *Jintsu* and three destroyers, She was carrying over a hundred midshipmen, and arrived at Truk on 22 January.

11 February 1943: At Truk *Musashi* relieved her sister-ship *Yamato* as flagship of Admiral Isoroku Yamamoto's Combined Fleet.

1 April 1943: Operation 'I-gō' for the reinforcement of Rabaul began.

3 April 1943: Admiral Yamamoto and his staff departed from Truk for Rabaul. They were expected to return to *Musashi* on 19 April.



Musashi officers near aft port side part of the superstructure in 1943.

18 April 1943: 18 Army Air Force P-38s fighters over Bougainville shot down Admiral Yamamoto's bomber Mitsubishi GM4 Betty and a second Betty with Vice Admiral Matome Ugaki which survived. This US army operation 'Ultra Codebreaker' was authorized by President Roosevelt.

23 April 1943: A flying boat carrying the ashes of Admiral Yamamoto and six of his staff officers arrived on *Musashi*. The ashes were secretly transferred to the Admiral's sea cabin.

17 May 1943: Admiral Mineichi Koga, the new chief of the Combined Fleet, sortied from Truk for Yokosuka in response to the Attu invasion with Battleship Division 1's *Musashi*, Battleship Division 3's *Kongō* and *Haruna*, heavy cruisers *Tone* and *Chikuma*, aircraft carrier *Hiyō* and five destroyers. *Musashi* also carried Admiral Yamamoto's ashes for a state funeral. *Musashi* dropped anchor at the Kisarazu Bight on the evening of 22 May and a Budist ceremony was held aboard. Yamamoto's ashes were sent ashore the next day aboard destroyer *Yūgumo*.

23 June 1943: *Musashi* returned to Yokosuka for overhaul and over-painting.

24 June 1943: Between 11:03hr and 14:25hr *Musashi* was visited at Yokosuka by the Emperor and other officials. It was a top-secret event; nevertheless, the Imperial flag was hoisted. Admiral Mineichi Koga hosted Emperor Hirohito and his brother Prince Nobuhito Takamatsu, Marquis Koichi Kido, Admiral Shigetaro Shimada, Admiral Osami Nagano, Admiral Soemu Toyoda, Vice Admiral Toshisuke Sugiyama, Admiral Nishizo Tsukahara, Minister Tsuneo Matsudaira and other officials.

A festive dinner was enjoyed. Later, the Emperor visited the crew's quarters

and an AA defence station on the tower bridge. It seems likely that the Emperor used *Musashi*'s elevator to reach it.

25 June 1943: *Musashi* left Yokosuka for Kure and arrived there on 27 June.

1 July to 8 July: *Musashi* drydocked for some repairs and bottom cleaning.

14 July 1943: *Musashi* departed Kure for trials and returned to Hashirajima and in the next few days to Kure and Yokosuka.

31 July 1943: *Musashi* departed Yokosuka for Truk with Destroyer Division 10 and arrived at Truk on 5 August.

18 September 1943: Flagship *Musashi* remained at Truk with *Fusō*, *Kongō* and *Haruna*.

5–6 October 1943: US Task Force launched a raid on Wake and Marshall Islands.

17 October 1943: Admiral Koga sortied from Truk to intercept the enemy carriers with First Battleship Division; *Yamato* and *Musashi*, Second Battleship Division; *Fusō* and Third Battleship Division; *Kongō* and *Haruna*, three aircraft carriers *Shōkaku*, *Zuikaku* and *Zuihō* and eight heavy cruisers, *Atago*, *Takao*, *Maya*, *Chōkai*, *Suzuya*, *Mogami*, *Chikuma*, *Tone*, light cruisers *Agano*, *Noshiro*, *Ōyodo* and destroyers.

19 October 1943: the fleet arrived at Brown Atoll, Eniwetok.

23 October 1943: The fleet departed Brown Atoll and sortied to a position 25 miles south of Wake. After no contact with enemy forces, the fleet returned to Truk on 26 October.

10 February 1944: *Musashi* departed Truk for Yokosuka escorted by light cruiser *Ōyodo* and four destroyers, with Admiral Mineichi Koga on board.

15 February 1944: *Musashi* arrived at Yokosuka. That evening she commenced embarkation of ammunition, provisions and fuel for the garrison of Palau. No less than 40 Isuzu and Nissan trucks were embarked on the afterdeck. The transfer of cargo continued until 24 February.

22 February 1944: Yokosuka, *Musashi* embarked the 300-strong IJN 87th AA Defence Unit, a 100-strong Army unit and other personnel, including some IJN staff officers destined for re-assignment to Palau. At 10:00hr she departed Yokosuka for Palau escorted by three destroyers. Off Hachijō-jima the group encountered a typhoon and had to reduce speed from 18 to about 6 knots, after some sailors from the destroyer *Shiratsuyu* were washed overboard.

25 February 1944: First Battleship Division's *Yamato* and *Musashi* were reassigned from the First Fleet to the Second Fleet.

29 February 1944: *Musashi* arrived at Koror anchorage on Palau, where her cargo, including 3800 mines, was unloaded.

11 March 1944: At Palau, *Musashi* received fresh provisions from the supply ship *Kitakami Maru*.

29 March 1944: *Musashi* departed from Palau to avoid an anticipated air raid and moved towards the north of the island. She sailed in the company of cruisers *Atago*, *Takao* and *Chōkai* escorted by eight destroyers and awaited the force at the entrance to the channel. At 17:44hr, *Musashi* cleared the western channel when she was hit in the port bow about 20 feet below the waterline by one of six torpedoes fired by USS *Tunny* (SS-282). The torpedo punched a hole about 10 feet in diameter in her bow. The forward windlass room and the Type 'O' hydrophone compartment were flooded. Eighteen crewmen were killed and 7 hydrophone operators. The bow was flooded by about 3000 tons of water, but she continued making 24 knots.

However, Admiral Koga Staff forbade her to return to Palau. As soon as the damaged sections were shored up, *Musashi* departed from Palau that night for Kure escorted by three destroyers.

3 April 1944: *Musashi* arrived at Kure at 09:34hr.

10 April 1944: *Musashi* entered Kure dry dock No.4 where repairs were made to the hull along with the first modernisation of her armament since 22 April.

The two 15.5cm wing turrets were removed and two 150cm searchlights (No.7 and No.8) were removed. With new 25mm MG (16 x 3) and (25 x 1), the number of MG increased to 115 (30 x 3) and (25 x 1). Plans for fitting an additional twenty (6 x 2) 12.7cm HA guns on the new side superstructures were not realised. On the planned 12.7cm stands, 6 x 3 25mm MG were installed. Two Type 22 surface-search radars and two Type 13 air-search radars were fitted. The two searchlights which had been removed, were later installed for use by Sasebo's AA batteries.

27 April 1944: *Musashi* tested radar and AA guns in the Western Inland Sea.

1 May 1944: *Musashi* departed from Kure for Saeki, carrying supplies destined for the garrison of Okinawa, and conducted anti-submarine and AA exercises on route.

11 May 1944: *Musashi* departed Saeki for Okinawa, and joined aircraft carriers *Hiyō*, *Junyō*, *Ryuhō*, *Zuihō*, *Chiyoda* and *Chitose* plus four destroyers, and sailed to Okinawa.

12 May 1944: *Musashi* arrived at Nakagusuku Bay (Okinawa) and unloaded her cargo, and next sailed for Tawitawi (Sulu Sea), the operating base of the Mobile Fleet. She arrived there on 16 May. The First Battleship Division; *Yamato* and *Musashi* participated in gunnery exercises at a range of almost 22 miles.

10 June 1944: Operation 'KON' for the relief of Biak started. *Musashi* along with *Yamato*, the light cruiser *Noshiro* and three destroyers, made for Batjan on Halmahera Island.

12 June 1944: The US Invasion of the Marianas began and Operation 'KON' was postponed.

The force arrived at Batjan where it was joined by *Haguro* and *Myōkō* and one destroyer. *Musashi* was grazed by the fleet oiler *Genyō Maru* and as a result two port-side 25mm MG triple mounts were wrecked.

13 June 1944: The force departed from Batjan to rendezvous with the Mobile Fleet. The next day, north of Halmahera, after returning from anti-submarine patrol, *Musashi's* floatplane F1M2 capsized, but its crew was rescued.

19 June 1944: Operation 'A-Gō' began – the Battle of the Philippine Sea.

Yamato and the other ships mistakenly damaged four Zeke fighters but *Musashi* was one of the few ships whose lookout correctly identified the overflying planes in time.

20 June 1944: *Musashi* provided AA support for the retreating aircraft carrier *Zuihō* and next day fired several main guns (common projectiles) at a formation of twenty attacking Helldivers from her aft turret, destroying two dive-bombers. At the same time *Musashi's* 25mm MG gunners shot down by mistake one A6M5 'Zero' fighter.

24 June 1944: *Musashi* arrived at Nakagusuku Bay, Okinawa, for refuelling, then, escorted by destroyers, departed from Okinawa for Japan the next day.

29 June 1944: *Musashi* departed from Hashirajima for Kure with *Yamato*, arriving at Kure that same day.

2 July 1944: *Musashi* embarked armaments, ammunition and provisions. Five additional 25mm triple MG mounts were installed (the total number of 25mm guns was 130). The Type 22 radar was replaced by Type 22 Mod. 4 with a limited fire-control capability. 2200 infantrymen were embarked.

8 July 1944: After embarking 3522 men and materials of the IJ Army 49th Division's 106th Infantry Regiment on *Yamato* and *Musashi*, both battleships departed from Kure for Okinawa along with Cruiser Division 4's *Atago*, *Takao*, *Maya* and *Chōkai*, Cruiser Division 7's *Kumano*, *Suzuya*, *Tone* and *Chikuma*, light cruiser *Noshiro* and destroyers as Group 'A', departed Kure. Two hours later Group 'B' consisting of *Kongō*, *Nagato*, *Mogami*, *Yahagi* and destroyers.

10 July 1944: Group 'A' and Group 'B' arrived at Nakagusuku Bay, *Musashi* refueled four destroyers. At evening Group 'A' departed Nakagusuku Bay for Lingga (near Singapore).

16 July 1944: *Musashi* and *Yamato* were detached from Group 'A' and sailed directly to Lingga, escorted by three destroyers. After arriving at Lingga *Musashi* transferred her soldiers and cargo to the 5,289-ton cargo ship *Zuishō Maru*.

19 July 1944: At Lingga the battleships joined the Mobile Fleet.

12 August 1944: Captain Toshihara Inoguchi ordered *Musashi* to be painted a new darker colour.

1, 15, 24 September 1944: While staying on Lingga anchorage *Musashi* received fresh provisions from the supply ship *Kitakami Maru*.

3 October 1944: *Musashi*, *Yamato* and *Nagato* were transferred to Galang – No.3 anchorage north of Lingga. While entering the anchorage *Musashi* grazed an unmarked sandbar and her pit sword became clogged, disabling the pitometer log temporarily. During the next few days *Nagato* ferried the sailors from both superbattleships to Singapore where they enjoyed shore liberty.

6 October 1944: *Musashi* received fresh provisions from *Kitakami Maru*.

15 October 1944: The First Battleship Division's *Musashi* and *Yamato* returned to Lingga anchorage.

18 October 1944: Black deck camouflage intended for the night breakthrough in the San Bernardino Strait was hastily applied to both *Musashi* and *Yamato*. The main component was soot from stacks.

18–20 October: Both superbattleships departed Lingga for Brunei Bay, Borneo.

22 October 1944: Operation 'Shō-Ichi-Gō' (victory) – The Battle of Leyte Gulf – started. The force sortied from Brunei towards the Philippines with Vice Admiral Takeo Kurita's First Mobile Striking Force, Force 'A': First Battleship Division – *Yamato*, *Musashi*, *Nagato*, Cruiser Division 4 and 5 and destroyers.

23 October 1944: During the Battle of the Palawan Passage the Vice Admiral flagship cruiser *Atago* was sunk and the cruiser *Takao* was damaged. Kurita transferred to *Yamato* and resumed command of the First Attack Force. Heavy cruiser *Maya*'s 796 surviving crewmen were picked up by destroyer *Akishimo* and transferred to *Musashi*.

24 October 1944: 'The Battle of the Sibuyan Sea'.

07:43hr: The Centre Force assumed the AA cruising formation, divided into two concentric rings and *Musashi* was stationed on the starboard side of the leading No.1 unit.

08:10hr: Lookouts on *Musashi* reported sighting three Consolidated PBV Catalina patrol bombers.

The air alarm was sounded. A search plane from CV-11 USS *Intrepid* was sighted.

For the next hour, *Musashi* attempted unsuccessfully to jam the plane's radio reports.

10:18hr: Lookouts sighted over 40 enemy carrier planes on bearing 110.

10:25hr: *Musashi* opened AA fire.

10:27hr: *Musashi*, making 24 knots, was attacked by eight Helldivers from *Intrepid*.

Four near misses around the bow caused minor leaks below the waterline. One 600lb bomb hit turret No.1 of 46cm guns but failed to penetrate its roof armour.

10:29hr: Three Avengers from USS *Intrepid* attacked *Musashi* and one torpedo hit starboard frame 130 and quickly flooded the voids in outboard No.9 boiler room causing an initial list of 5.5° which was reduced to about 1° by counter-flooding. Shock damage disabled some instruments in the main turret plotting room. During this attack *Musashi* fired 48 15.5cm and 160 12.7cm rounds at the US aircraft.

11:54hr: *Musashi*'s Type 13 air-search radar detected approaching enemy planes on bearing 290, range 81 kilometres.

11:57hr: Another contact was made with aircraft bearing 210, range 80.

12:03hr: US planes were sighted.

The second attack by eight Helldivers from *Intrepid* caused two bomb hits and five near misses. A hit at frame 15 to port destroyed the crew toilet and washroom and curled up the port bow deck plates. The second bomb penetrated three decks and detonated at frame 138 port and started a fire in the engine room and boiler rooms No.11 and No.12. The damage resulted in the loss of the port inboard shaft. *Musashi*'s speed fell off to 22 knots. Two Helldivers were shot down.

12:06hr: Nine Avengers launched a 'hammer and anvil' attack; one from this group was hit by flak and turned away. The eight remaining Avengers scored three hits on *Musashi* on the port-side at frames 82, 102 and 140. The first torpedo struck near the citadel of No.1 main gun turret, the second flooded the hydraulic machinery compartment No.2 and the third torpedo flooded engine room No.4. Nearby compartments were shored up and the main guns went over to the reserve hydraulic pumps. After immediate counter-flooding, the list was reduced to one degree port, but *Musashi* was down about 2m by the bow. Her three remaining propellers were throttled up for a maximum speed of 22 knots. The bow trim was reduced to 1m.

During this attack, *Musashi* switched over to her second main armament director. She fired nine 46cm type common (San Shiki) shells, seventeen 15.5cm and over two hundred 25mm rounds.

After the first main gun salvo, a bomb fragment (splinter) penetrated the muzzle of the middle 46cm gun barrel of turret No.1 and detonated a common-type shell that had just been loaded.

The resulting explosion disabled the turret's elevating machinery, rendering it inoperable.



After this, the remaining two turrets fired 45 'San Shiki' shells of the 54 that were fired in the battle.

13:12hr: Vice Admiral Kurita ordered the fleet speed reduced to 22 knots so that *Musashi* could keep up.

13:31hr: A third attack took place, this time by 29 aircraft from the US aircraft carriers *Essex* (CV-9) and *Lexington* (CV-16). *Musashi* was strafed by two Hellcats and four Helldivers which scored two near hits starboard amidships and abreast the aft main gun turret No.3 that caused casualties among the nearby AA gun crews.

Six Avengers launched three more 'hammer and anvil' attacks. The first torpedo hit the starboard side at frame 60 and ripped into the ship's shell, forward of the side protection system.

The blast from the explosion penetrated the fuel tanks and watertight compartments, and wrecked the log and sounding rooms. A temporary hospital at the bow filled with carbon monoxide. There were many casualties. Next, three Helldivers scored four bomb hits on the port side near main gun turret No.1.

Another torpedo hit the starboard bow area and flooded store rooms and caused a further list to starboard. The third torpedo hit the port side forward of the main gun turret No.1 and the fourth hit port amidships.

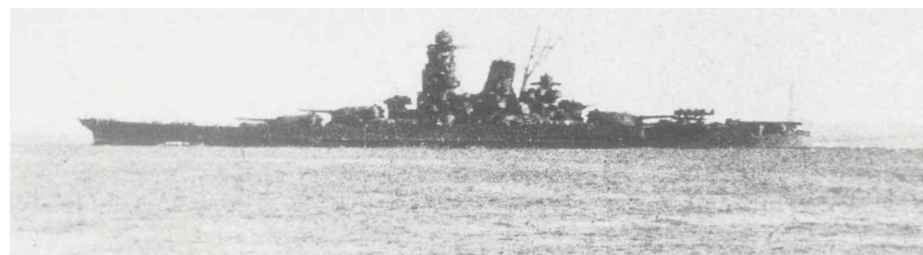
13:50hr: The third attack ended; the heavy list to starboard was reduced by counter-flooding to about one degree (1°). The ship's bow was now down about 4m although all trim tanks were filled. *Musashi*'s speed was reduced to 20 knots. During this attack she fired 35 46cm common shells, 79 15.5cm shells and over 500 25mm rounds.

14:12hr: A fourth series of attacks started, and was directed against *Yamato* and *Nagato* by eight Hellcats and 12 Helldivers from the aircraft carrier *Essex*.

Yamato during the Battle of Leyte Gulf on October 1944, Photo taken by attacking US aircraft. Note the black camouflage on her wooden deck (and probably main gun turret No.1) intended for the night breakthrough in the San Bernardino Strait.

14:55hr: A fifth attack by 69 aircraft from USS *Enterprise* (CV-6) and USS *Franklin* (CV-13) began against Vice Admiral Kurita's fleet.

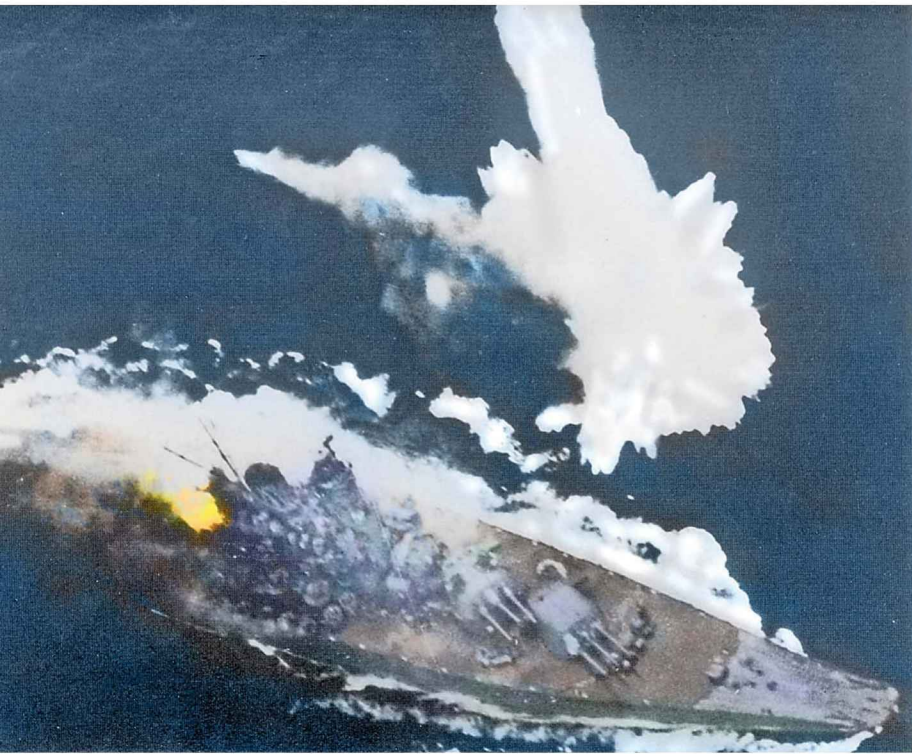
15:15hr: Nine Helldivers from USS *Enterprise* scored four 1000lb AP bombhits and a dozen near misses on *Musashi*. The first three struck in the port bow area and caused damage below decks and this damage was dealt with by the damage control team. The fourth bomb wrecked the Chief Steward's



Upper photo: *Musashi* on 22 October 1944 at Brunei. Lower photo: The last view of *Musashi* in the late afternoon of 24 October 1944 before her sinking at 19:36hrs



The Battle of the Sibuyan Sea on 24 October 1944. This photo was taken at the moment Yamato was hit by two bombs near main gun turret No.1. Her sister-ship Musashi was sunk in this battle.



The last battle of Yamato on 7 April 1945. In this photo she is turning sharply at high speed. Fire and smoke is visible, caused by the bomb which hit the after 15.5cm gun turret. A bomb detonates in water on her port side.

room. An attack by eight Avengers resulted in four torpedo hits – two torpedoes to port and starboard near frame 70. The next two torpedoes hit around frame 110 and at frame 138. The hits flooded cooling machinery room No.3 and the hydraulic machinery compartment. She was down about 4m by the bow and making 16 knots on three shafts. After counter-flooding her starboard list was deduced to 1–2°, but her speed fell off to 13 knots.

15:25hr: A sixth attack on the fleet began. Thirty-seven aircraft attacked *Musashi*. Three Helldivers from USS *Franklin* scored two 500lb bomb hits. Next, nine Avengers attacked her and two were shot down.

15:30hr: Seven Helldivers and two Avengers from USS *Intrepid* attacked *Musashi*.

One 500lb bomb penetrated the right wing of the air defence station and detonated on the tower bridge. The bridge and the adjacent operations room were set on fire. Fifty-two crewmen were killed and twenty wounded, including *Musashi*'s captain Rear Admiral Toshihara Inoguchi. After the fire was extinguished, Admiral Inoguchi assumed command from the second aft bridge.

The next three bombs detonated in a row port side on the forecastle deck, abreast the forward main gun turrets and knocked out two single and one triple 25mm MG mounts, the main communications room, telegraph room No.1 and the telephone room. The blast penetrated boiler rooms No.4 and No.8.

The next two bombs exploded on the forecastle deck starboard, abreast the superstructure. They wrecked two single and one triple 25mm MG mounts. The seventh bomb hit the middle AA gun crew shelter, causing extensive damage on the flag deck. The eighth bomb exploded in the port-side crew's space No.5 and demolished the nearby hospital. The ninth bomb struck the main gun turret No.1, and the tenth bomb exploded in the starboard officer's wardroom. Six near-miss bombs caused more damages to the hull's steel plating.

Although the bomb caused numerous casualties and much damage to the superstructure, *Musashi* was finally sunk by an additional 11 torpedo hits:

Three torpedoes struck the port-side frames 40, 60 and 75 causing extensive damage and flooding forward starboard area, including flooding in the No.4 bilge-pump room. The first of these torpedoes hit abreast main gun turret No.1 and flooded its lower powder-handling room. The second torpedo slowly flooded port boiler rooms No.8 and No.12.

The next four torpedoes struck port side on frames 125, 145, 140 x 3, 165, further flooding boiler room No.8 and the aft 25mm ammunition magazine. A 30-foot long section of the ship's side was gouged out. The engine room No.4 was flooded, causing *Musashi* to lose her outer port-side shaft. Her speed fell off to 6 knots.

Next the final torpedoes struck at starboard frames 80 and 105.

Musashi developed a 10° list to port. The crew counter-flooded again and reduced the list to 6°. Her main steering engine was shorted out temporarily and her main rudder jammed at 15° left.

Musashi sustained a total minimum of 20 torpedo hits and a minimum of 17 bomb hits and 18 bomb near misses.

16:21hr: Vice Admiral Kurita's force again approached *Musashi*. She was heading north with a 10° list to port, was down by the bow more than 26 feet, with her forecastle deck awash. Vice Admiral Kurita dispatched the heavy cruiser *Tone* and destroyers *Shimakaze* and *Kiyoshimo* to escort her.

All free hands and the wounded were assembled topside starboard to counter the list.

The port main anchor was dropped into the sea. Rice and other consumables were loaded on the starboard side. In a last attempt to reduce the list in the crew's spaces starboard aft, some boiler rooms and starboard outboard engine room No.3 were flooded using the Kingston valves. As a result, *Musashi* lost another shaft. Rear Admiral Inoguchi attempted to beach *Musashi*, but her engines stopped before his order could be carried out.

19:15hr: When the list reached 12°, Rear Admiral Inoguchi gave the order to: 'standby to abandon ship'. The Executive Officer Captain Kenkichi Katō assembled the crew on the afterdeck. The battle flag was lowered. The destroyer *Shimakaze* removed 635 live (of 796) survivors of *Maya*, taken aboard *Musashi* a day earlier.

Rear Admiral Inoguchi retired to his cabin and was not seen again.

19:30hr: After her list reached 30° to port, *Musashi* slowly started to turn over. Captain Katō gave the order to abandon ship. He ordered the Emperor's portrait removed.

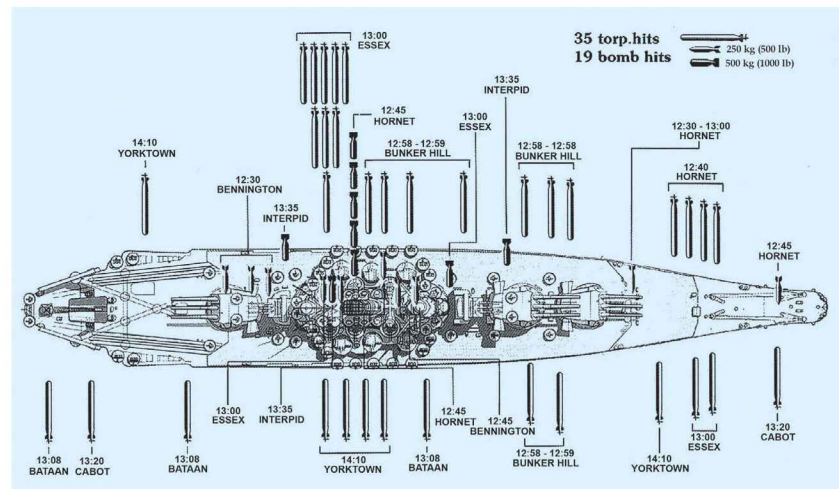
19:36hr: *Musashi* capsized with a sharp lurch to port and began sinking by the bow.

For some moments her stern was about 40–50m above the sea surface and her two propellers slowly turning were visible as the *Musashi* slid below the water. A short time after she disappeared from the sea surface two giant underwater explosions were heard.

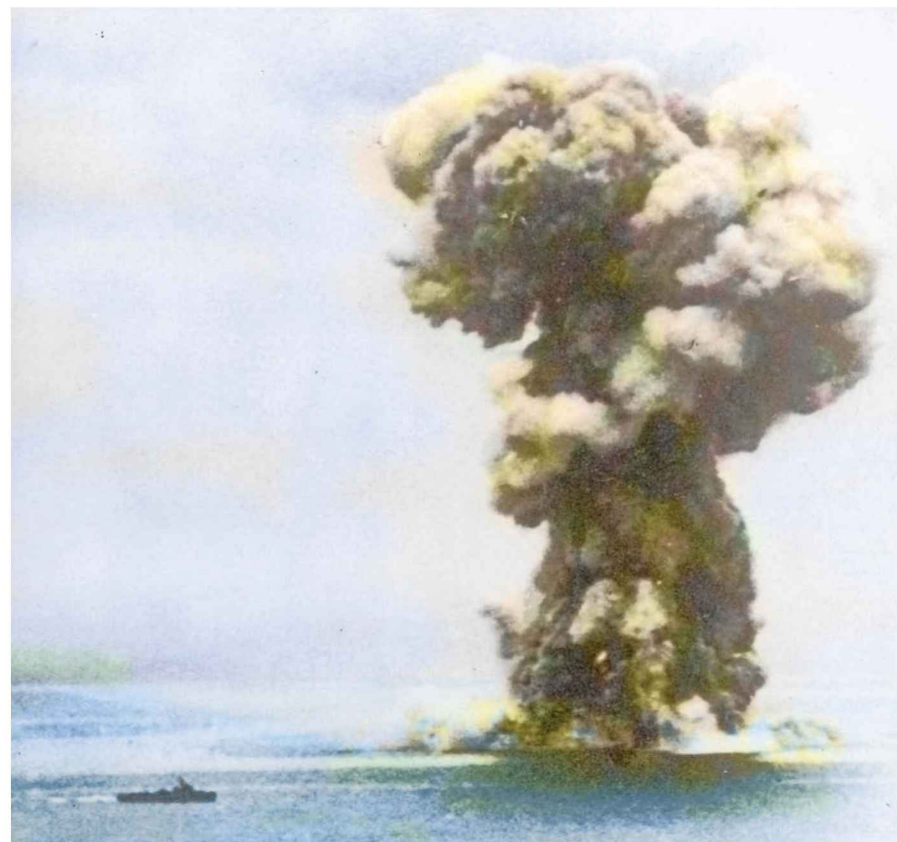
Musashi sank in the Sibuyan Sea at 13–07N, 122–32E in 1300m-deep water.

Destroyers *Kiyoshimō*, *Isokaze* and *Hamakaze* rescued 1376 survivors but 1023 crewmen were lost from her 2399 men. This number of *Musashi*'s crewmen looks somewhat understated in comparison with her sister ship *Yamato*, so perhaps only the number of survivors was correct.

The loss of the *Musashi* was for a long time a top secret in Japan. She was removed from the IJ Navy list on 31 August 1945.



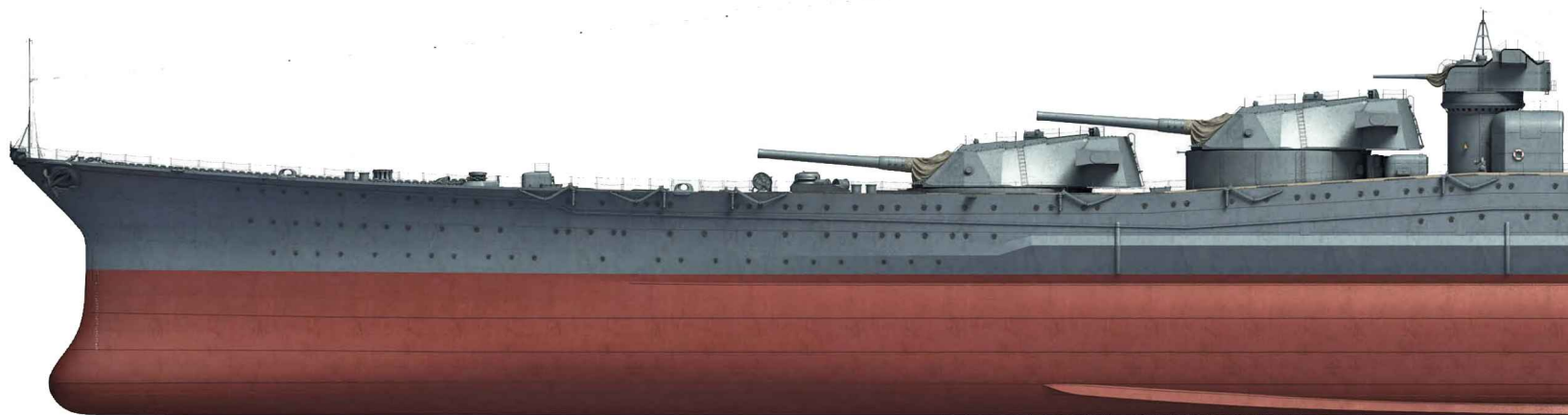
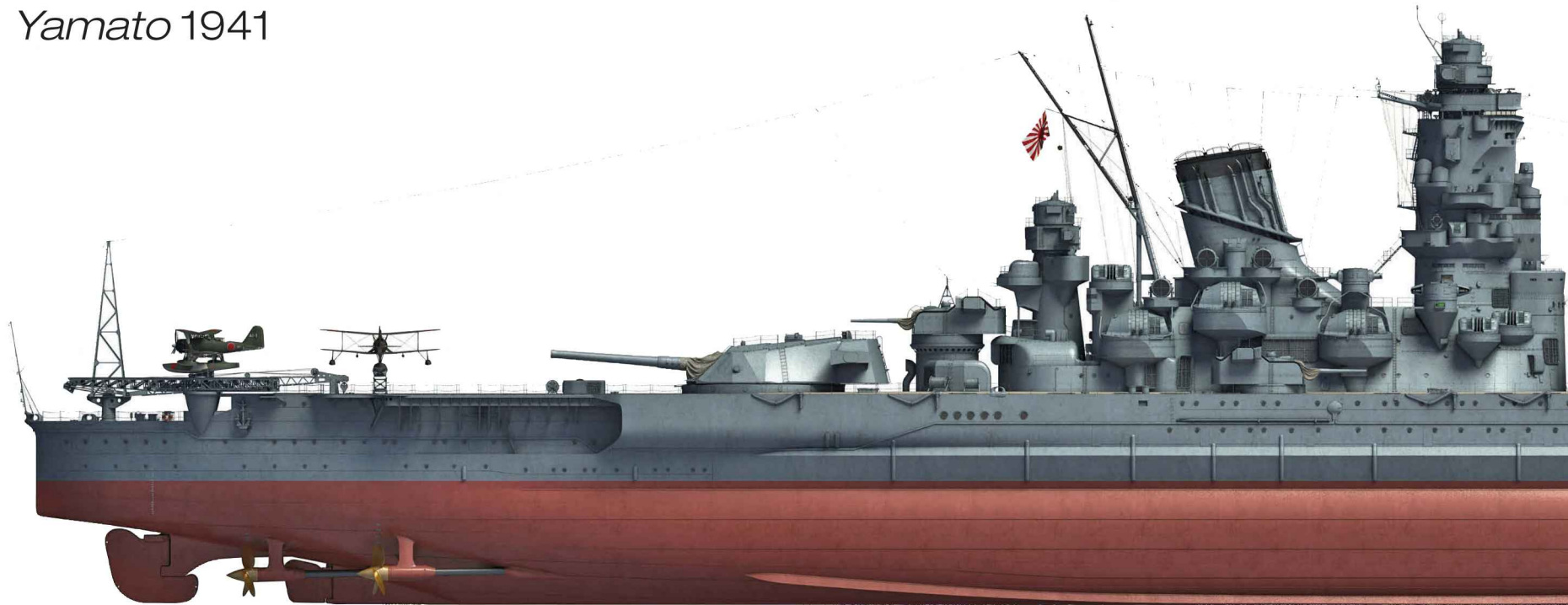
The hits on Yamato in her last battle. (From a new calculation by Gakken)

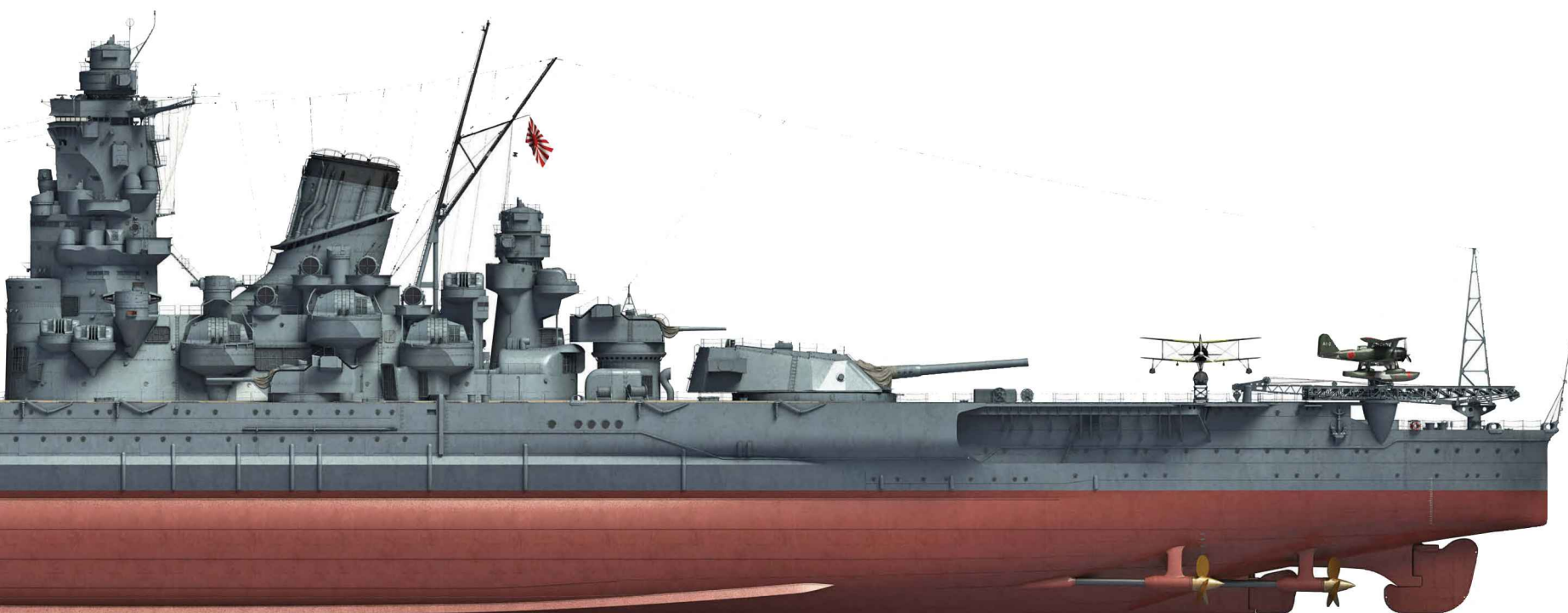
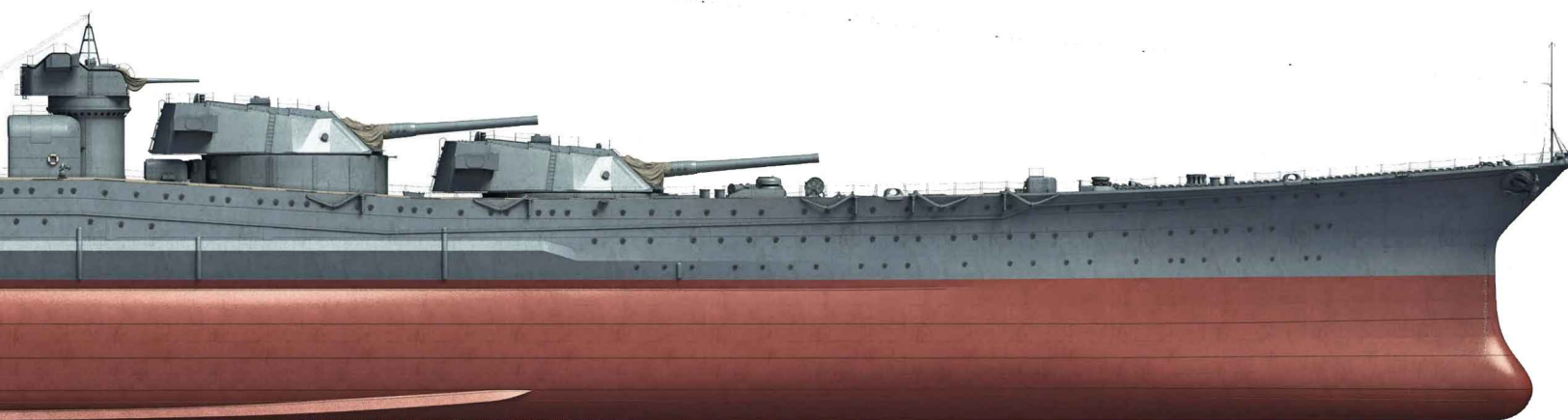


14:23hrs. Yamato's fore ammunition magazines exploded and some seconds later, the rear magazines also exploded. The huge mushroom of smoke reached a ceiling of 6000m. It was seen by sentries on Kagoshima more than 200km away. The fore magazine would have contained about 250 tons of cordite and 800 rounds for the secondary guns, as well as many tons of HA and MG rounds.

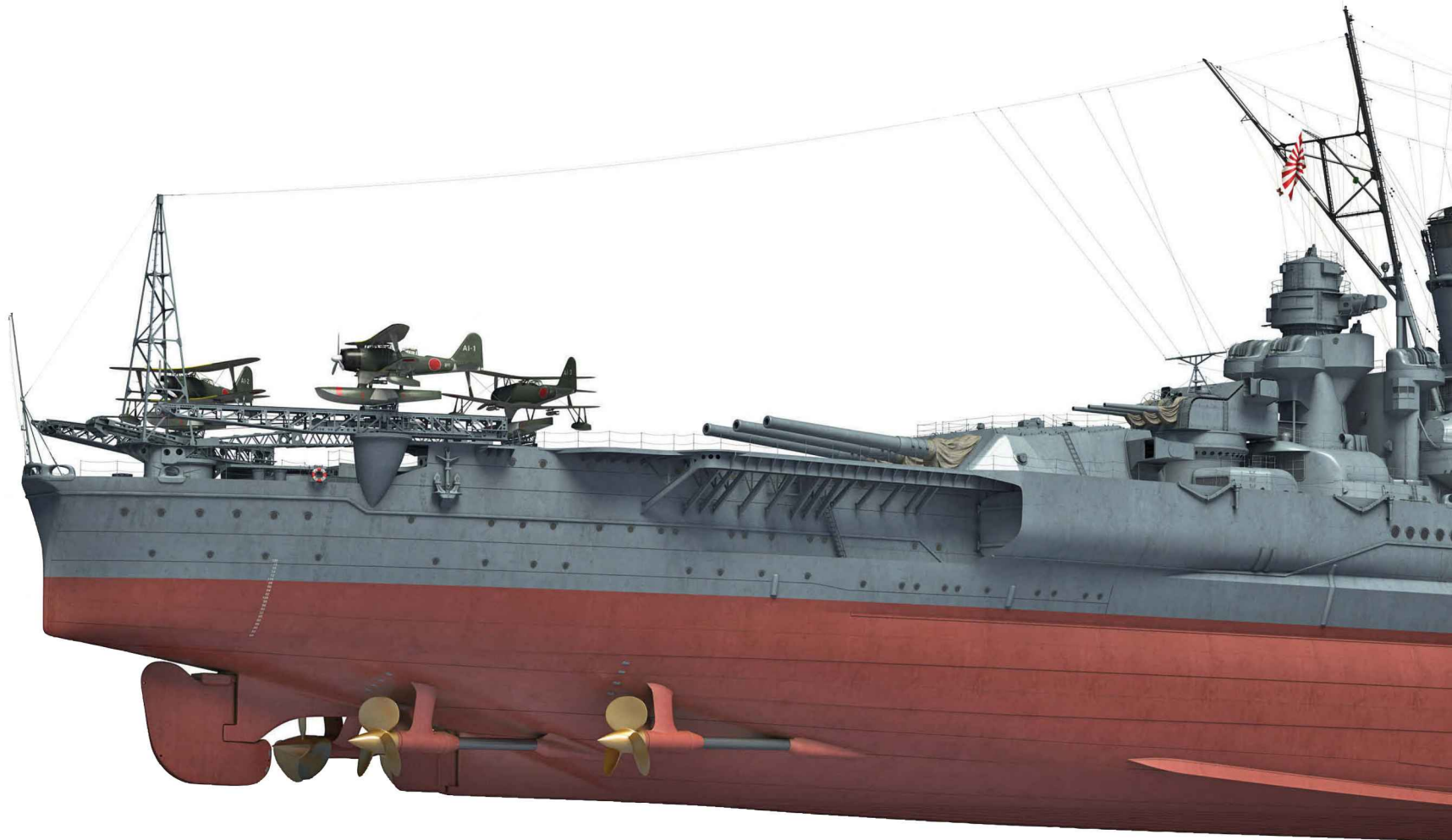
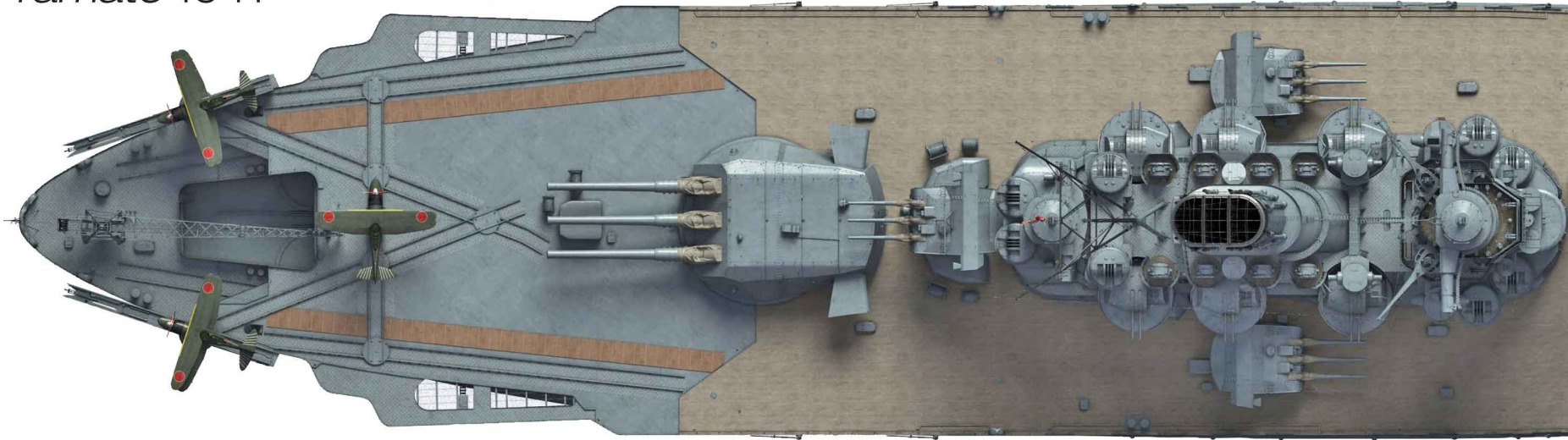
YAMATO AND MUSASHI PRIMARY VIEWS

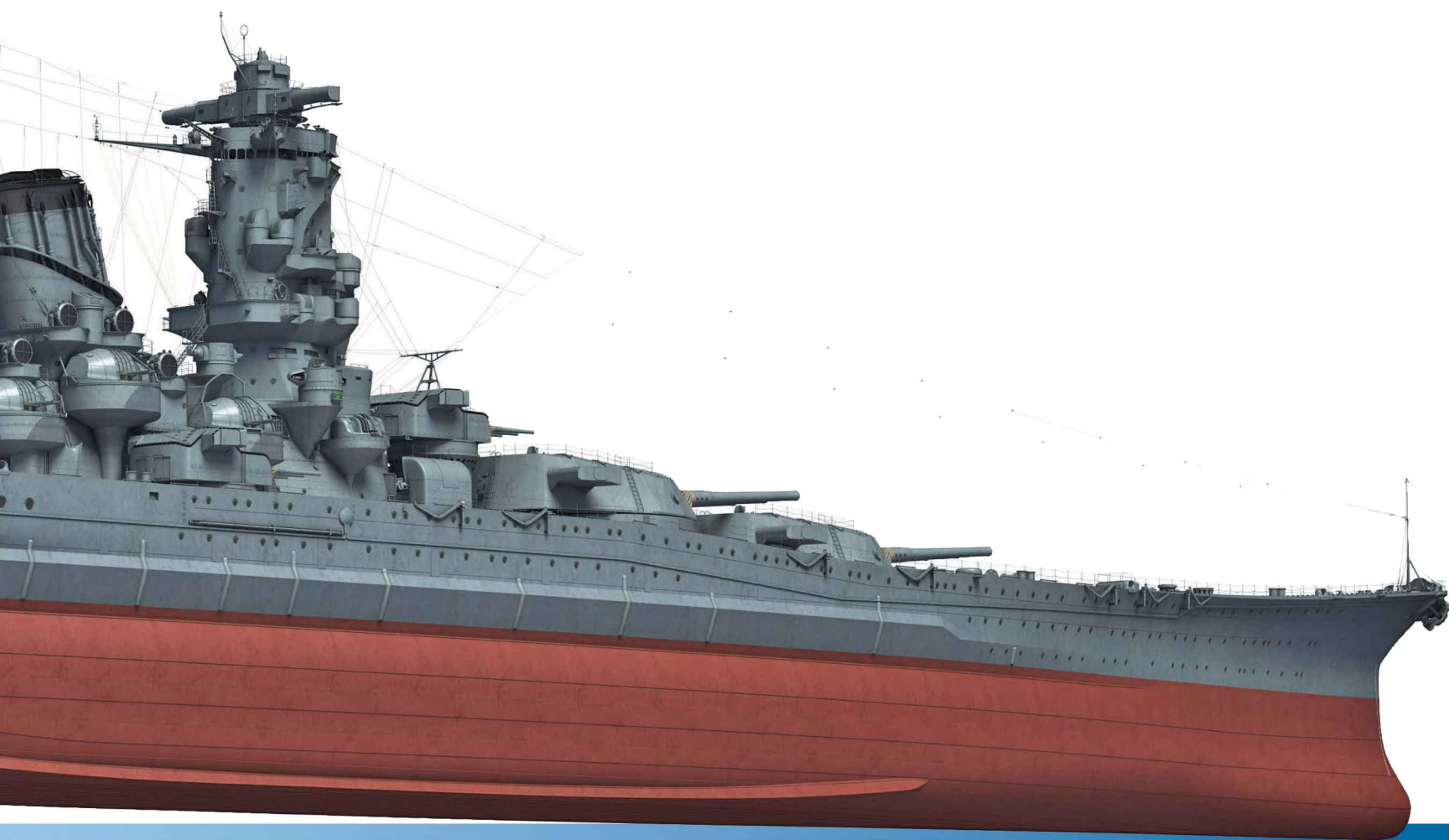
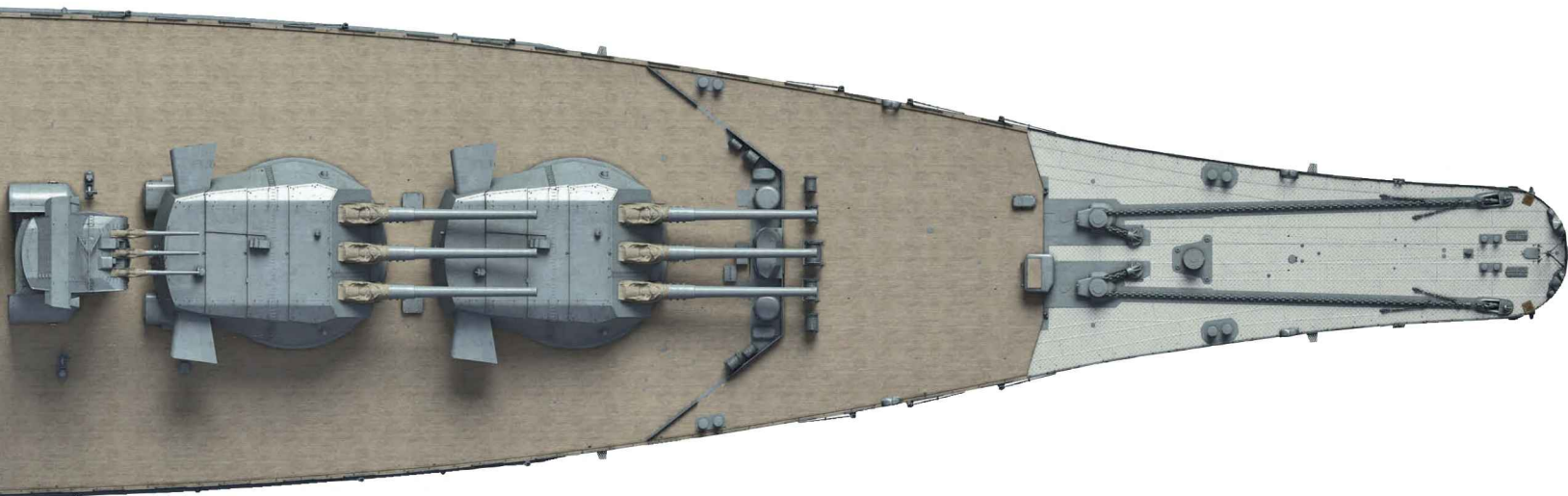
Yamato 1941



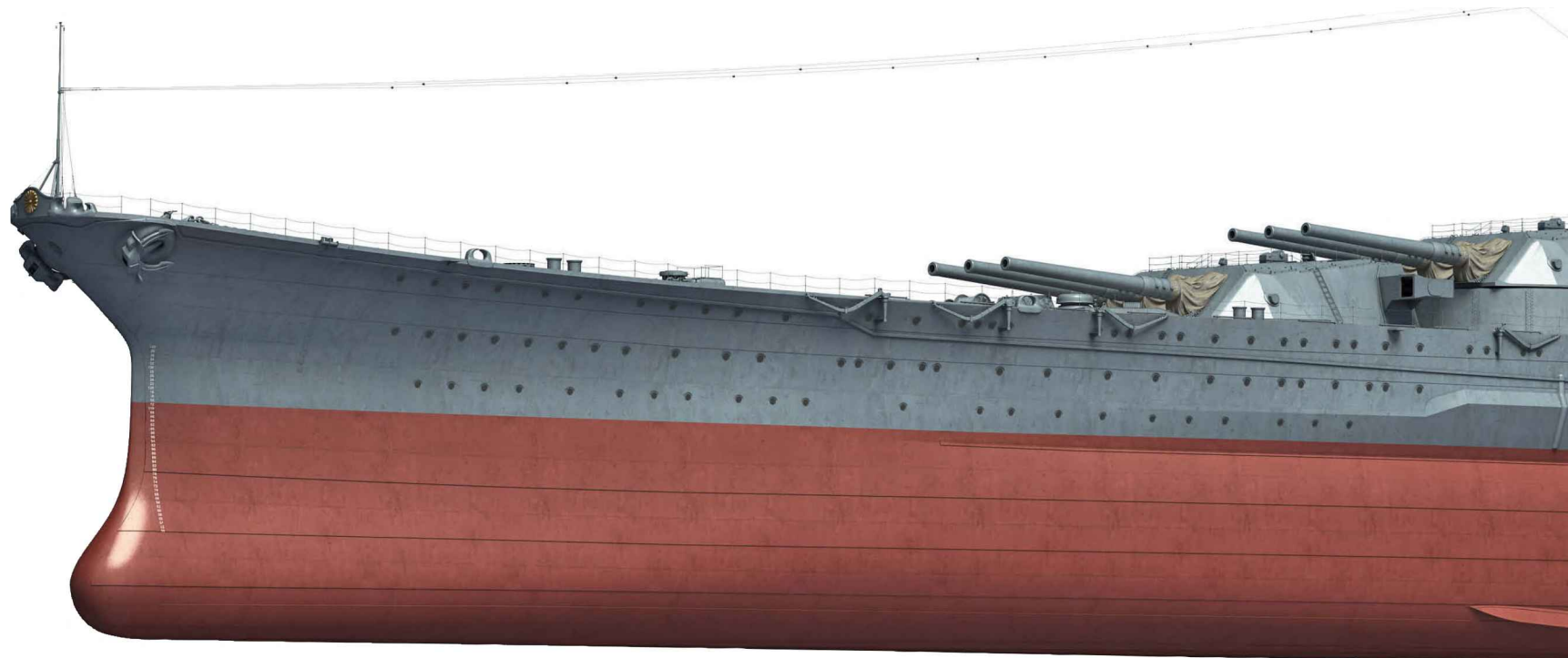


Yamato 1941



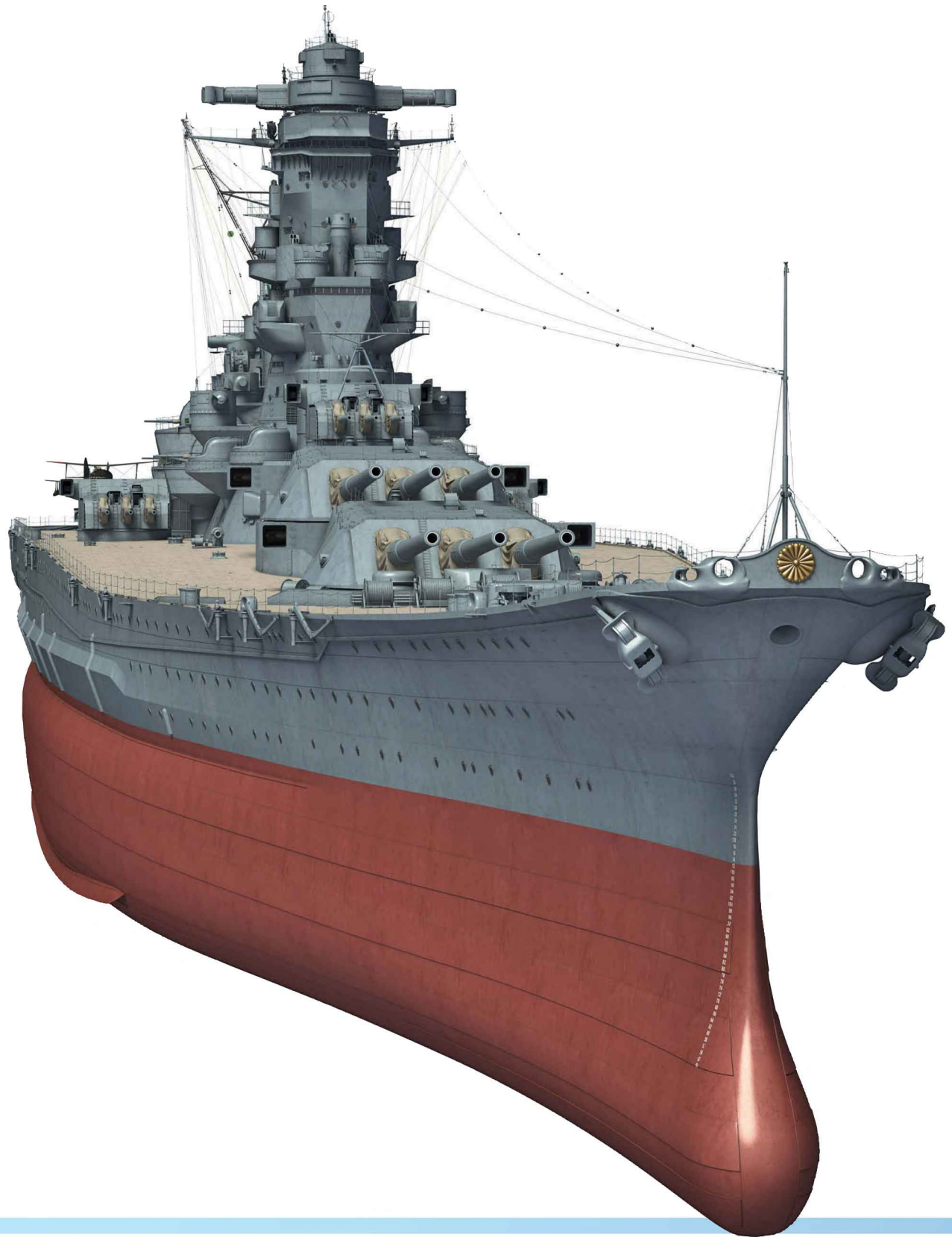


Yamato 1941



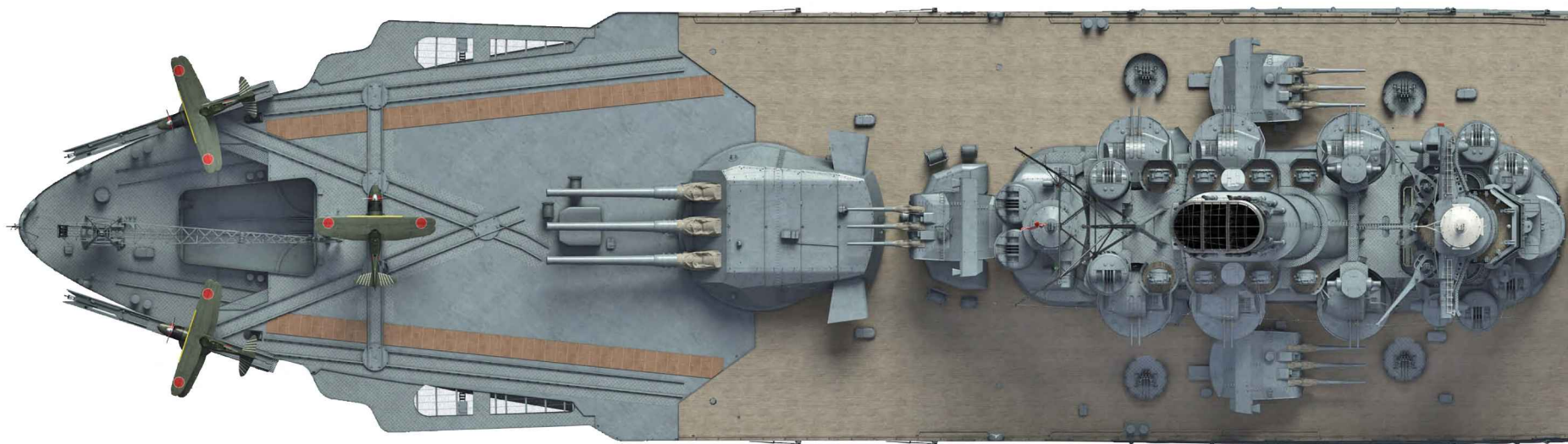
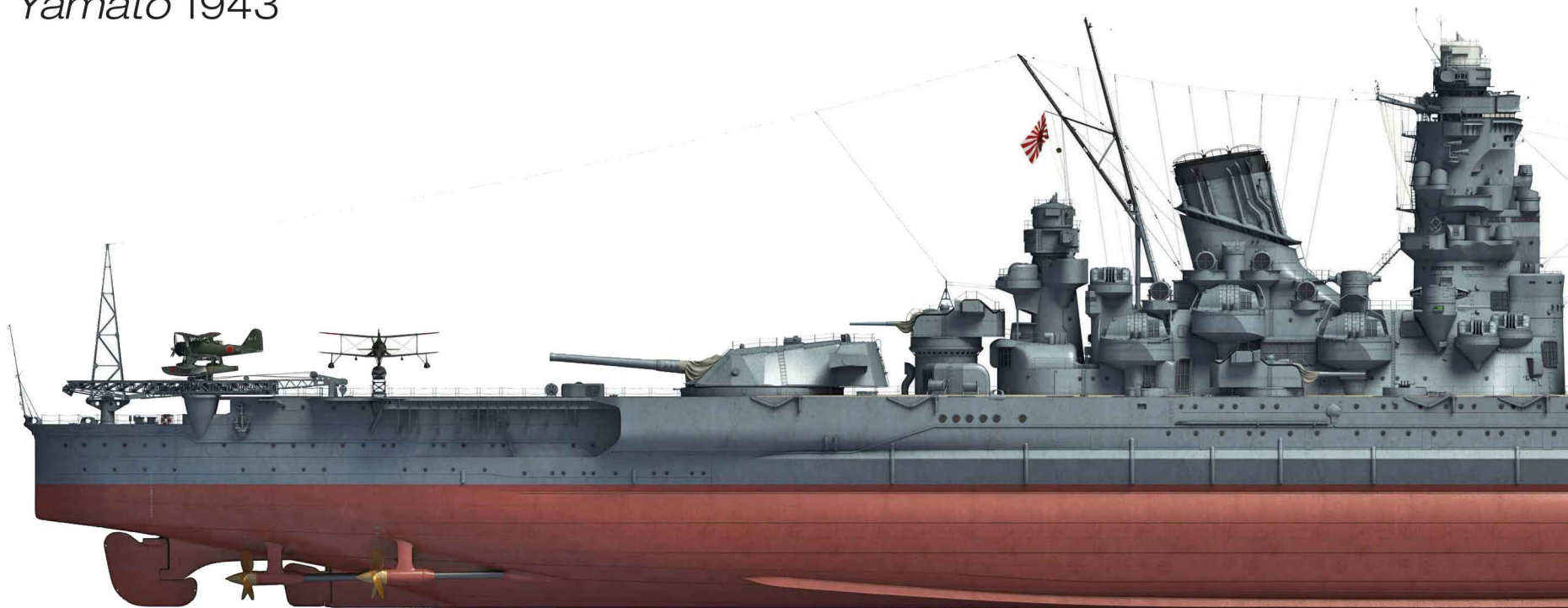


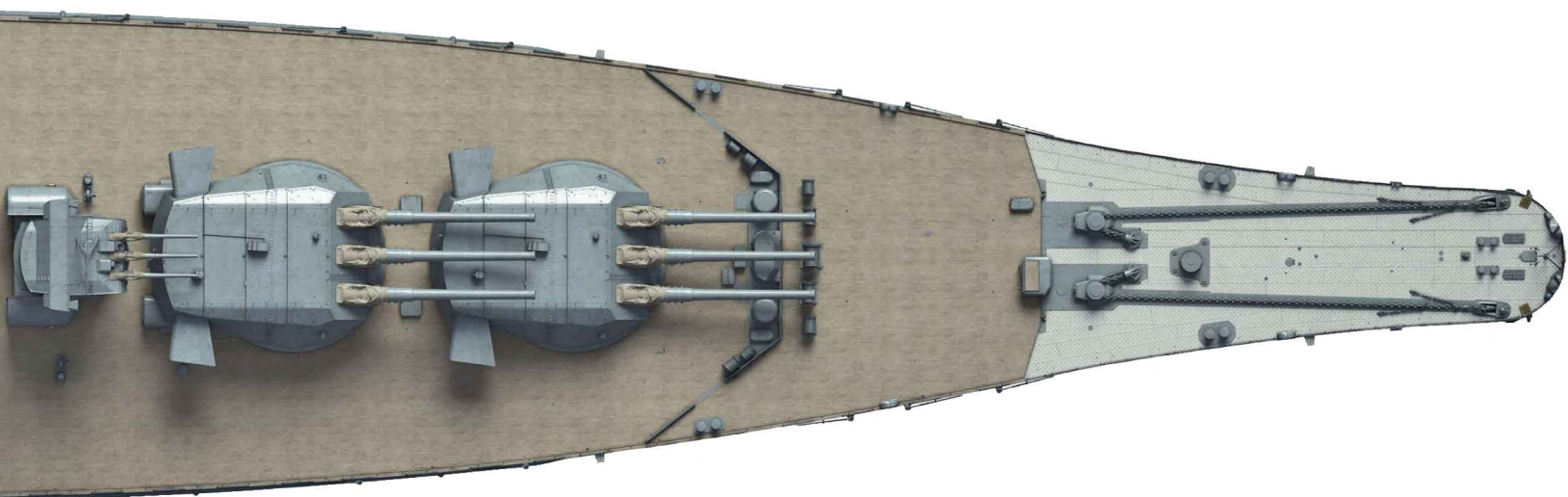
Yamato 1941



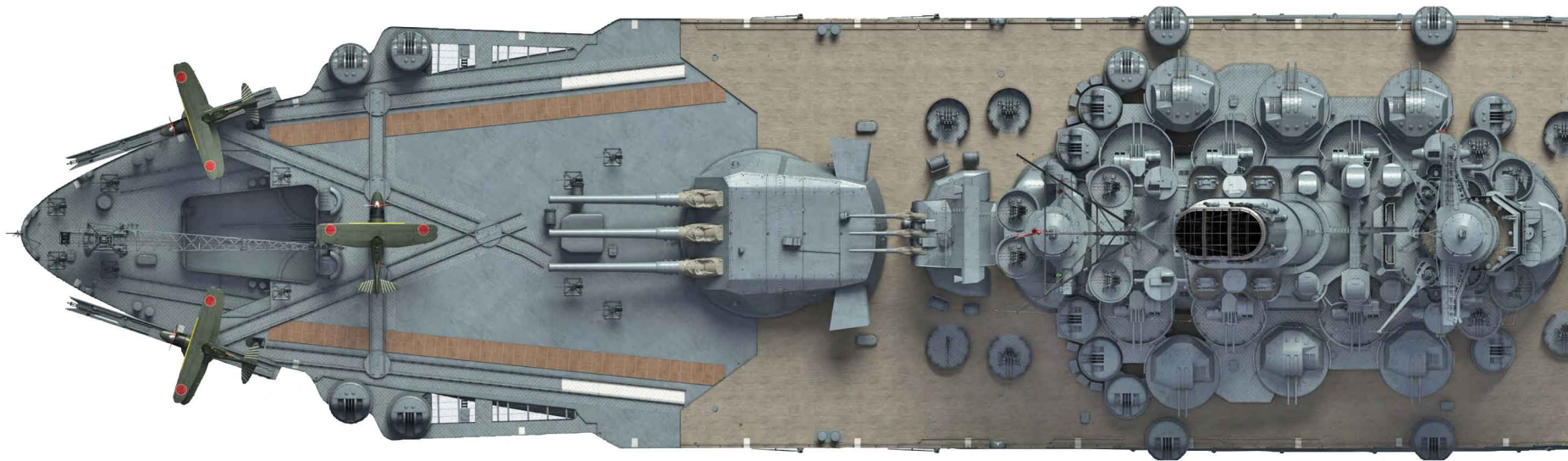
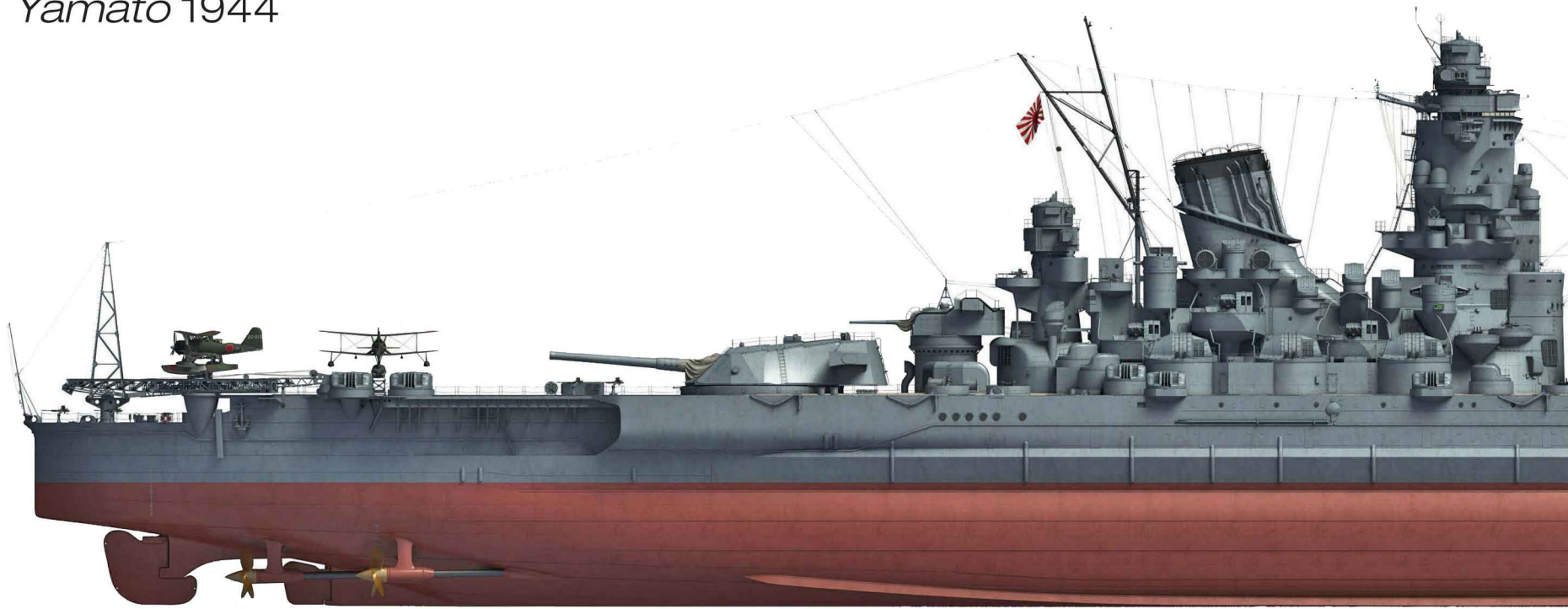


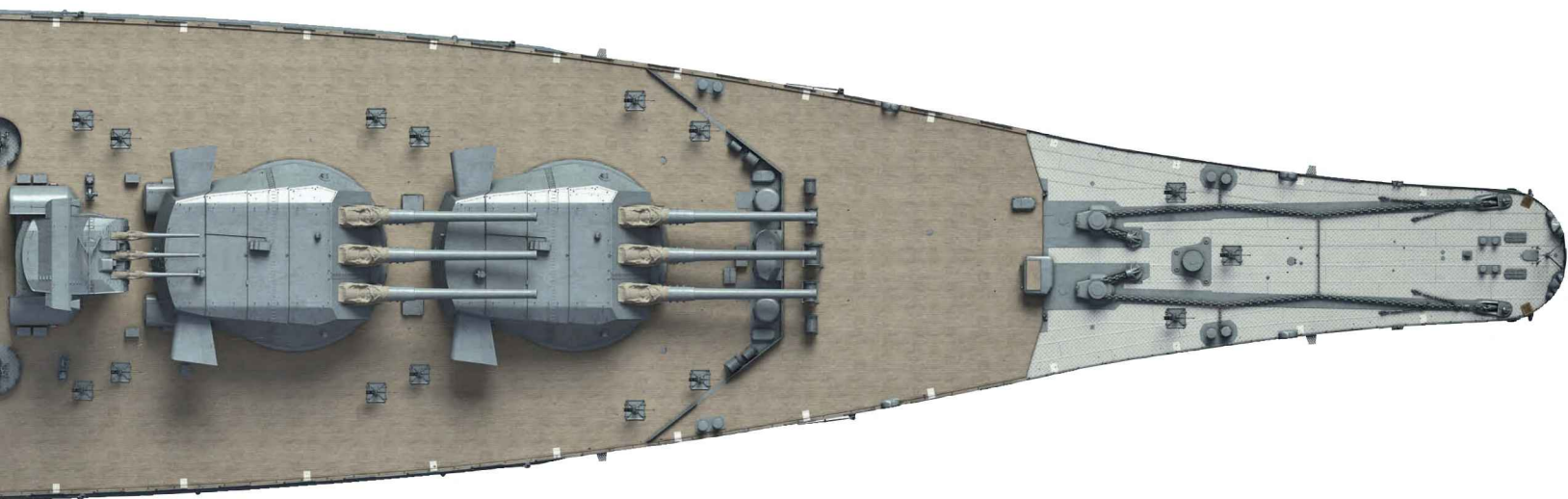
Yamato 1943



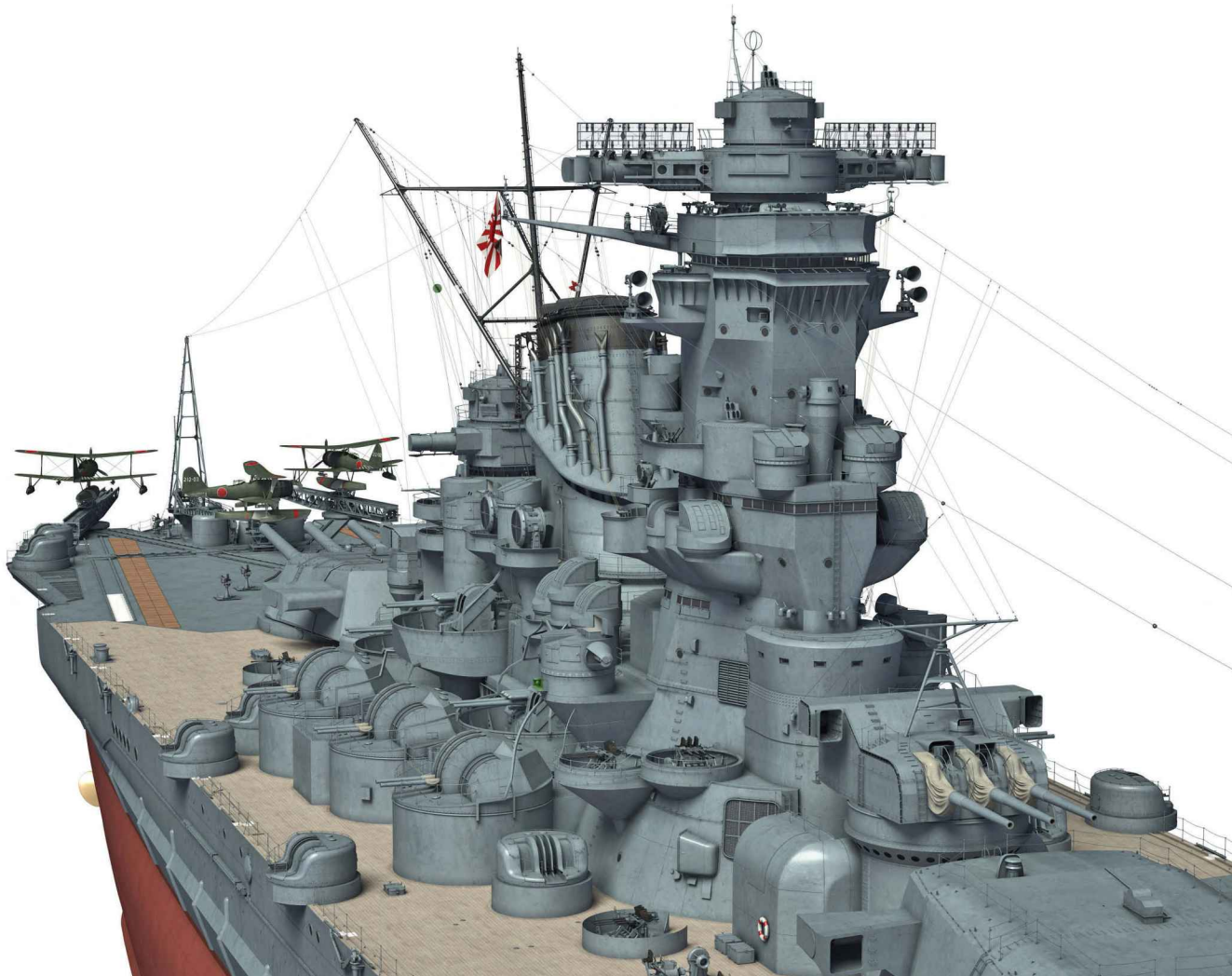
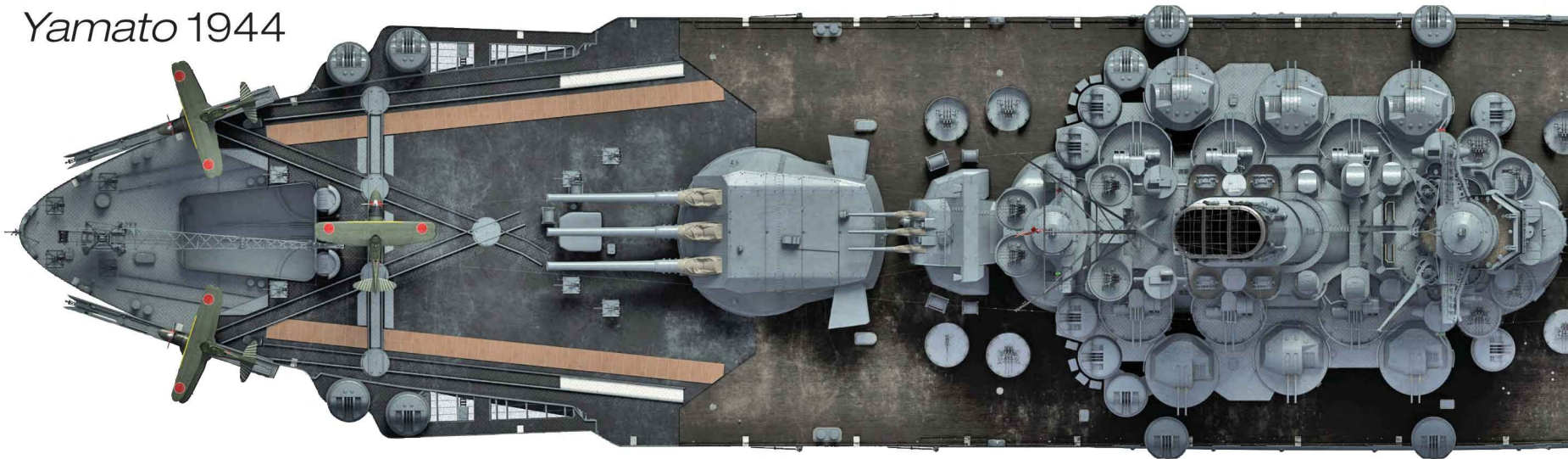


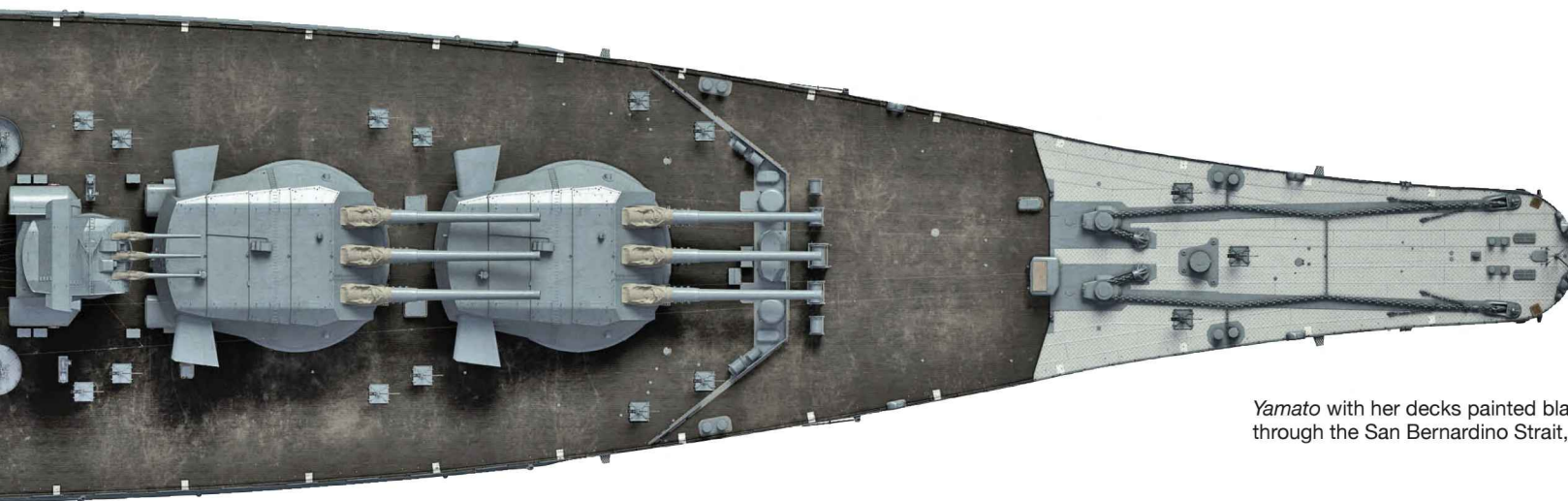
Yamato 1944



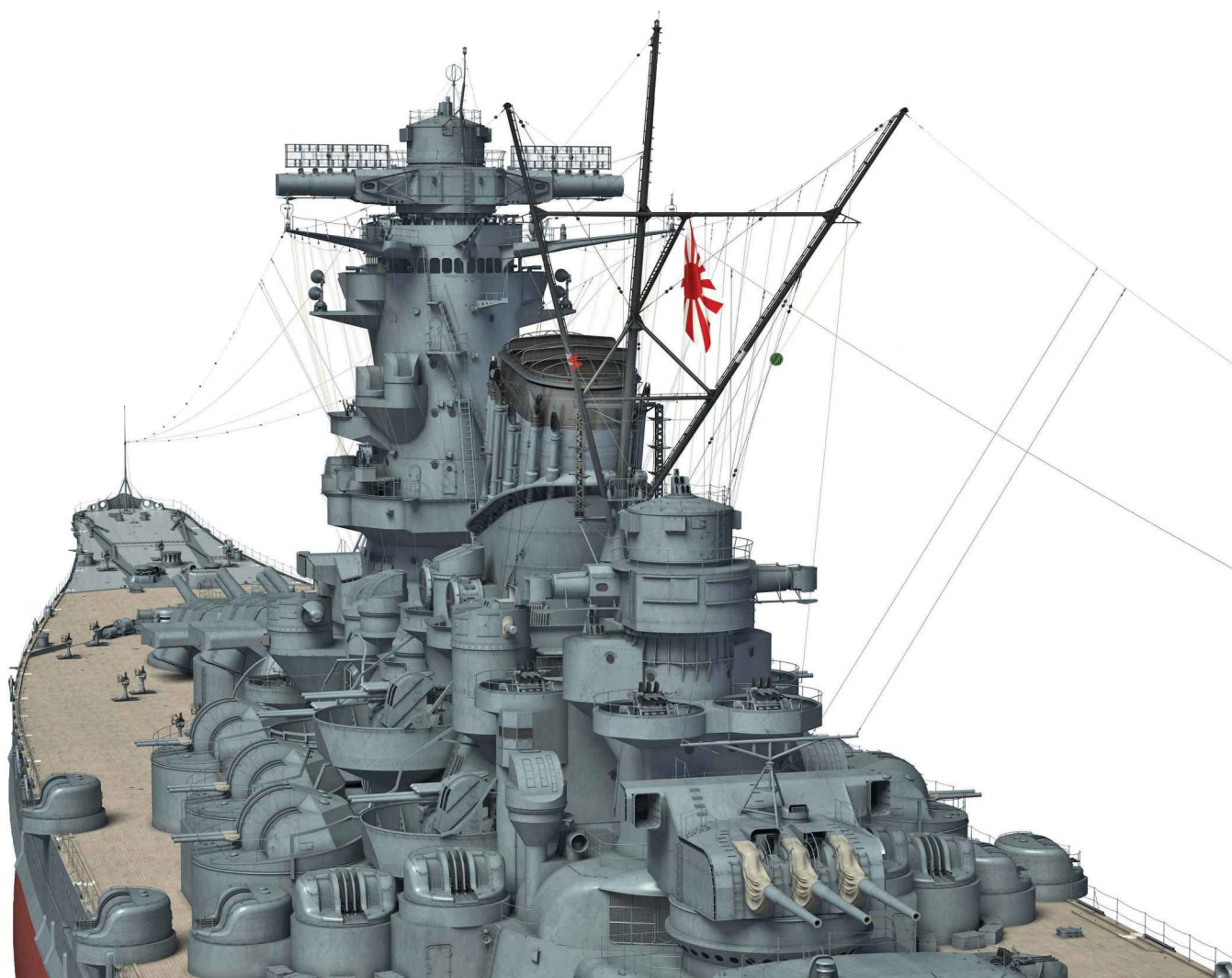


Yamato 1944

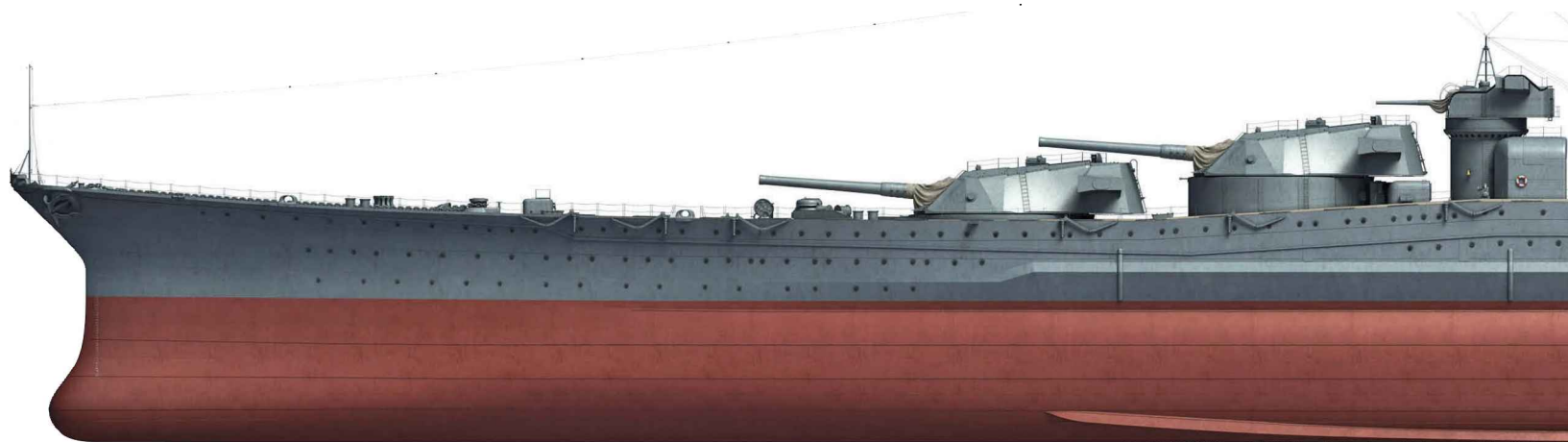
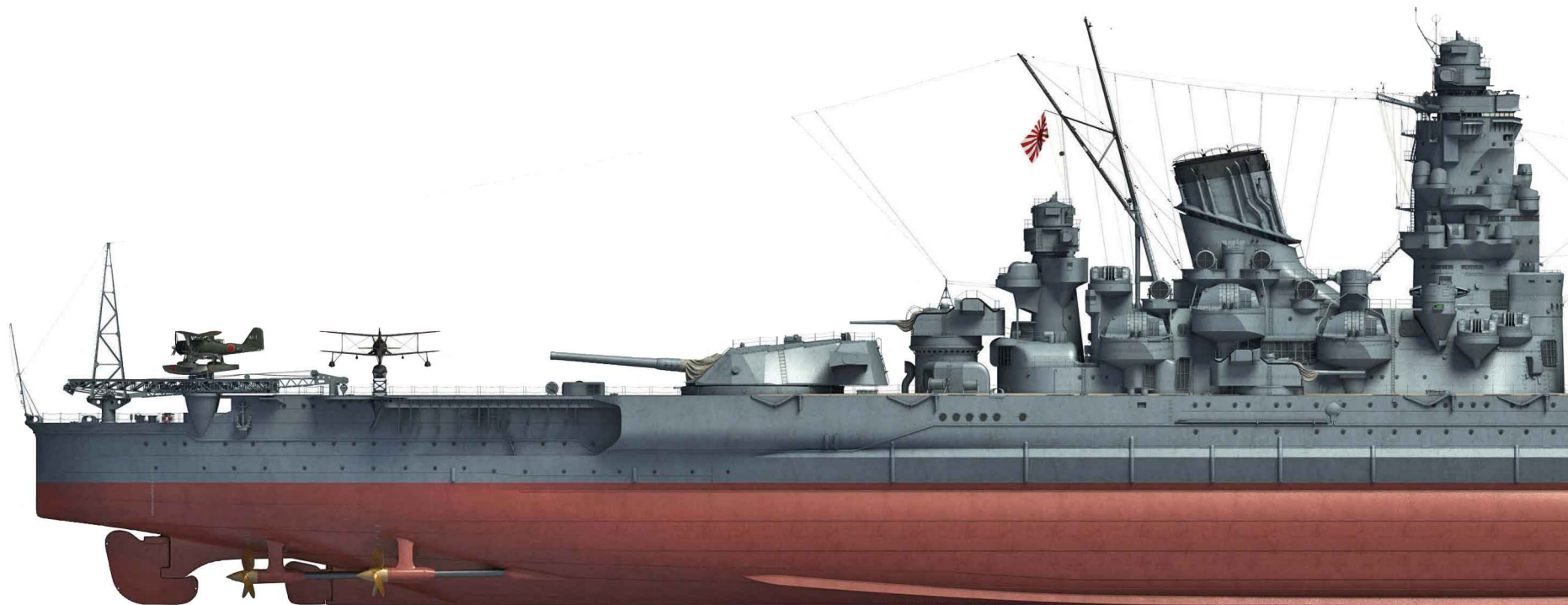


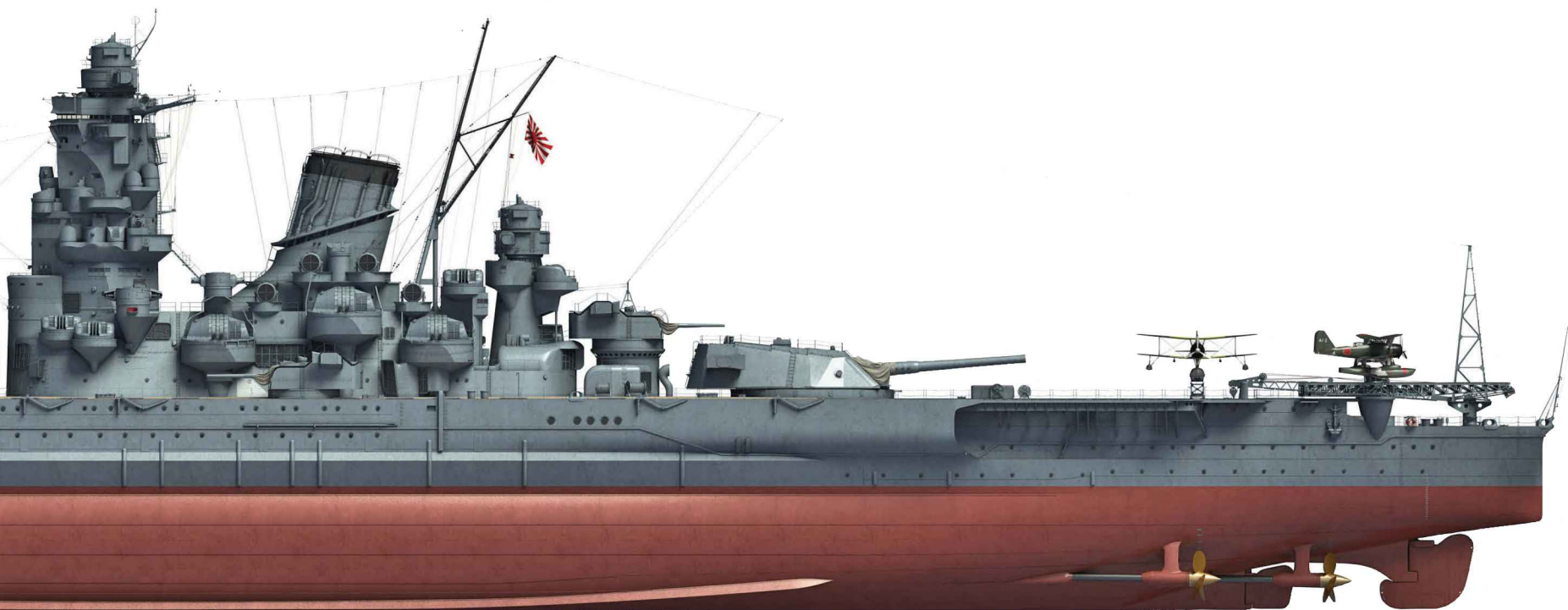


Yamato with her decks painted black for the passage through the San Bernardino Strait, 24-25 October 1944

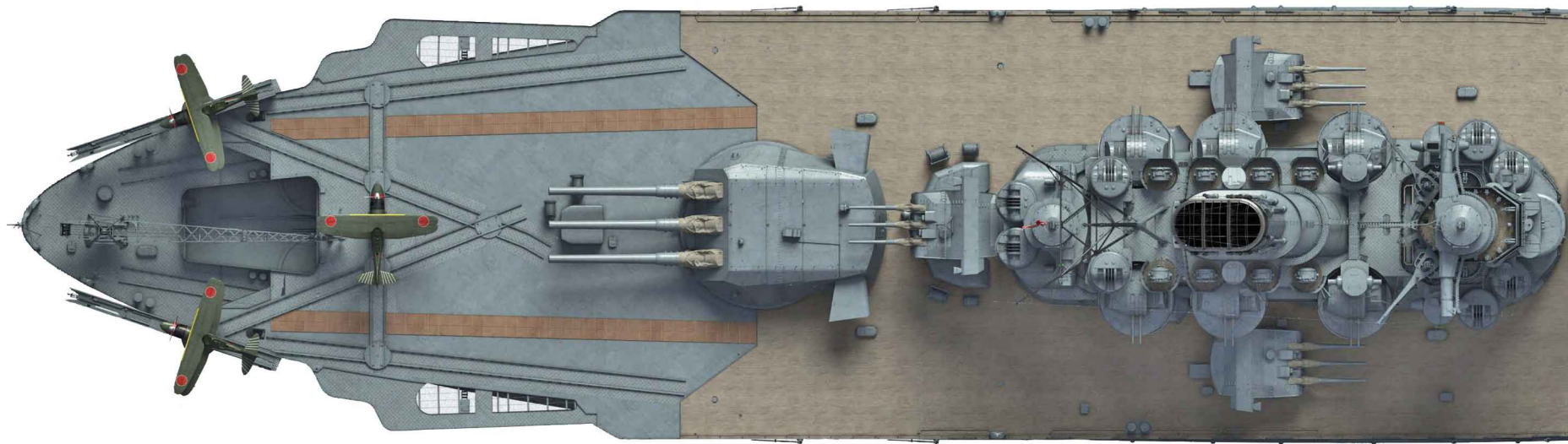


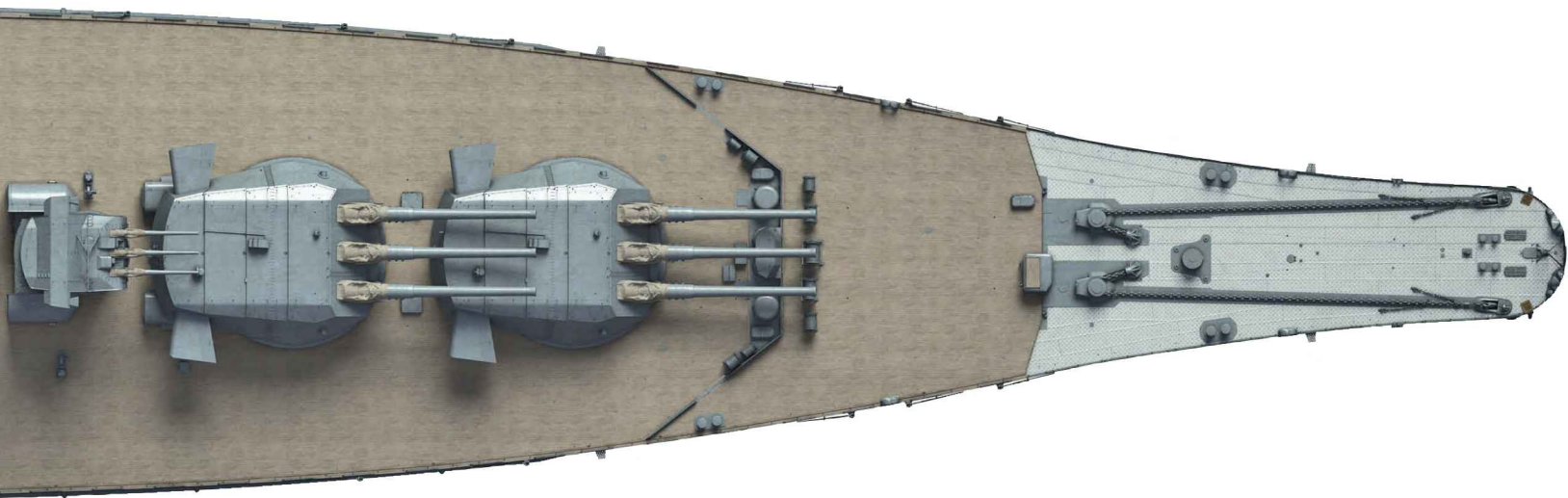
Musashi 1942



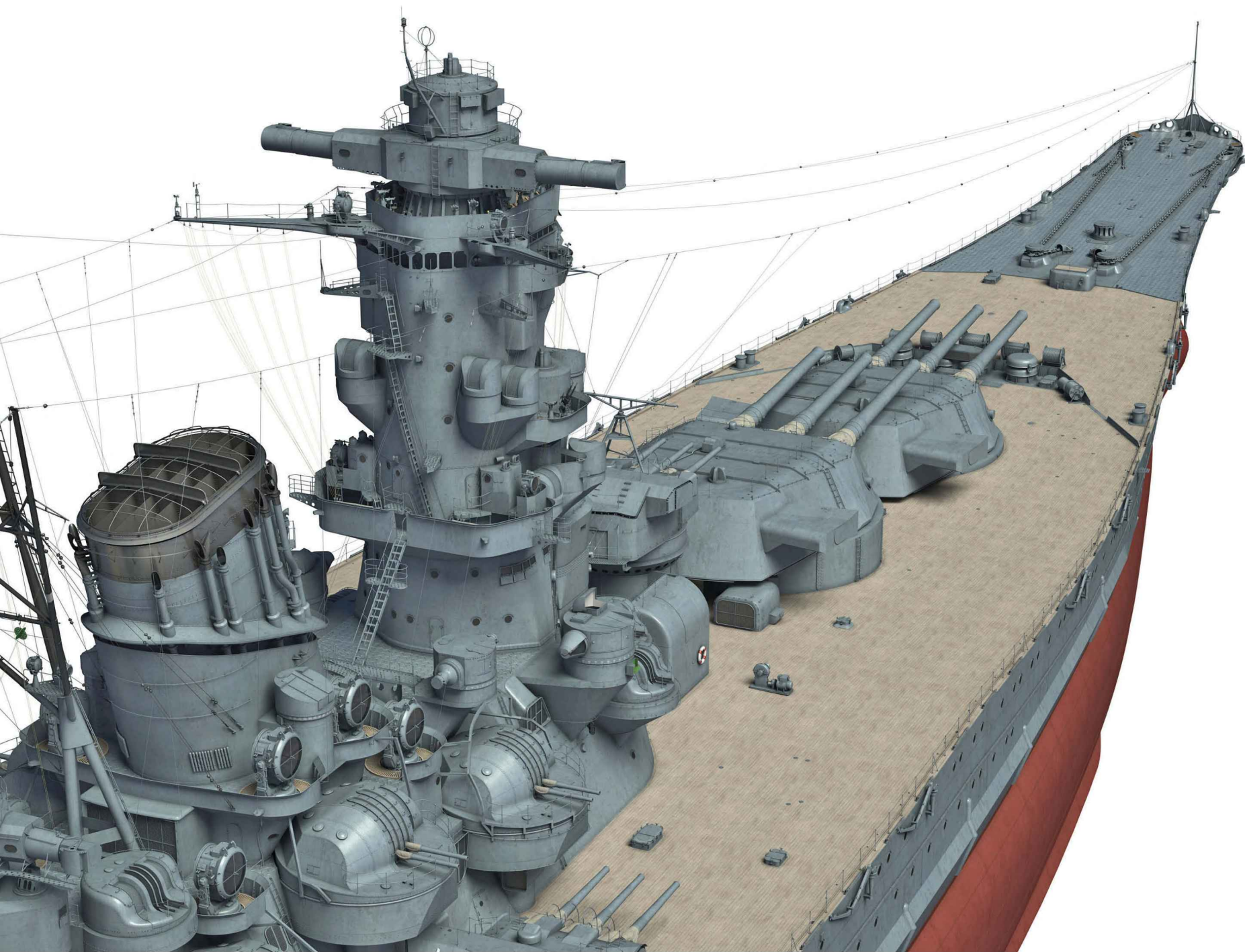


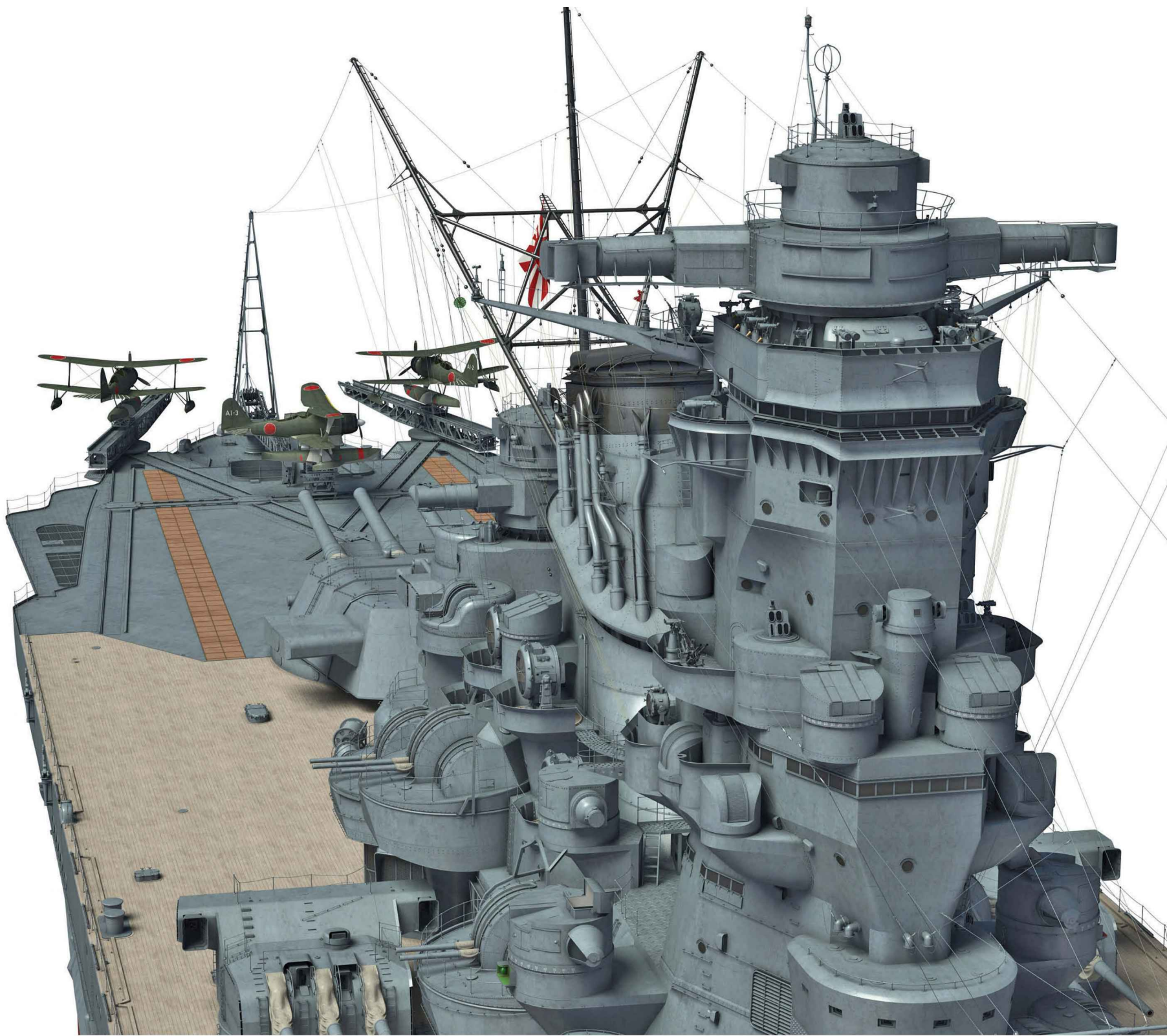
Musashi 1942



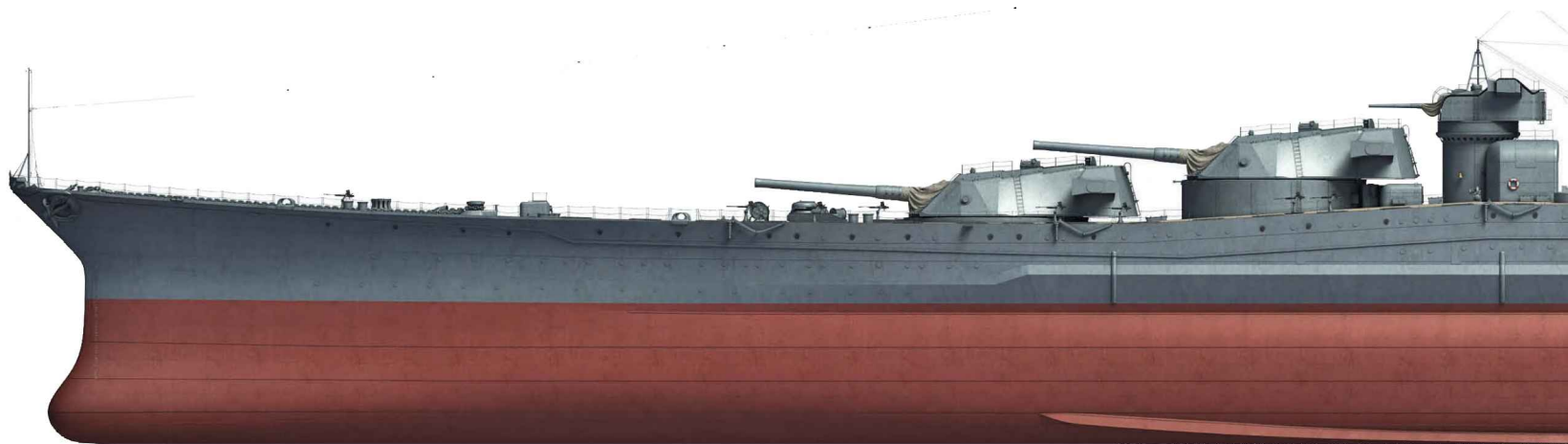
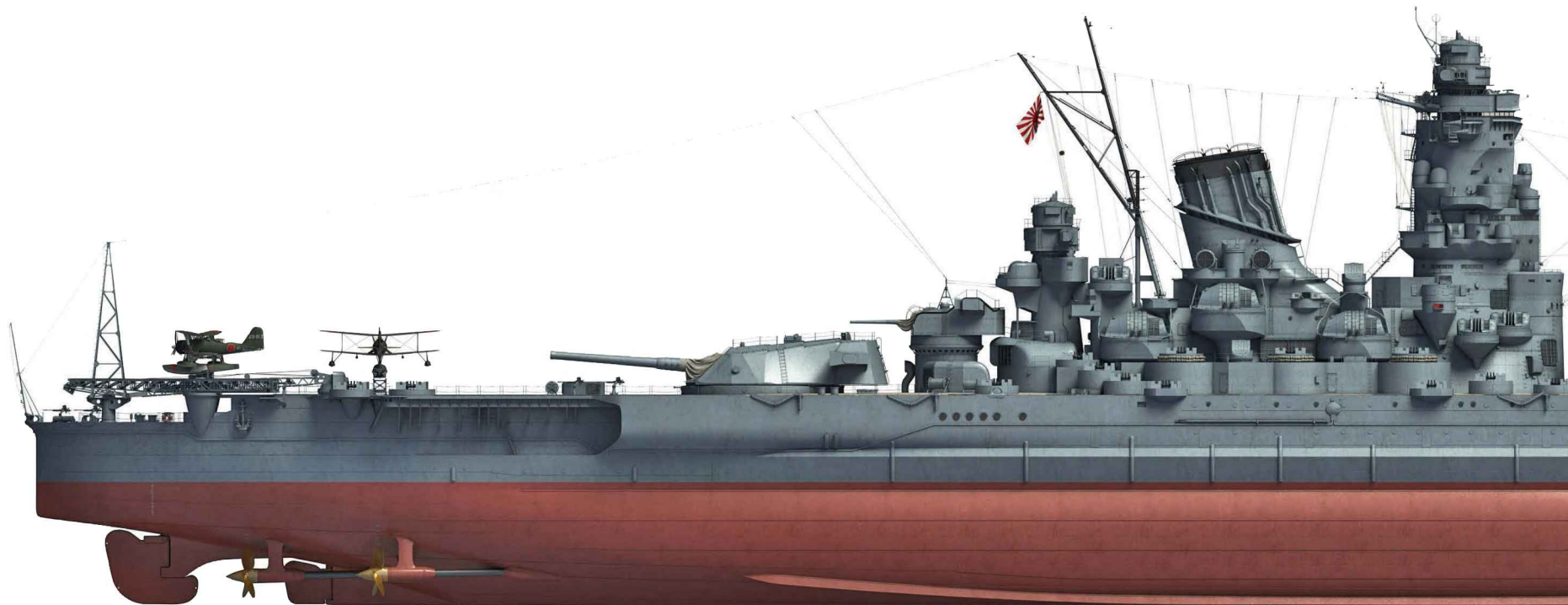


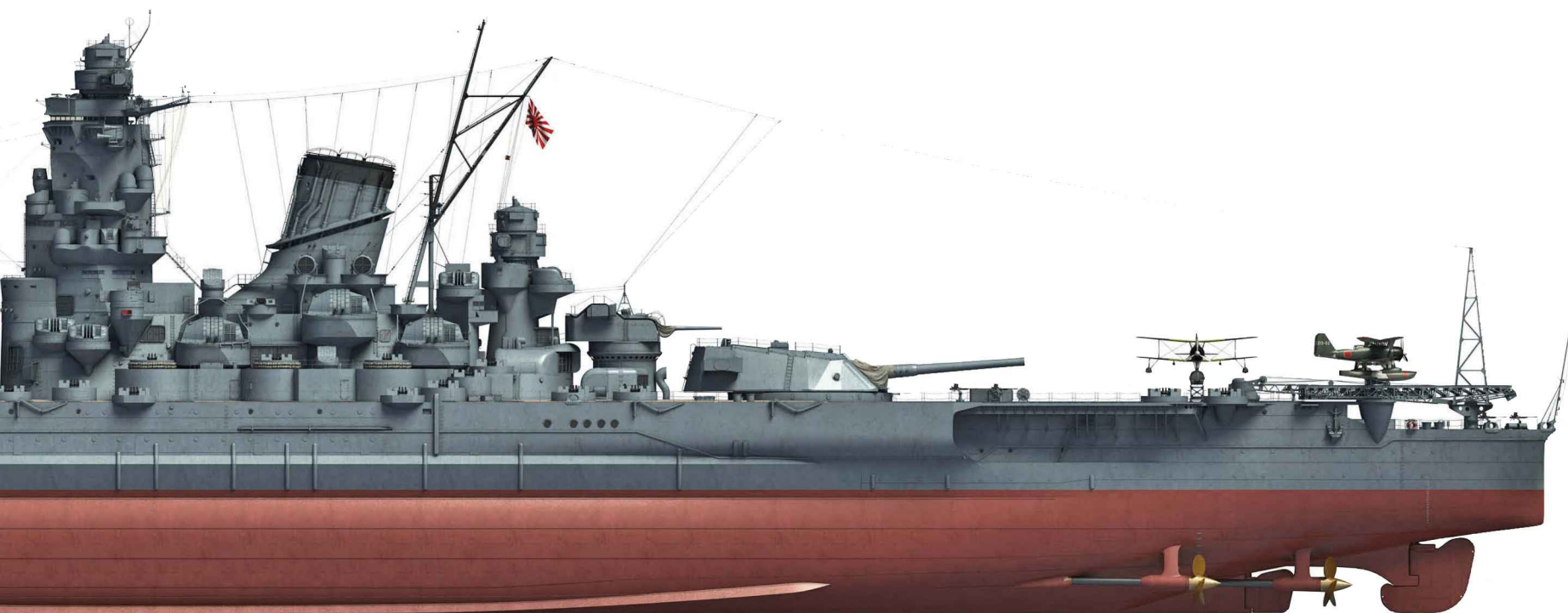
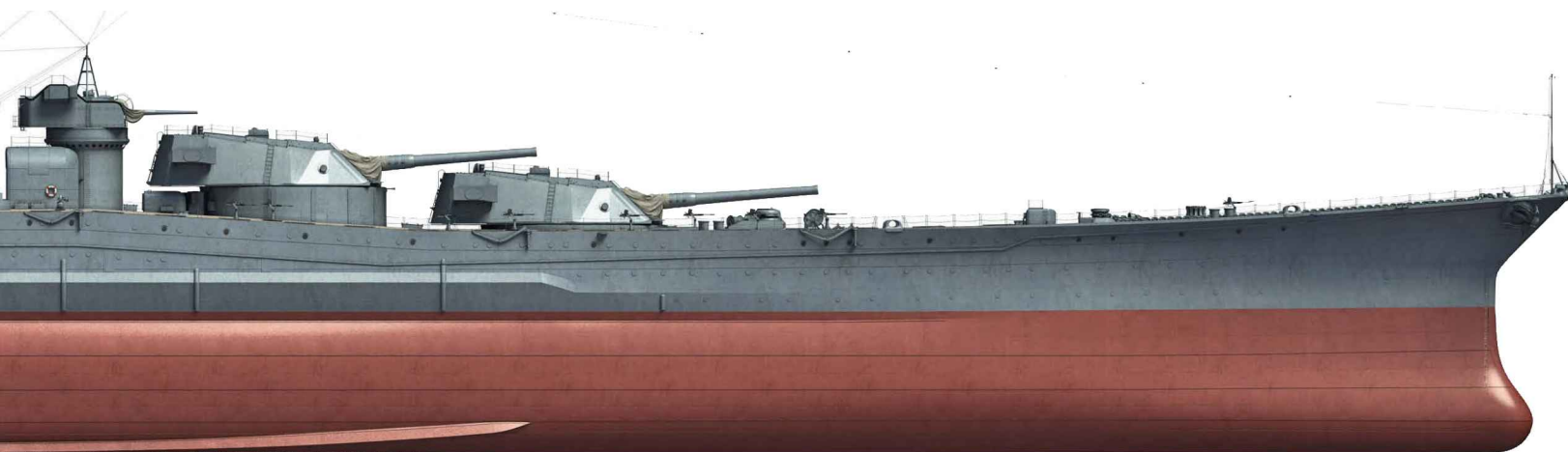
Musashi 1942



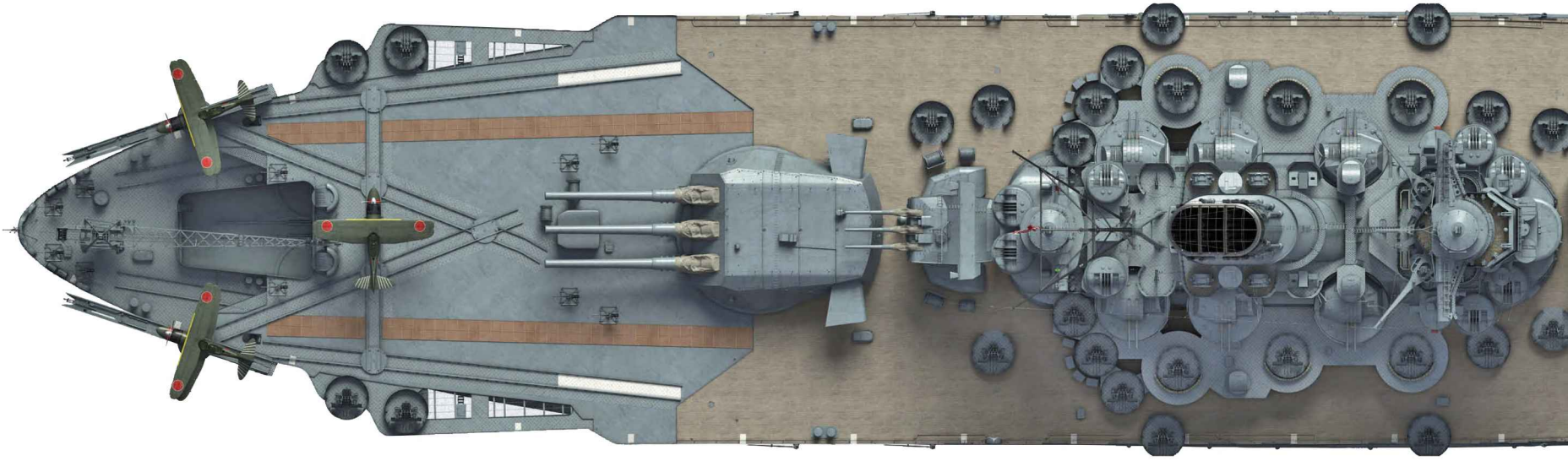


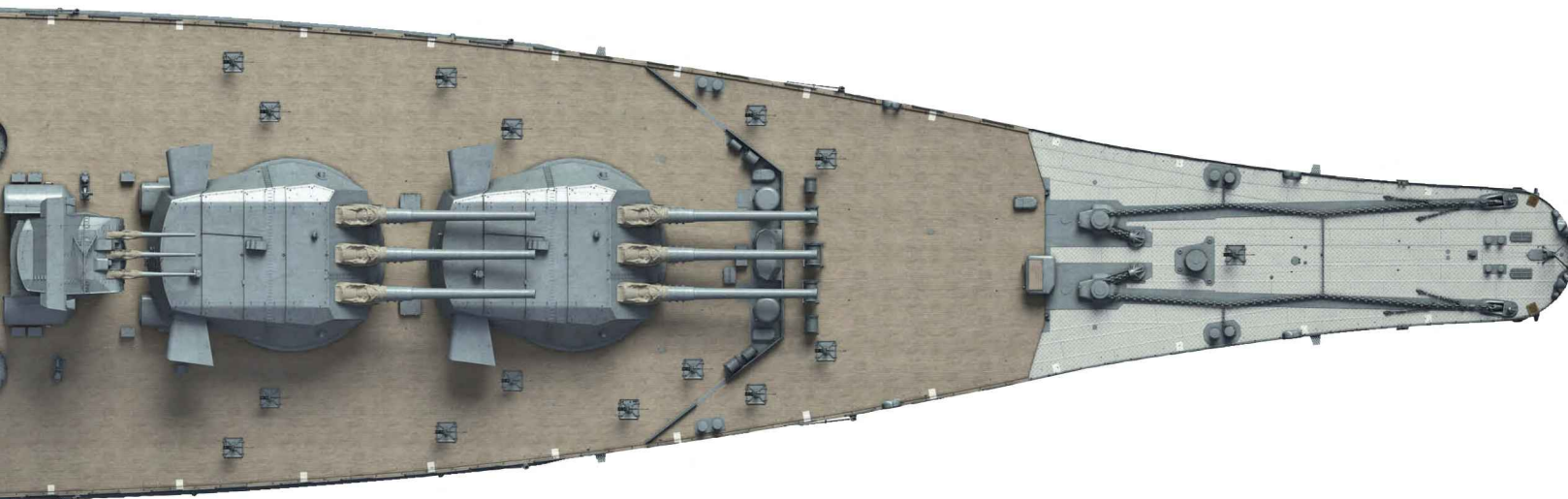
Musashi 1944



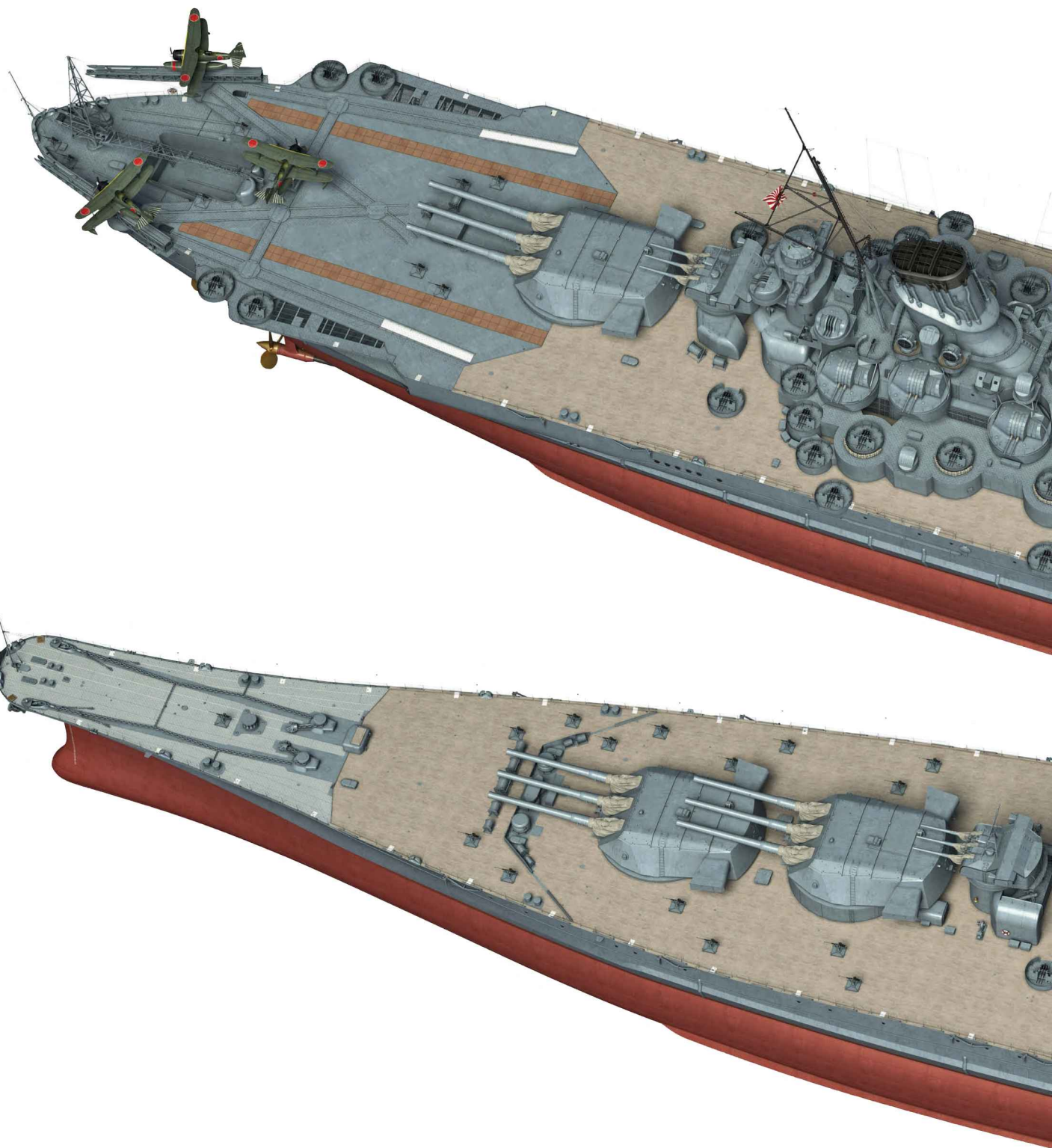


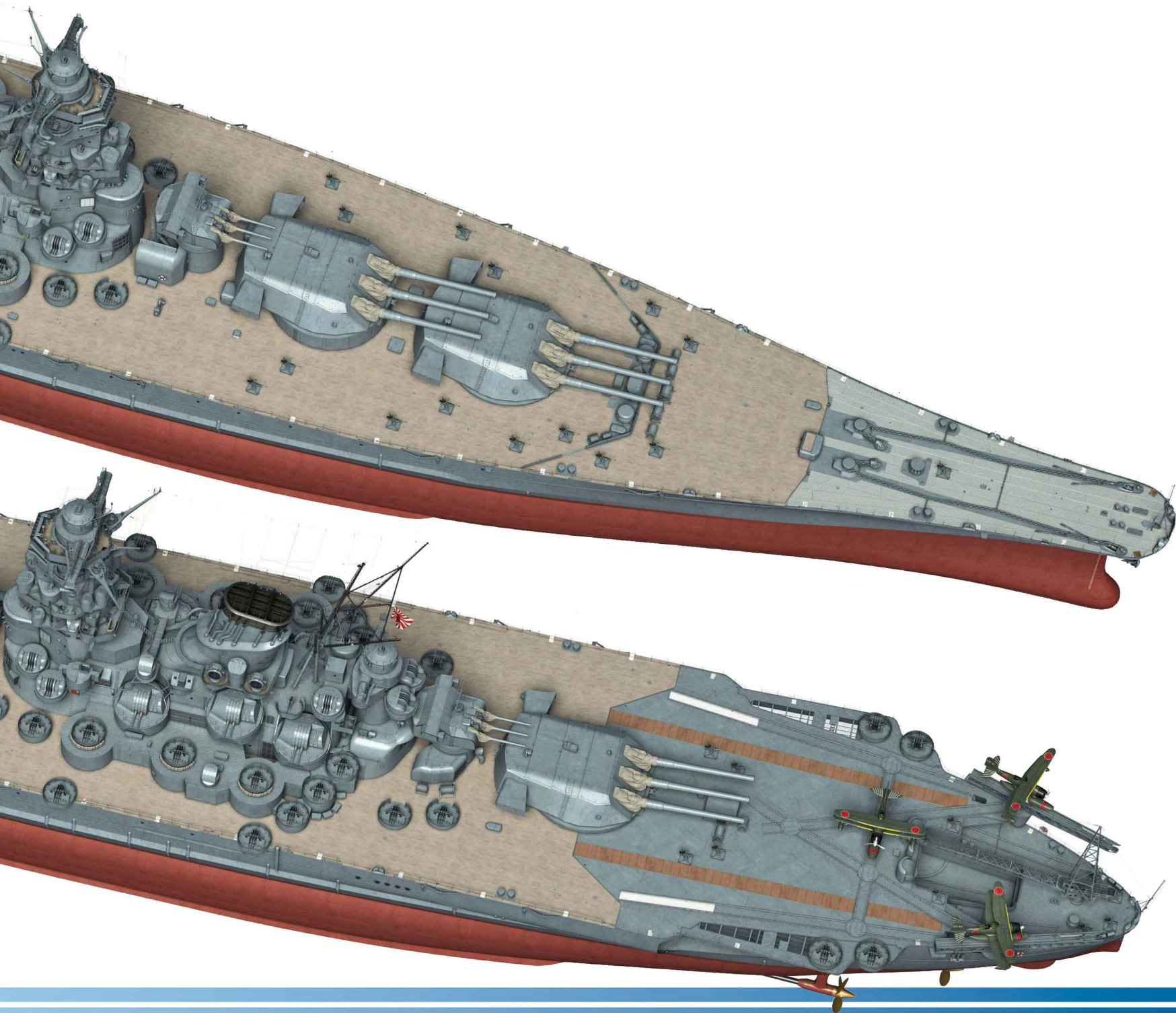
Musashi 1944





Musashi 1944

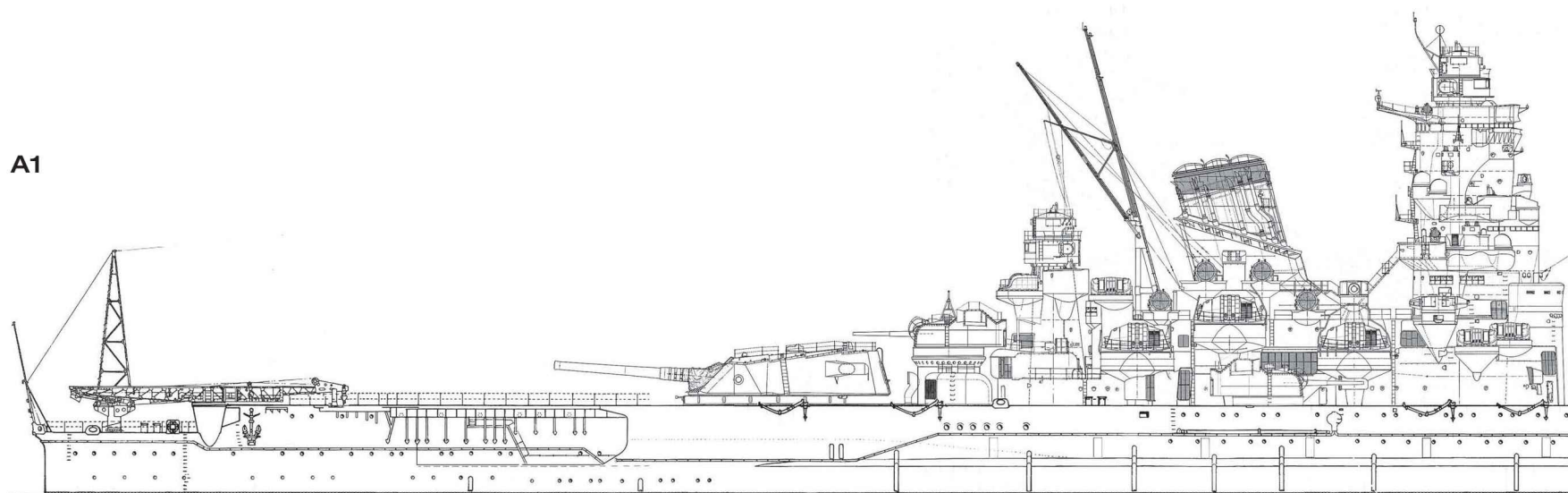


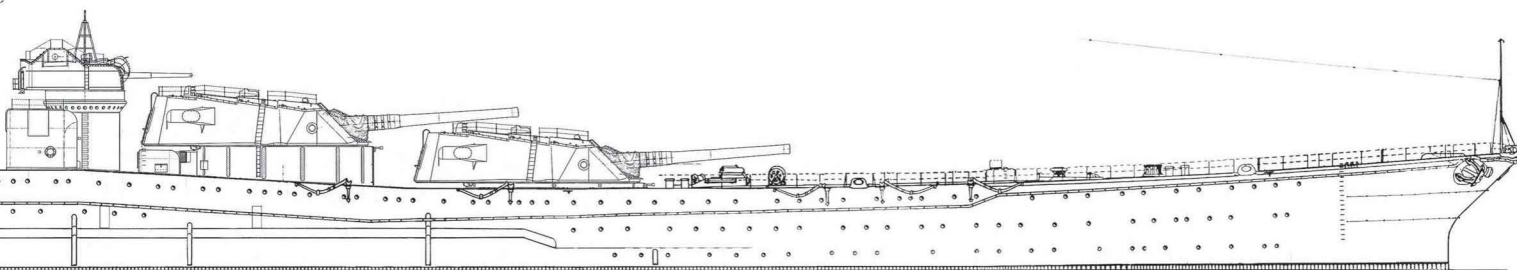


THE DRAWINGS

A General arrangements

A1 *Yamato* 1941 starboard profile (1/600 scale)





A General arrangements

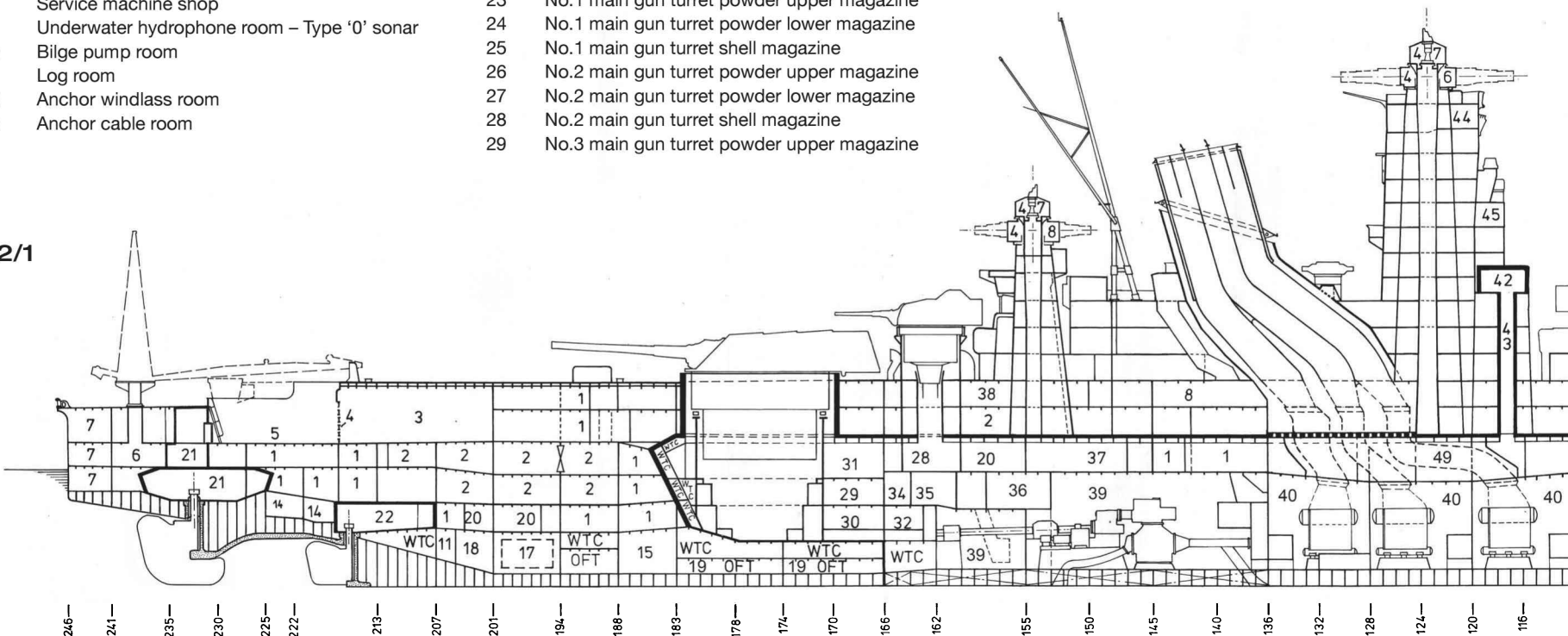
A2/1 Internal profile (1/600 scale)

- 1 Store
- 2 Crew space – living quarters
- 3 Hangar
- 4 Hangar shutter door
- 5 Open hangar deck
- 6 Crane motor room
- 7 Flood control section
- 8 Service machine shop
- 9 Underwater hydrophone room – Type ‘0’ sonar
- 10 Bilge pump room
- 11 Log room
- 12 Anchor windlass room
- 13 Anchor cable room

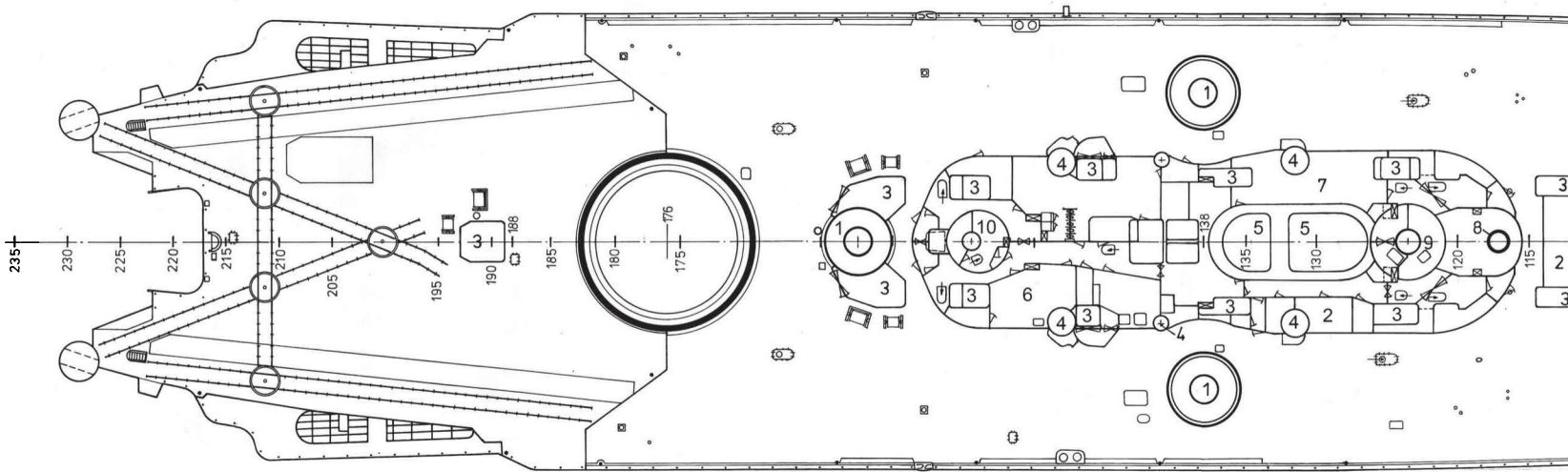
- 14 Trim tank
- 15 Oil pump room
- 16 Sounding room
- 17 Aviation fuel tank
- 18 Aviation fuel pump room
- 20 Cold store
- 21 Main rudder armoured room
- 22 Auxiliary rudder armoured room
- 23 No.1 main gun turret powder upper magazine
- 24 No.1 main gun turret powder lower magazine
- 25 No.1 main gun turret shell magazine
- 26 No.2 main gun turret powder upper magazine
- 27 No.2 main gun turret powder lower magazine
- 28 No.2 main gun turret shell magazine
- 29 No.3 main gun turret powder upper magazine

- 30 No.3 main gun turret powder lower magazine
- 31 No.3 main gun turret shell magazine
- 32 25mm MG ammunition magazine
- 33 15.5cm gun ammunition magazine
- 34 12.7cm HA gun ammunition magazine
- 35 12.7cm HA gun ammunition magazine
- 36 Hydraulic pump room

A2/1



A2/2

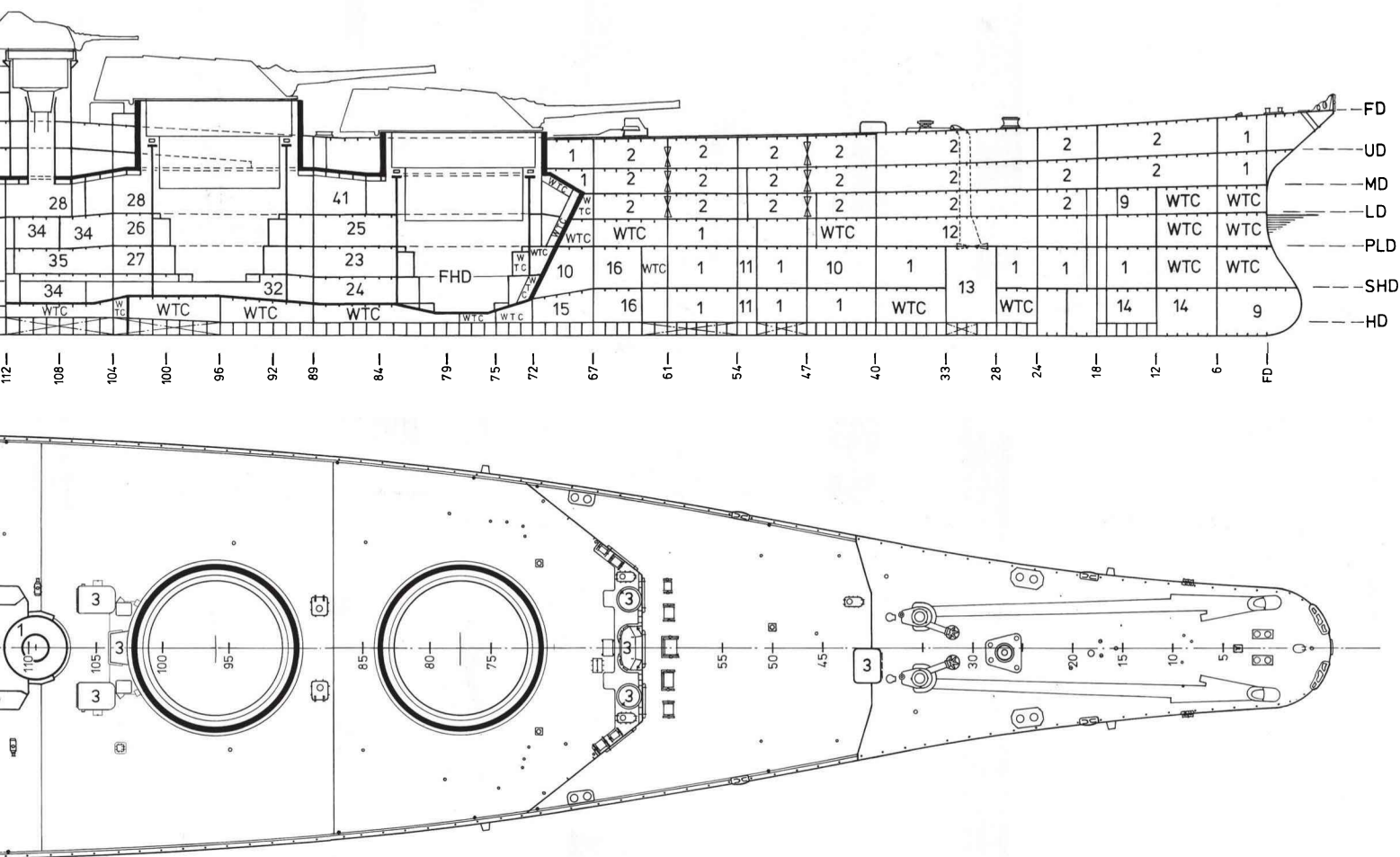


- 37 Transformer space
- 38 Wireless room
- 39 Engine room – turbine
- 40 Boiler room
- 41 Gyro room
- 42 Conning tower
- 43 Communication tube
- 44 Bridge No.1
- 45 Bridge No.2
- 46 15.5m rangefinder
- 47 LA director Type 98 – Hoiban
- 48 10m rangefinder
- 49 Ventilation and funnel compartment
- FD Forecastle deck
- UD Upper deck

- MD Middle deck
- LD Lower deck
- PLD Platform deck
- SHD Second hold deck
- HD Hold deck (over double bottom deck)

A2/2 Forecastle deck (FD)

- 1 15.5cm gun base
- 2 Deck store
- 3 Ventilation trunk
- 4 12.7cm gun base
- 5 Funnel hatch
- 6 Foundry and welding shop
- 7 Forge (smithy)
- 8 Communication tube
- 9 Tower bridge armoured cable trunking
- 10 Aft tower armoured cable trunking



A General arrangements

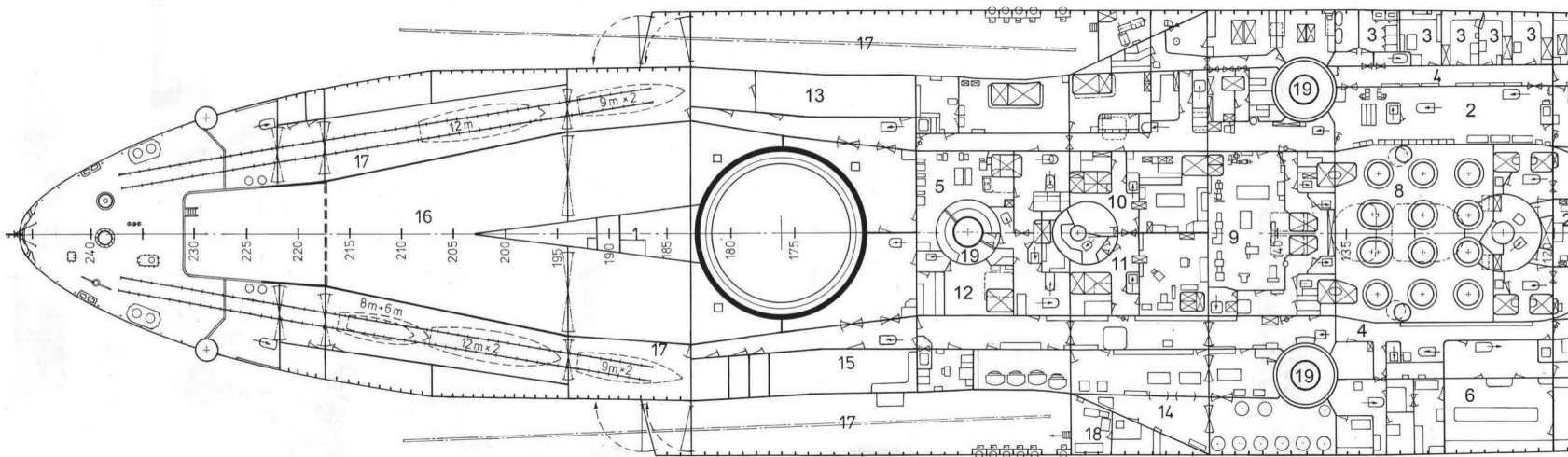
A2/3 Upper Deck (UD) (1/600 scale)

- | | | | |
|----|---------------------|----|--|
| 1 | Store | 14 | Galley |
| 2 | Crew space | 15 | Wash place |
| 3 | Officer's quarters | 16 | Hangar space |
| 4 | Passage | 17 | Boat stowage (starboard two 9m, two 12m, one 8m, one 6m, port side two 9m, one 12m Boat) |
| 5 | Wireless room | 18 | Raft stowage |
| 6 | Admiral's day cabin | 19 | 15.5 cm gun turret base |
| 7 | Admiral's cabin | 20 | Hall (lobby) |
| 8 | Uptake space | 21 | Communication hub |
| 9 | Machine shop | | |
| 10 | Electrician's shop | | |
| 11 | Carpenter's shop | | |
| 12 | Dynamo room | | |
| 13 | Laundry | | |

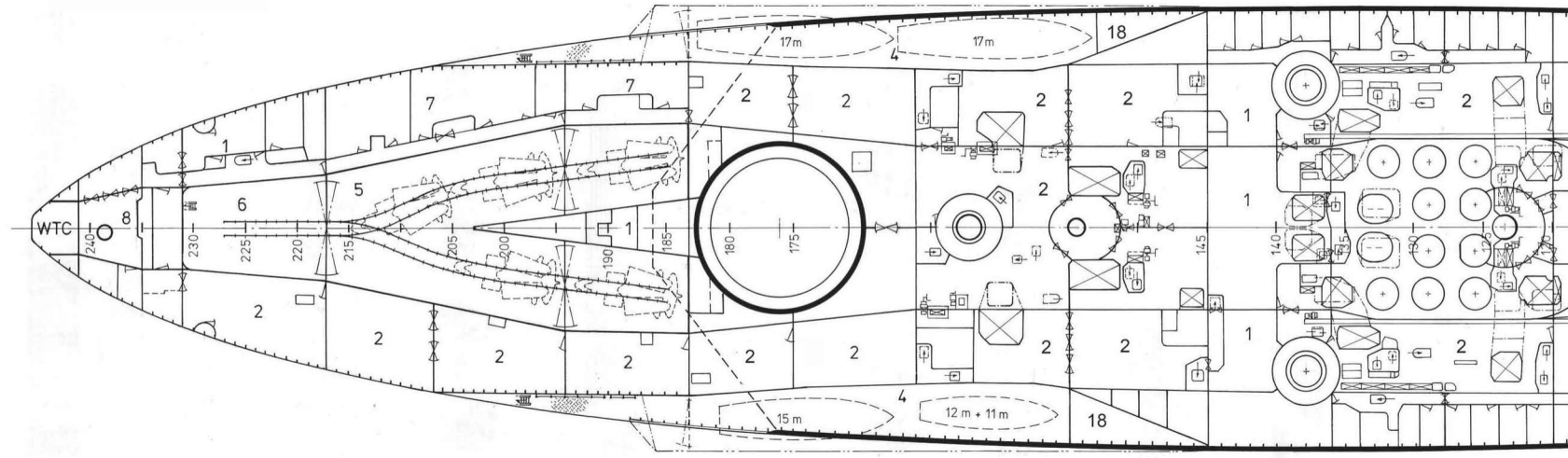
A2/4 Middle Deck (MD)

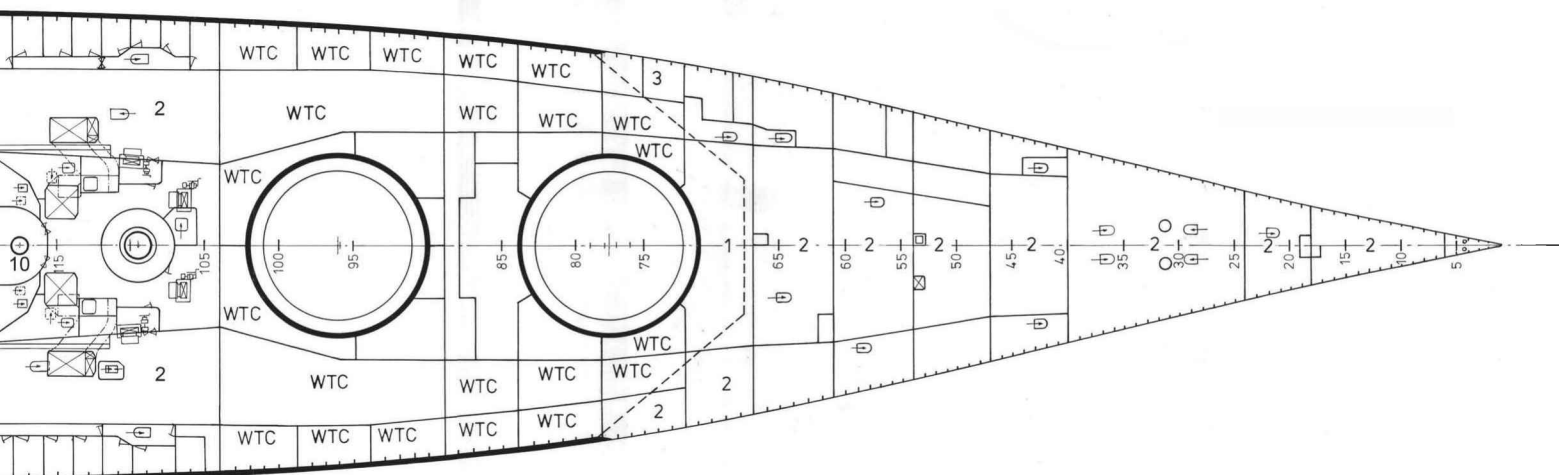
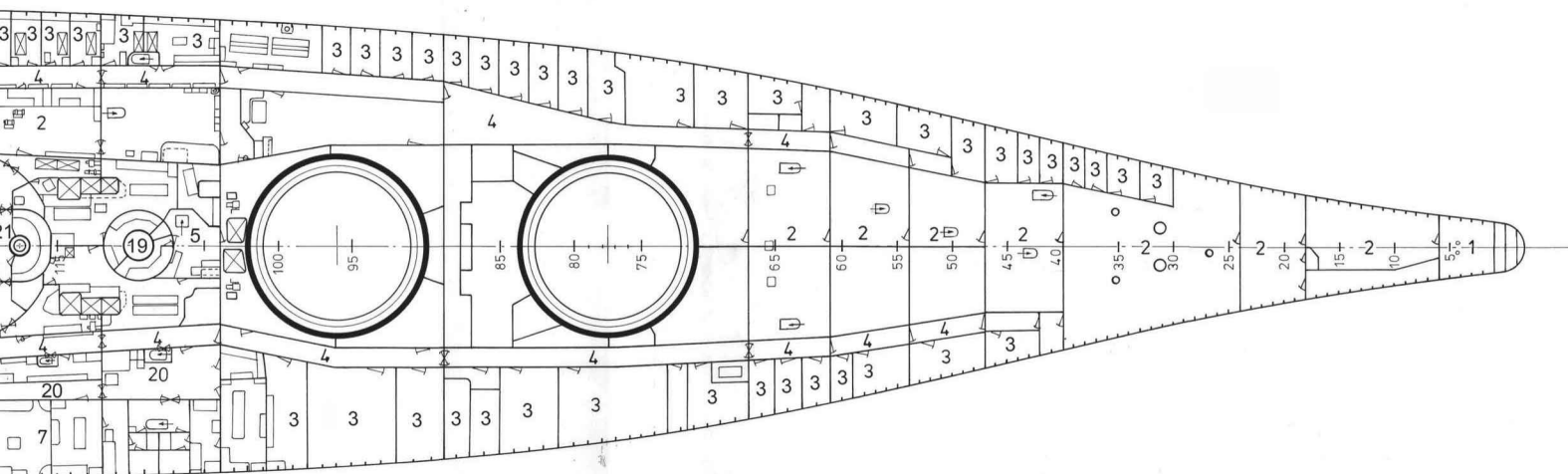
- | | |
|----|---|
| 1 | Store |
| 2 | Crew space |
| 3 | Sick-bay (hospital) |
| 4 | Boat stowage (starboard one 15m, one 12m, one 11m, port side two 17m boats) |
| 5 | Hangar |
| 6 | Open hangar deck |
| 7 | Warrant officer's quarters |
| 8 | Crane motor room |
| 9 | Passage |
| 10 | Communication tube |

A2/3



A2/4





A General arrangements

A2/5 Lower Deck (LD) (1/600 scale)

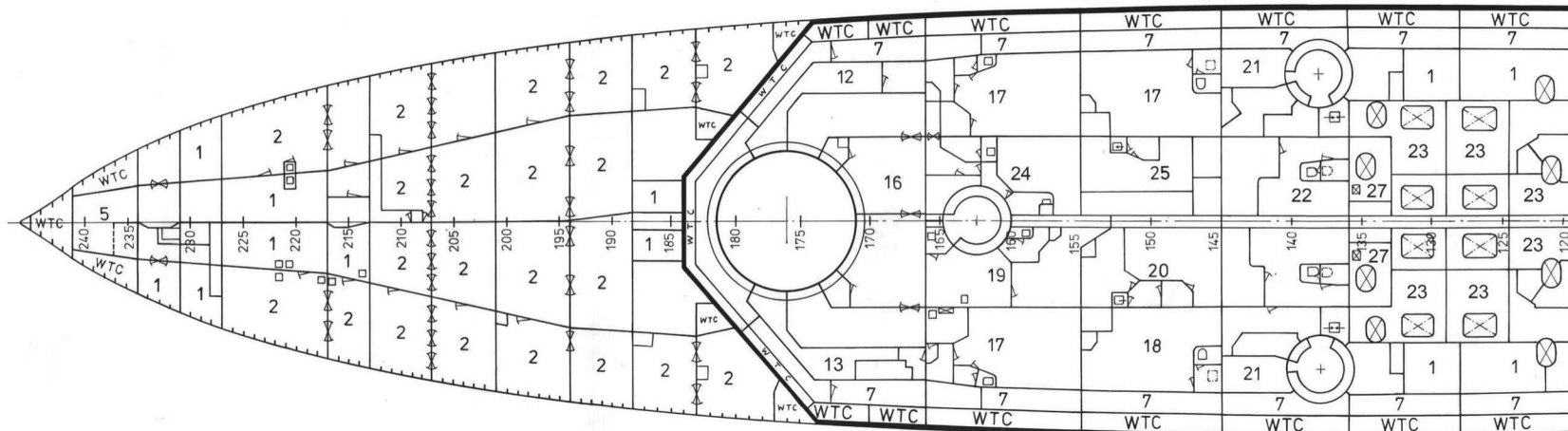
- 1 Store
- 2 Crew space
- 3 Underwater hydrophone room
- 4 Isolation ward
- 5 Crane motor room
- 6 Main armament transmitting station
- 7 Wire lead passage
- 8 Secondary (15.5cm) armament transmitting station
- 9 HA 12.7cm guns transmitting station
- 10 Gyro room
- 11 Telephone exchange
- 12 Cell room (battery)
- 13 Fan compartment

- 14 No.2 main gun turret shell magazine
- 15 Shell supply room
- 16 Secondary (15.5cm) armament shell room
- 17 Dynamo room and ventilation space
- 18 Dynamo room
- 19 Cooling machinery room
- 20 Transformer room
- 21 Secondary (15.5cm) armament shell magazine
- 22 Flooding control stand
- 23 Ventilation and funnel compartment
- 24 Radio station
- 25 Wireless room and dynamo room
- 26 Lower control station
- 27 Engine room space

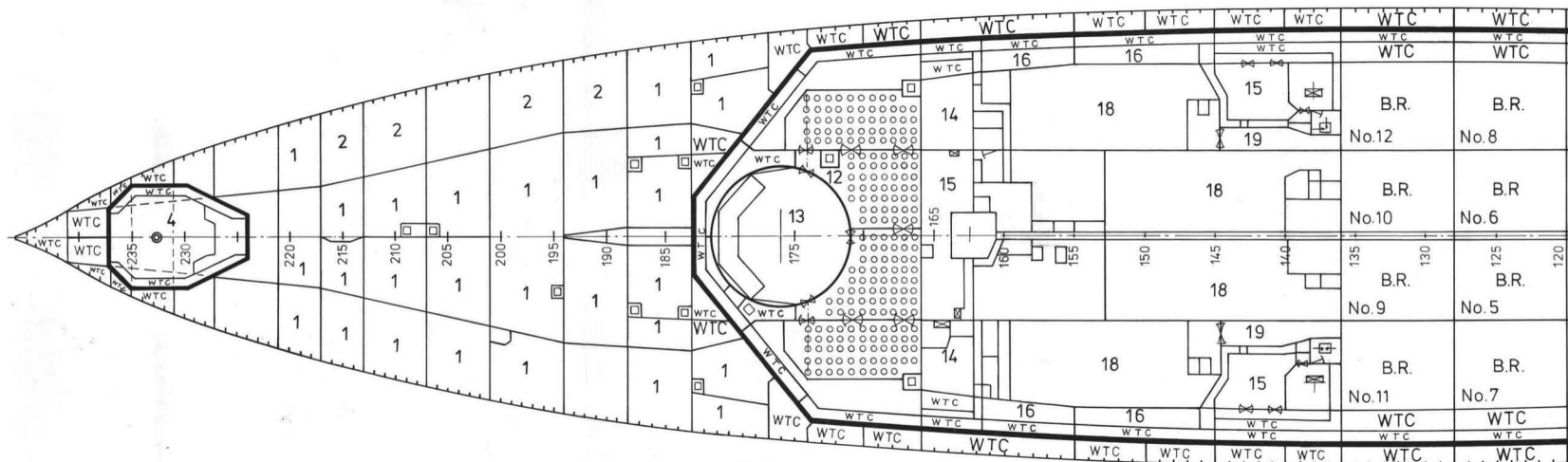
A2/6 Platform Deck (PLD)

- 1 Store
- 2 Crew space
- 3 Anchor windlass room
- 4 Main rudder engine armoured room
- 5 Black powder store
- 6 No.1 main gun turret shell magazine
- 7 Shell supply room
- 8 No.2 main gun turret upper powder magazine (canister stowage)
- 9 No.1 main turret magazine cooling machine room
- 10 Wireless telegraphy room
- 11 Powder supply room – upper
- 12 No.3 main gun turret shell magazine

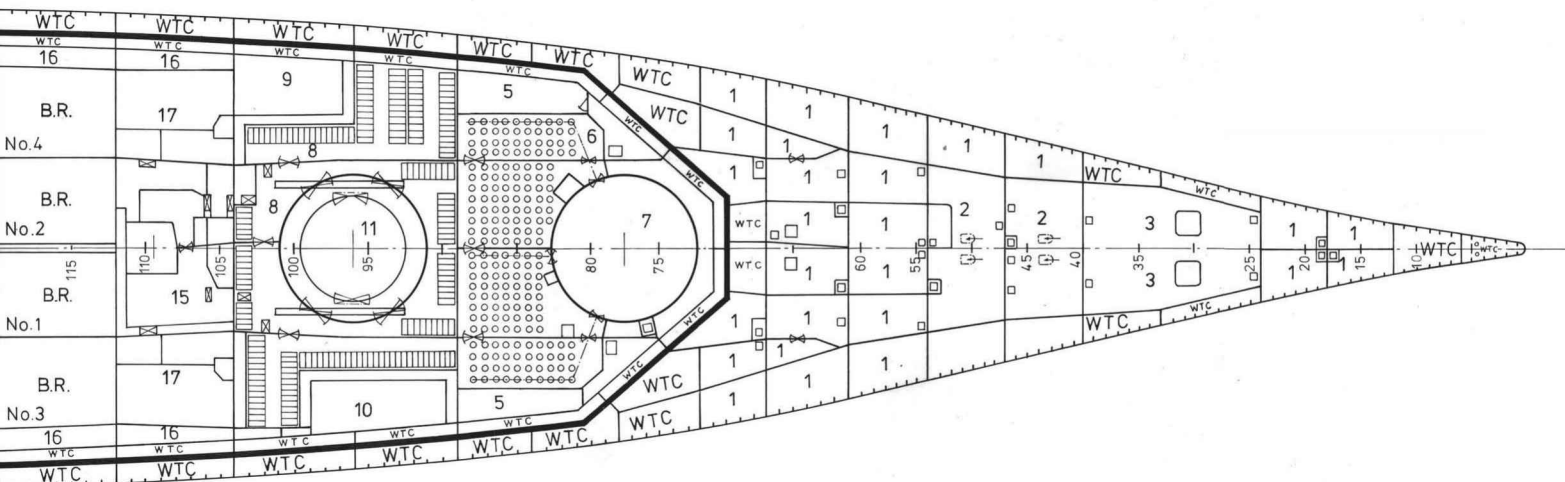
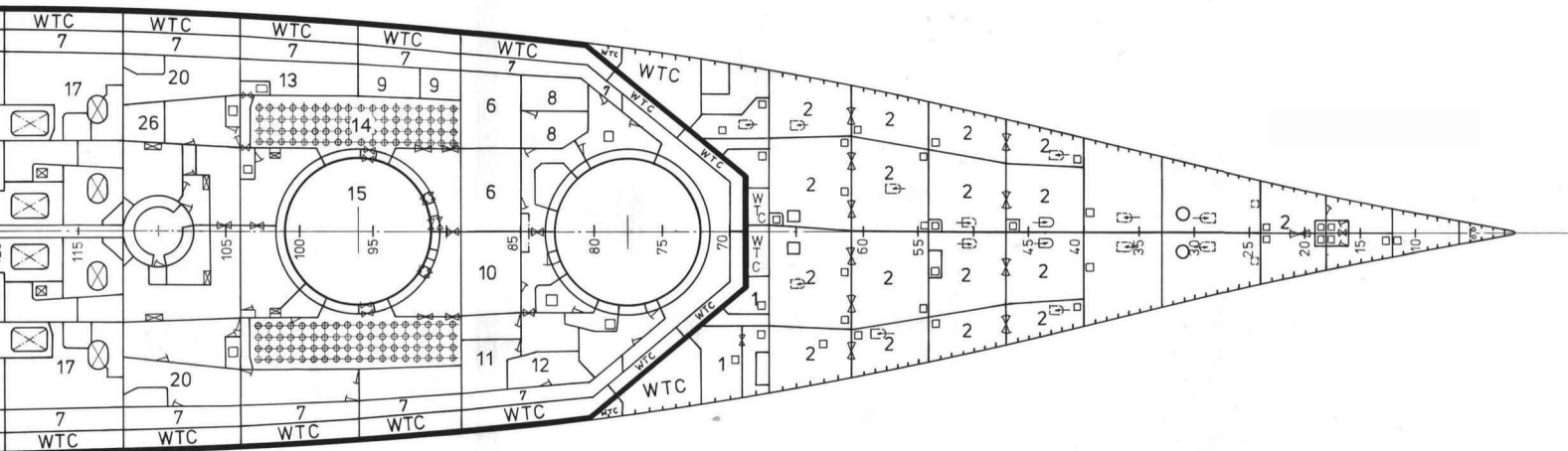
A2/5



A2/6



- 13 Shell supply room
14 Black powder magazine
15 15.5cm gun powder magazine
16 Fresh water tank (hydraulic tank)
17 Dynamo room
18 Main engine – turbine space
19 Boiler steam trunking



A General arrangements

A2/7 First Hold Deck (FHD) (1/600 scale)

- 1 No.1 main gun turret upper powder magazine (canister stowage)
- 2 Powder supply room – upper
- 3 No.2 main gun turret lower powder magazine (canister stowage)
- 4 Powder supply room – lower
- 5 No.2 main gun turret magazine cooling machinery room
- 6 Small arms magazine
- 7 15,5 cm gun powder magazine
- 8 Passage
- 9 Pump room
- 10 Boiler room

A2/8 Section Frame 176

- 1 Boat stowage
- 2 Crew space
- 3 Laundry
- 4 Cells
- 5 No.3 main gun turret upper powder magazine
- 6 No.3 main gun turret lower powder magazine
- 7 Propeller shaft tunnel

A2/9 Section Frame 141

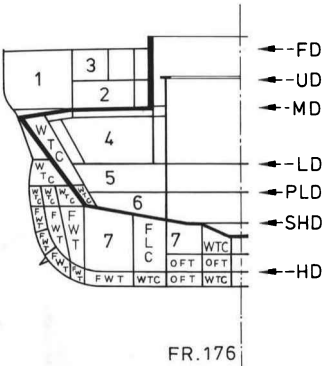
- 1 Store
- 2 Machine service shop
- 3 Hydraulic pump room
- 4 Engine (turbine) room
- 5 15.5cm gun ammunition magazine

- 6 Flooding control position
- 7 Wire trunking passage
- 8 Steam trunking passage

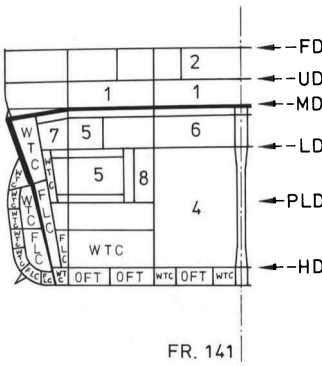
A2/10 Section Frame 110 (or 107?)

- 1 Officer's quarters
- 2 Passage
- 3 Crew space
- 4 Transformer room
- 5 Wire trunking passage
- 6 Dynamo room
- 7 Hydraulic pump room
- 8 Hydraulic measurements compartment

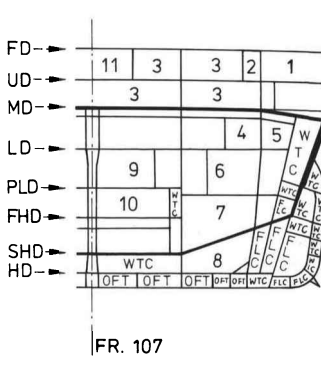
A2/7



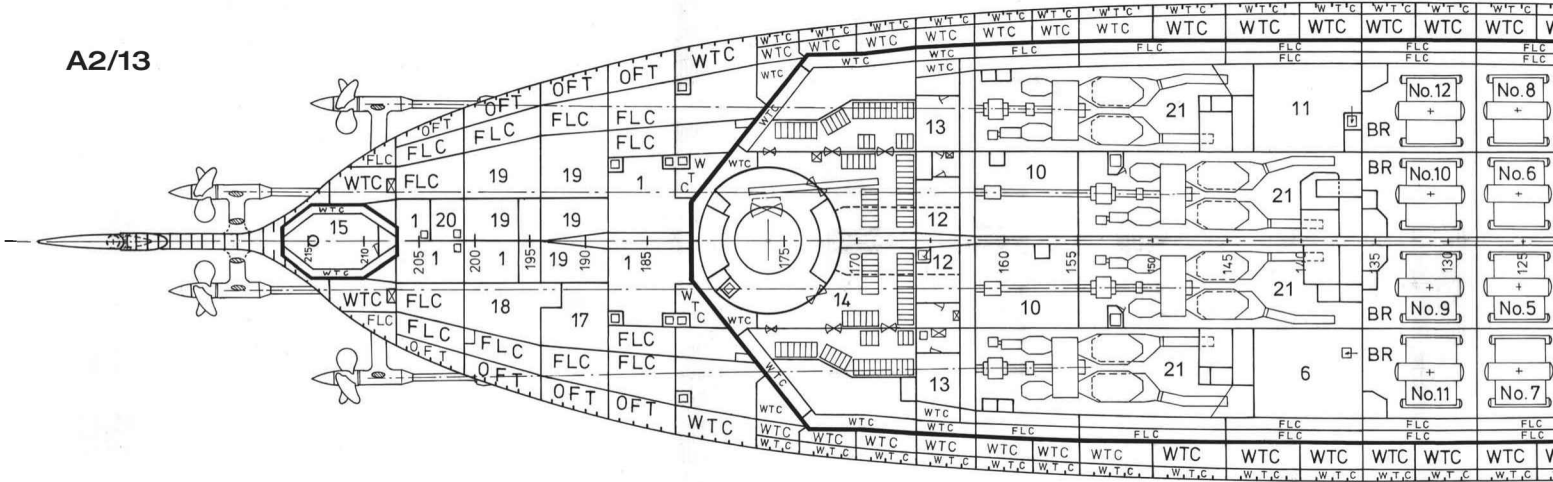
A2/8



A2/9



A2/13



- 9 15.5 cm gun ammunition magazine
- 10 12.7cm HA gun ammunition magazine
- 11 Wireless room

A2/11 Section Frame 96

- 1 Officer's quarters
- 2 No.2 main gun turret shell magazine
- 3 No.2 main gun turret upper powder magazine
- 4 No.2 main gun turret lower powder magazine
- 5 25 mm MG ammunition magazine
- 6 Wireless telegraphy room
- 7 HA gun transmitting station
- 8 Passage

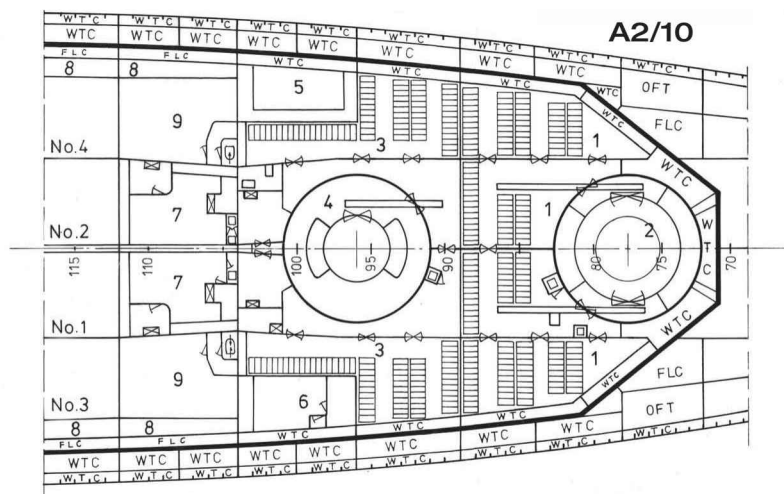
A2/12 Section Frame 30

- 1 Crew space
- 2 Anchor windlass room
- 3 Anchor cable room

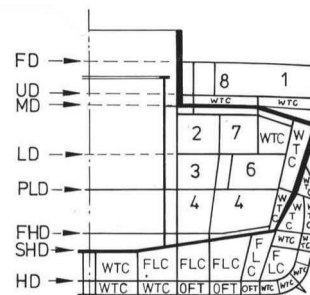
A2/13 Second Hold Deck (SHD)

- 1 Store
- 2 Bilge pump room
- 3 Anchor cable room
- 4 Log room
- 5 Sounding room
- 6 Cooling machinery room
- 7 No.1 main gun turret lower powder magazine
- 8 Flooding pipe room
- 9 Air (or carbon dioxide) bottle room

- 10 Hydraulic pipe conduit
- 11 Hydraulic pump room
- 12 25mm MG ammunition magazine
- 13 12.7cm HA gun ammunition magazine
- 14 No.3 main gun turret lower powder magazine
- 15 Auxiliary rudder engine armoured room
- 16 Fresh water pipe room
- 17 Waste water pipe room
- 18 Cooling machinery room
- 19 Cold magazine
- 20 Aviation fuel control position
- 21 Engine room

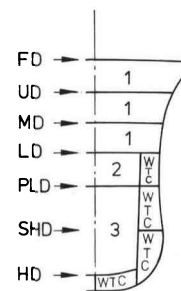


A2/11

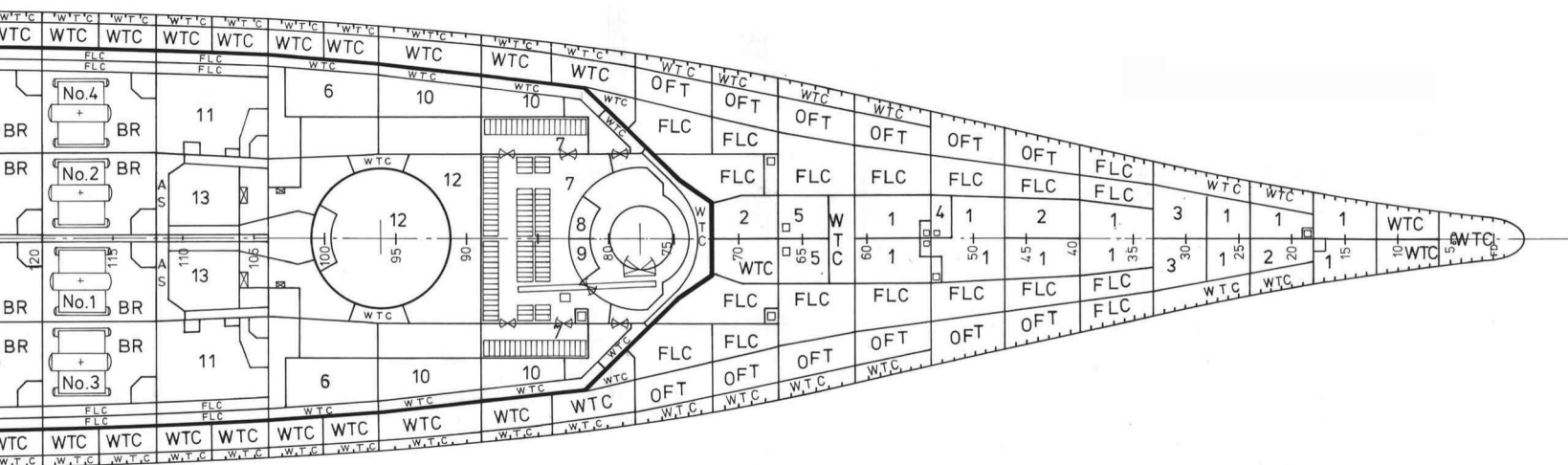


FR.96

A2/12



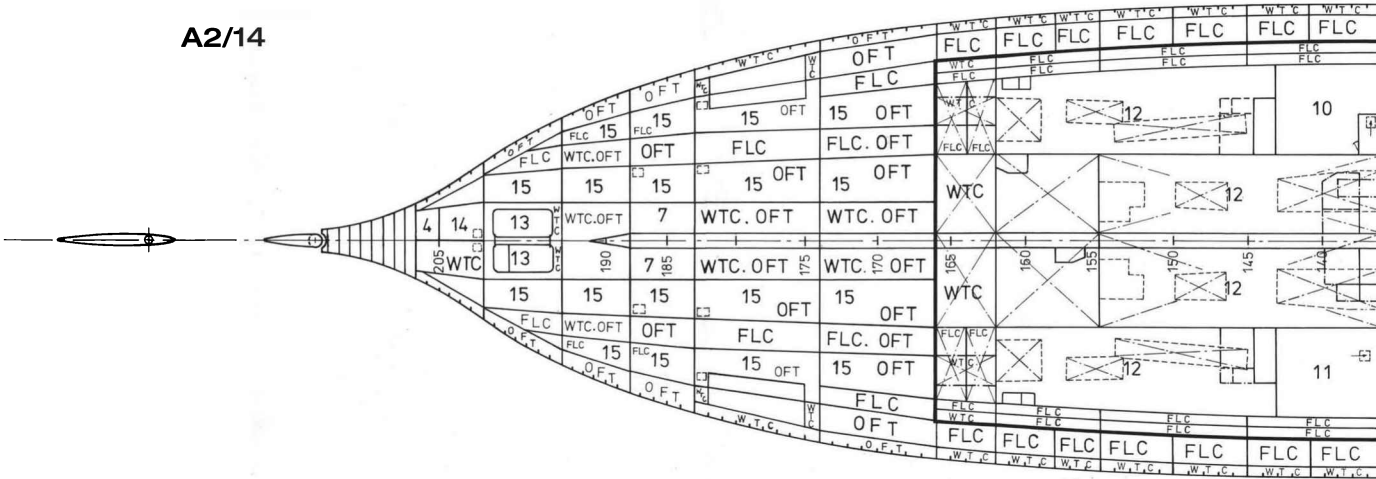
FR.30



A General arrangements

A2/14 Hatch Deck (HD) (1/600 scale)

- 1 Store
- 2 Underwater hydrophone room
- 3 Trim tank
- 4 Log room
- 5 Sounding room
- 6 Anchor cable room
- 7 Oil pump room
- 8 Bilge pump room
- 9 Hydraulic monitoring compartment
- 10 Hydraulic pump room
- 11 Cooling machinery room
- 12 Engine room – turbine
- 13 Aviation fuel tank
- 14 Aviation fuel pump room
- 15 Propeller shaft tunnel



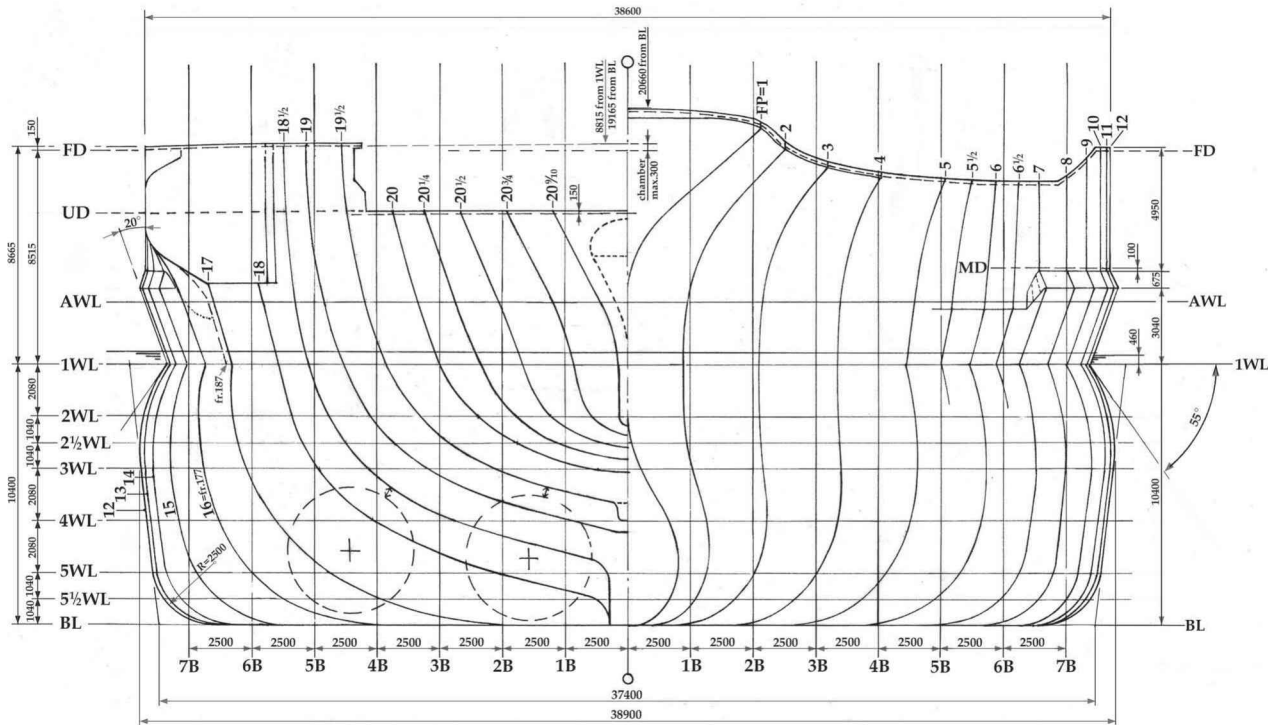
A2/15 Body plan (1/300 scale)

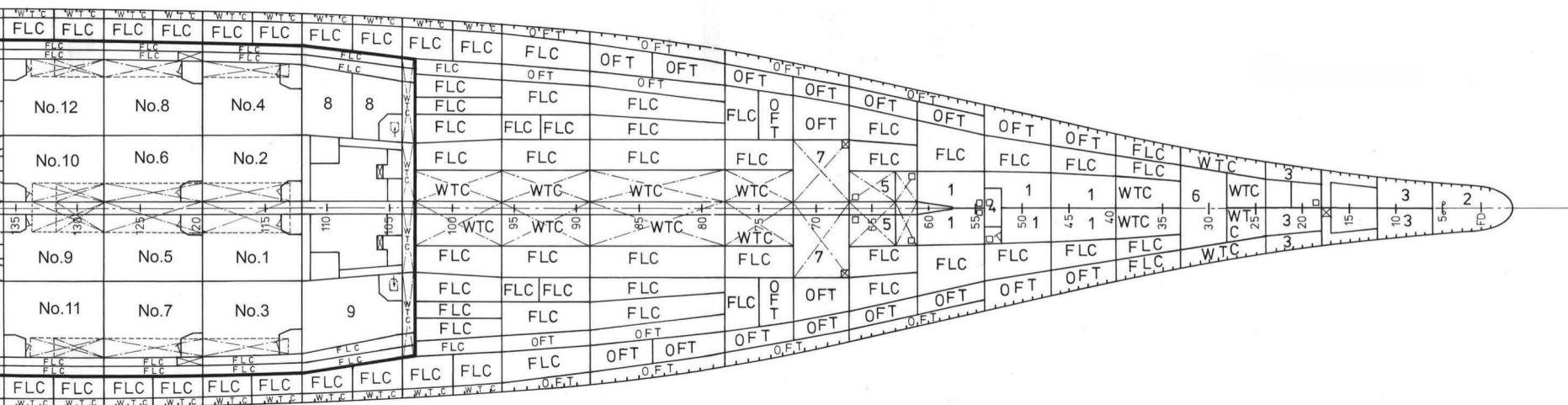
A2/16 Body lines of stern part

A2/17 Body lines of stern part

A2/18 Body lines of stern part

A2/15

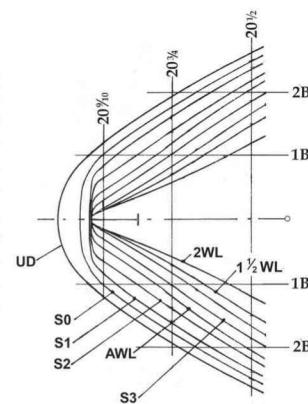
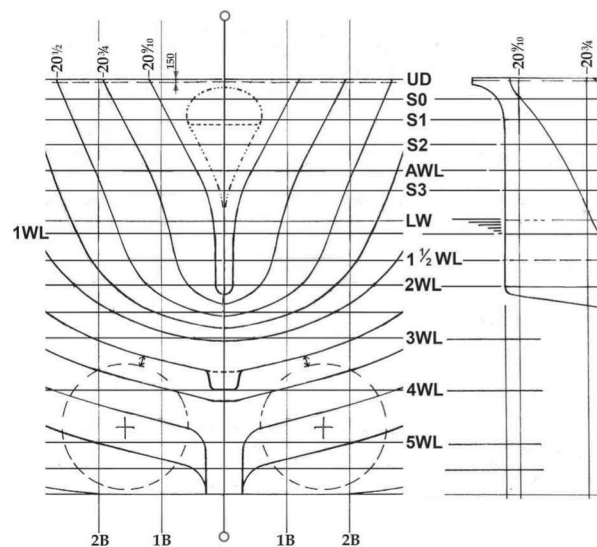




A2/16

A2/17

A2/18

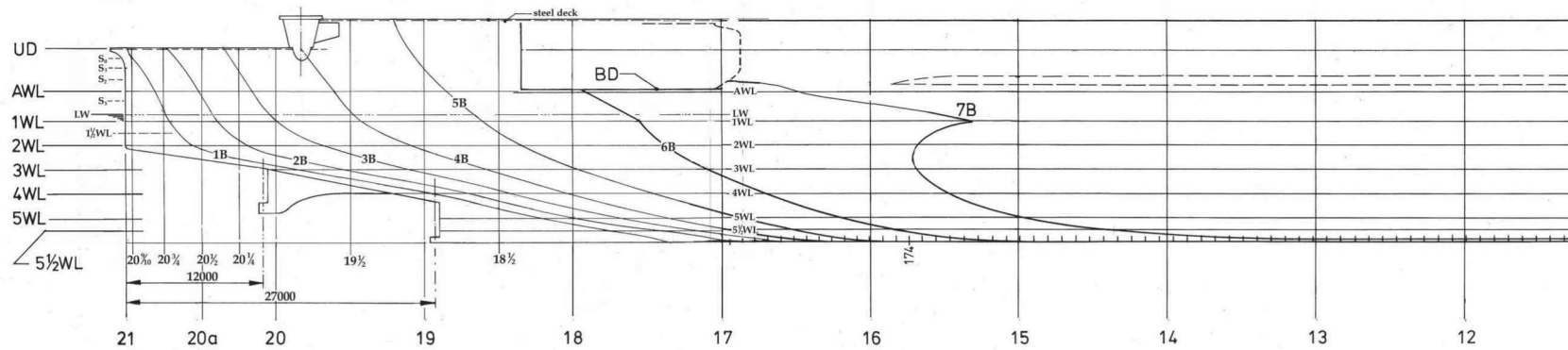


A General arrangements

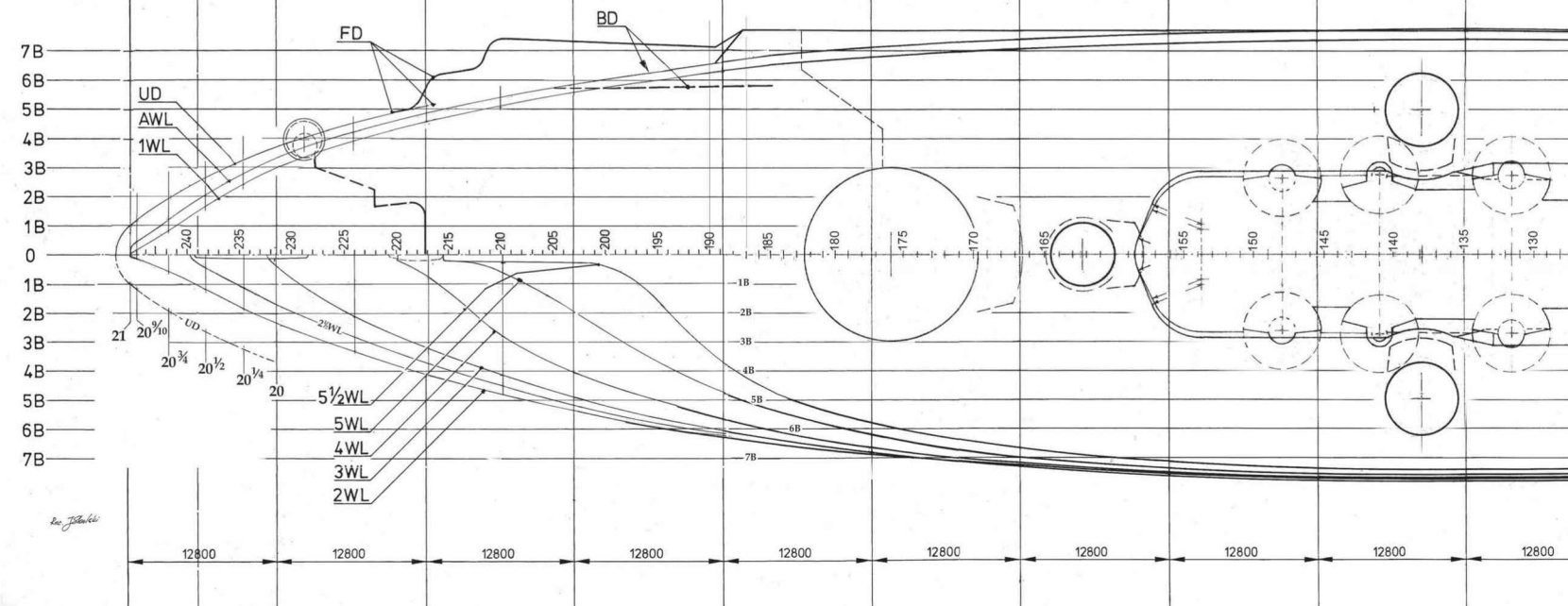
A2/19 Sheer elevation (1/600 scale)

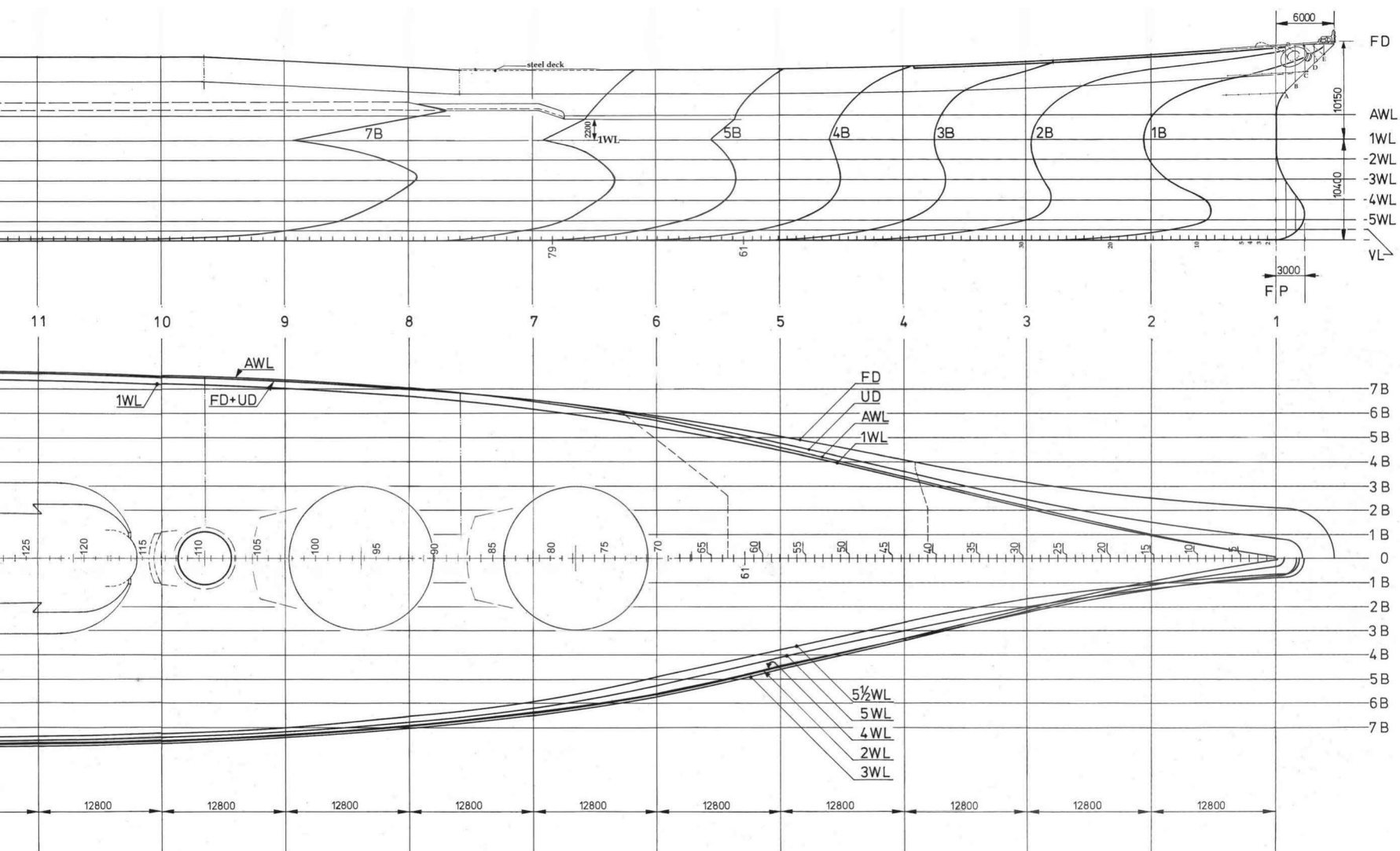
A2/20 Waterline plan

A2/19



A2/20





B Hull Structure

B1/1 Midship hull structure (1/300 scale)

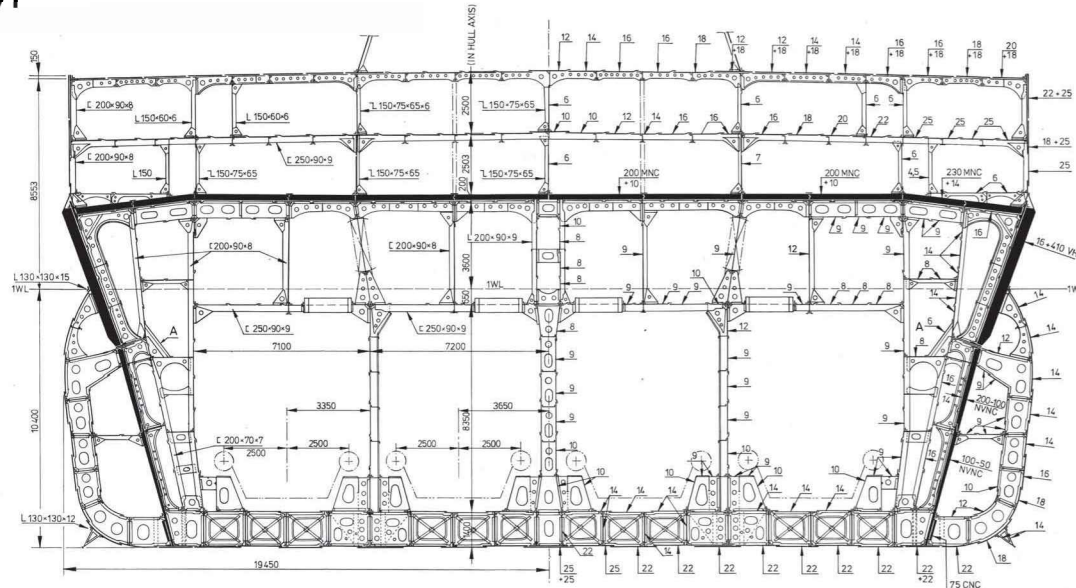
B1/2 Armour joints

B1/3 Plan of middle deck armour plates

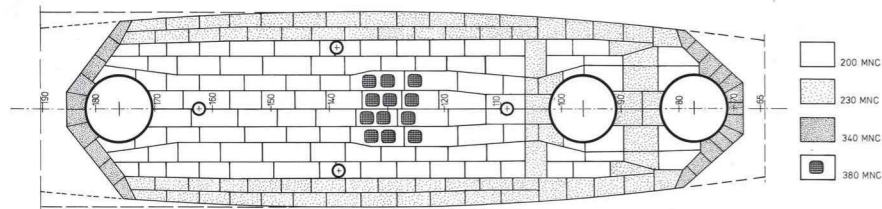
B1/4 Armour joints (plan)

B1/5 Armour joints (middle deck plate joint)

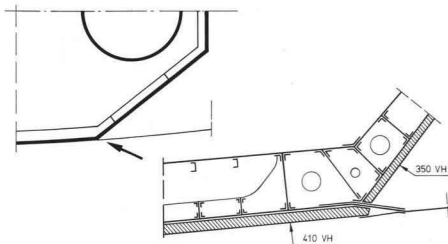
B1/1



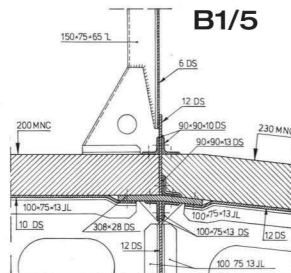
B1/3



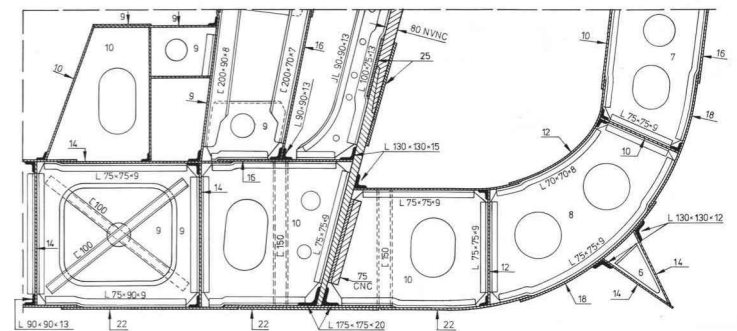
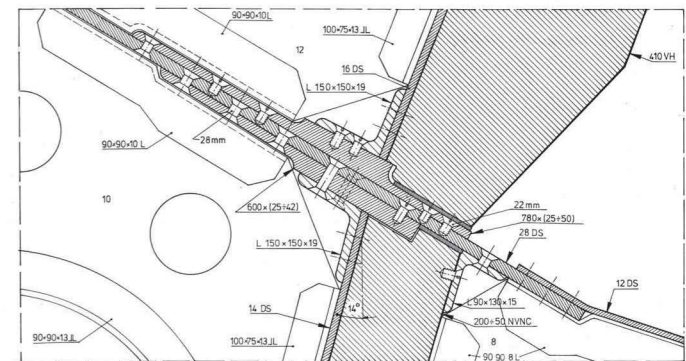
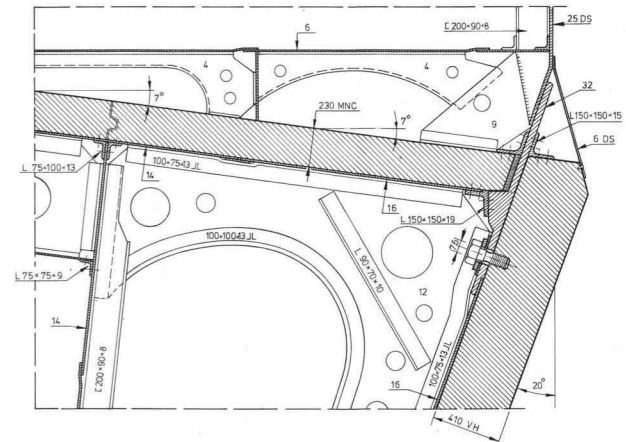
B1/4



B1/5



B1/2



B1/7 Hull plating (thickness in mm)



B Hull Structure

B1/8 Armour and protective plating - profile (1/600 scale)

Numbers give armour and protective plating thicknesses in mm

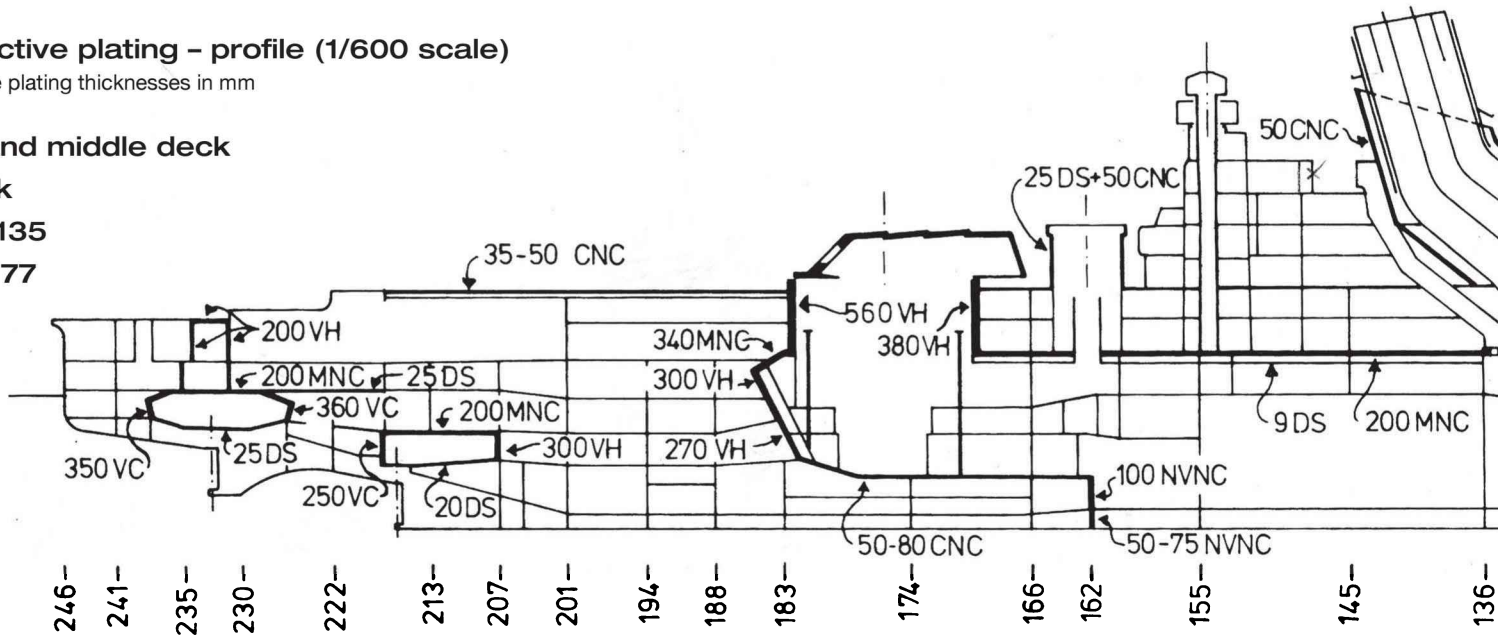
B1/9 Forecastle deck and middle deck

B1/10 Second hold deck

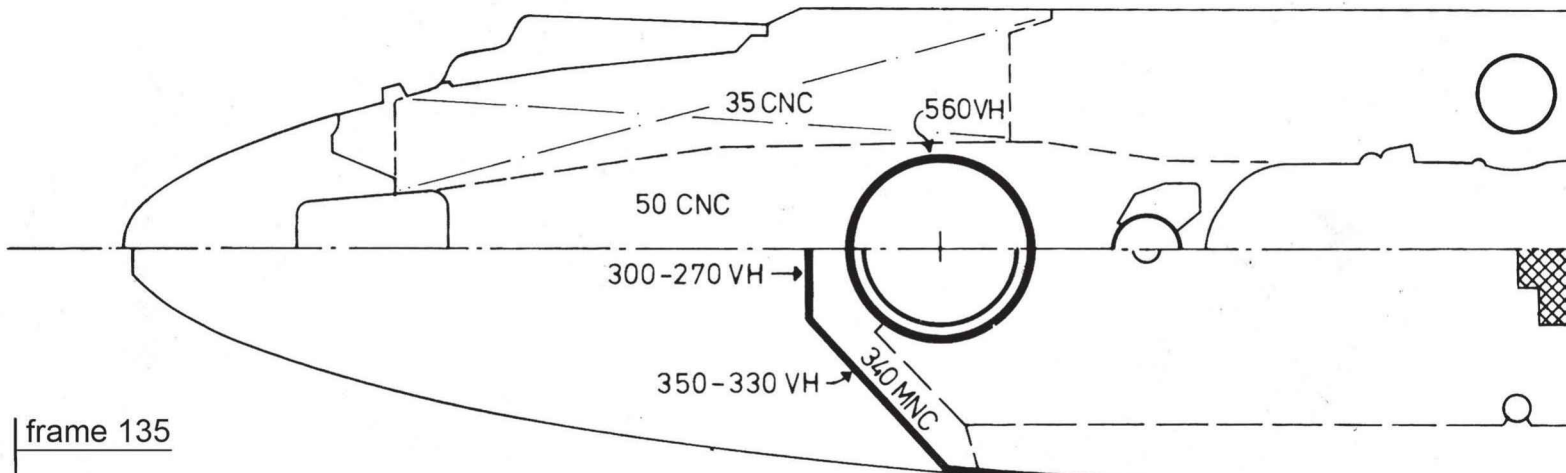
B1/11 Section at frame 135

B1/12 Section at frame 77

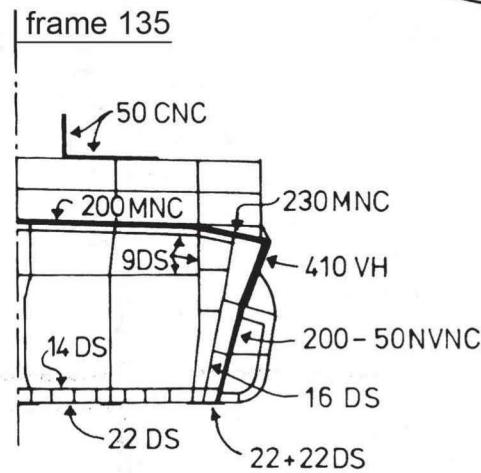
B1/8



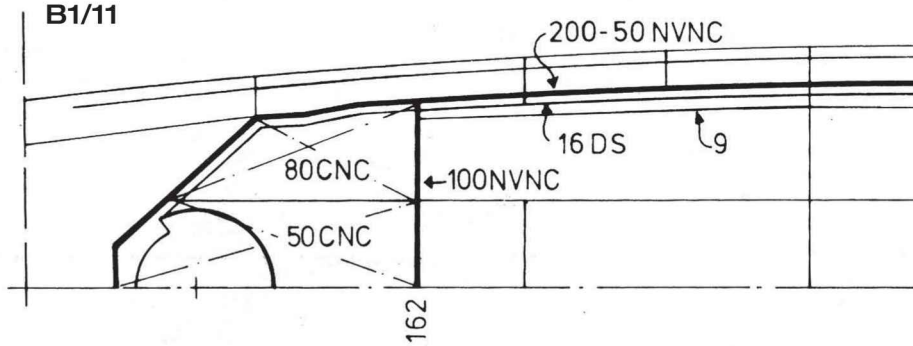
B1/9

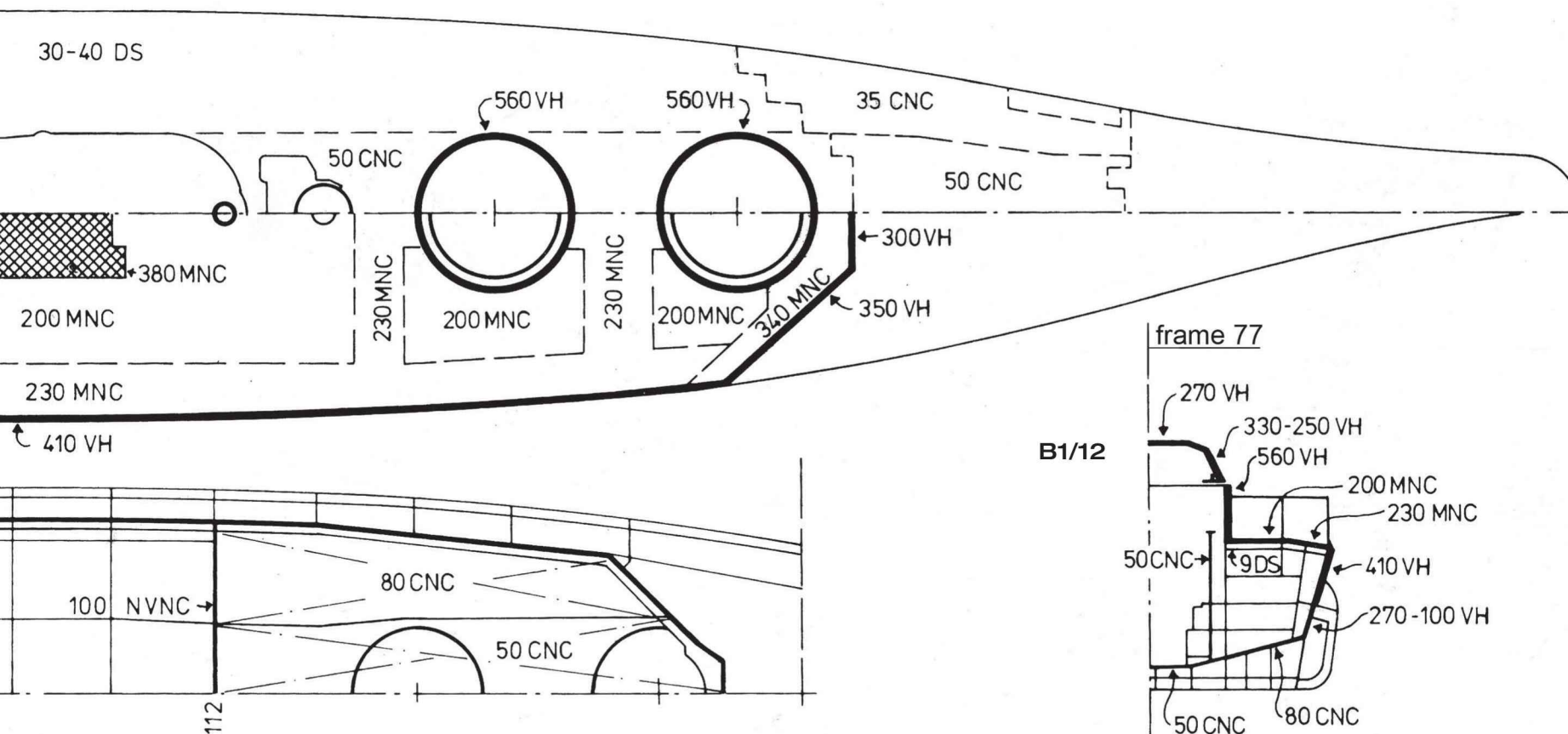
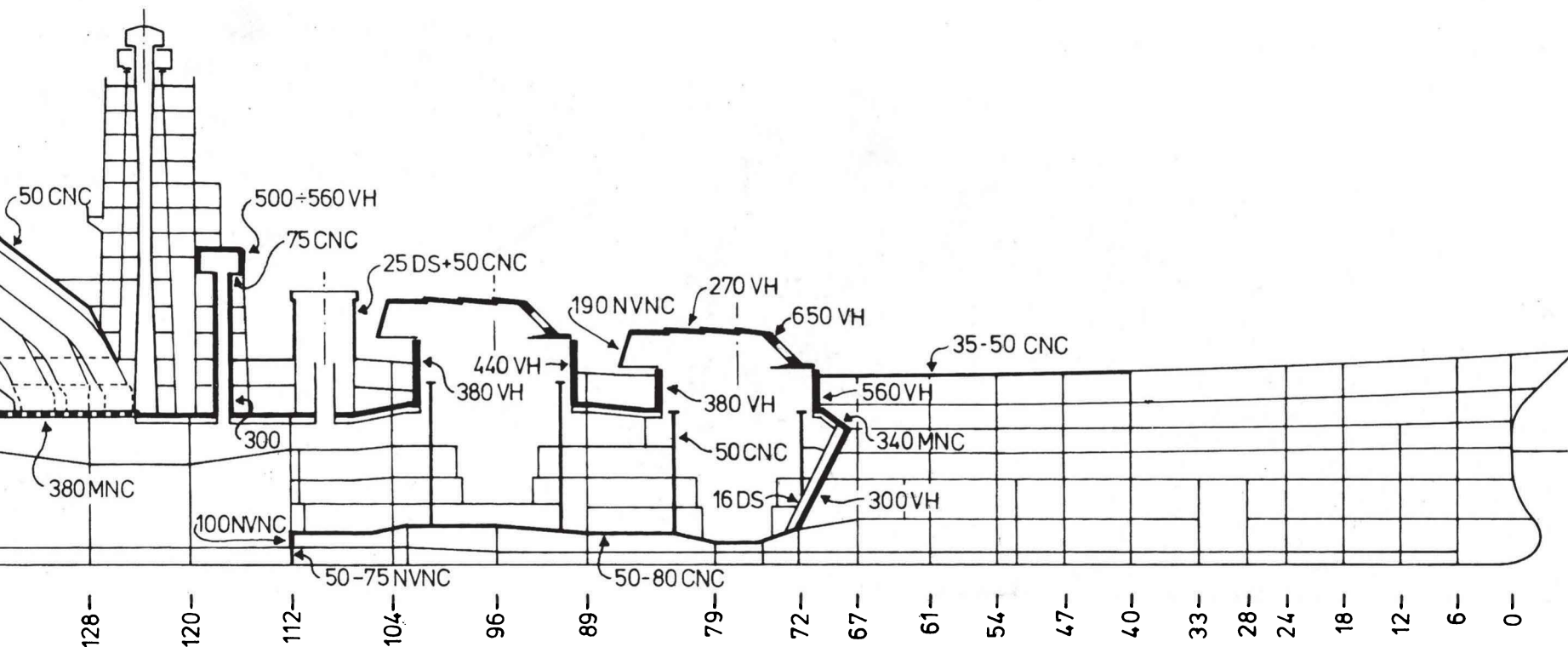


B1/10



B1/11

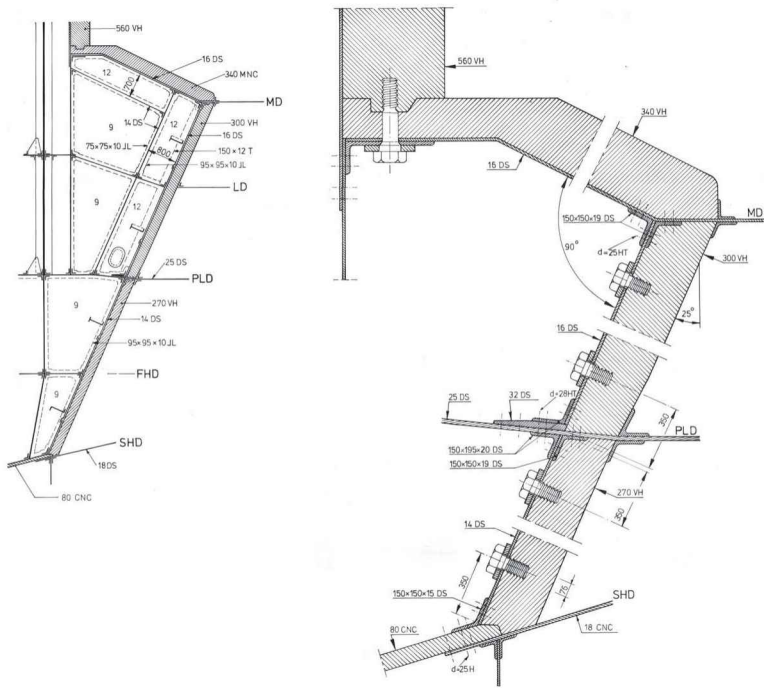




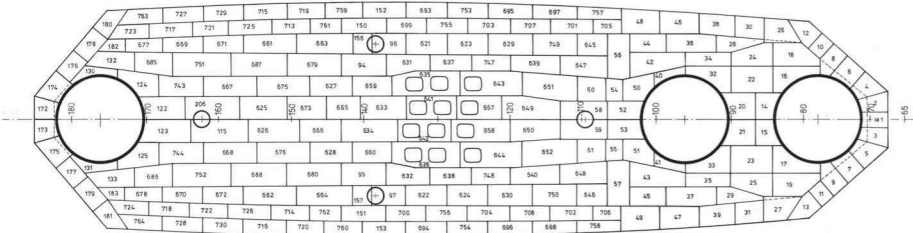
B Hull Structure

- B1/13 Plan of armoured box (middle deck)
- B1/14 Fore bottom part of box
- B1/15 Profile of armoured box
- B1/16 Stern part of box
- B1/17 Fore part of box
- B1/18 Side view
- B1/19 Fore armour of box (ship axis)
- B1/20 Protection of funnel intake – section and plan

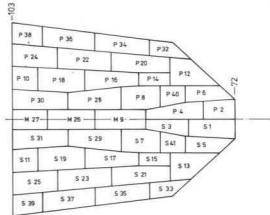
B1/19



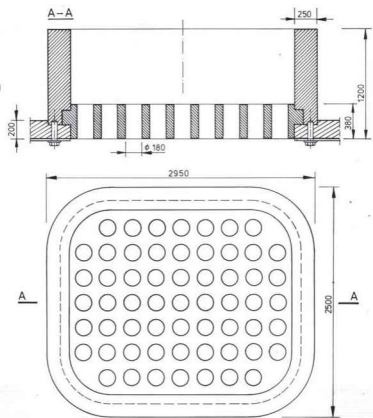
B1/13



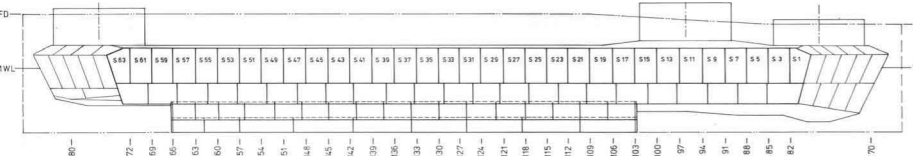
B1/14



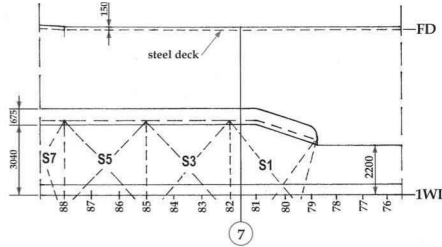
B1/20



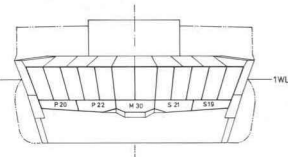
B1/15



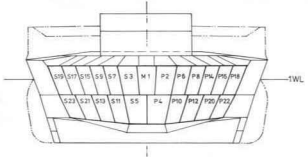
B1/18



B1/16

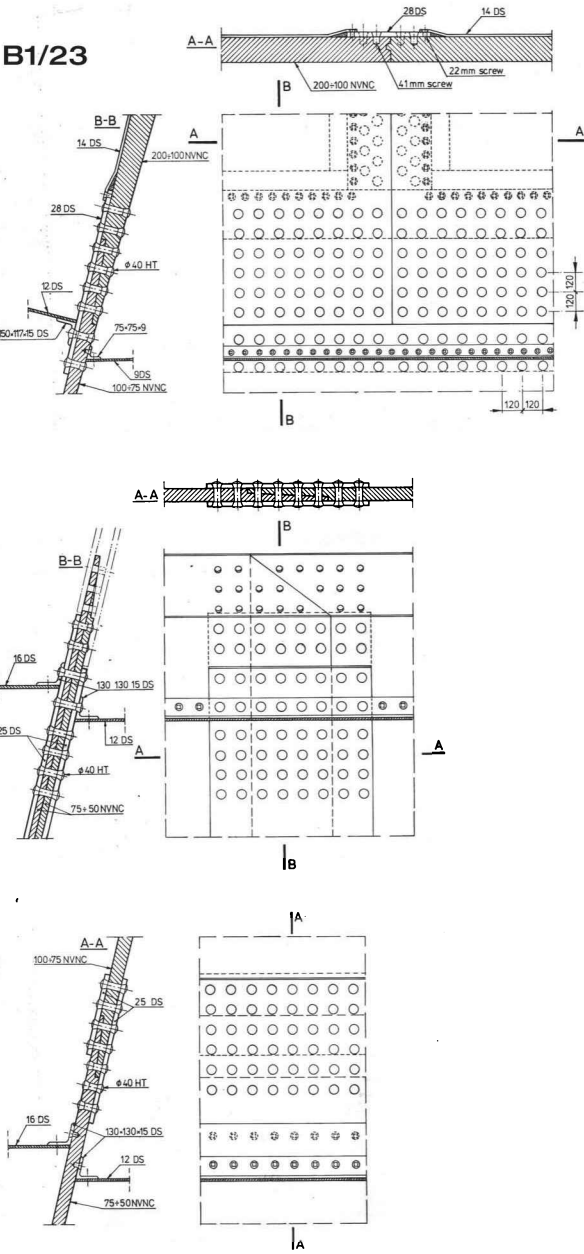


B1/17

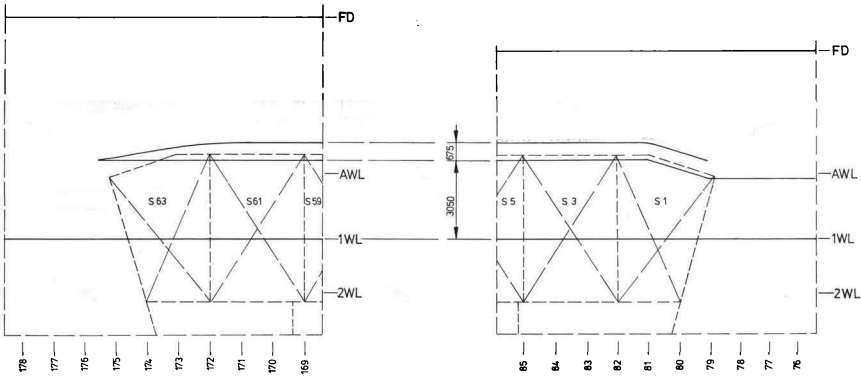


- B1/21 Fore and aft side cover of armoured box
- B1/22 Vertical joint of fore armour with side plating
- B1/23 Typical joints of hull plating
- B1/24 Joints of inner armour

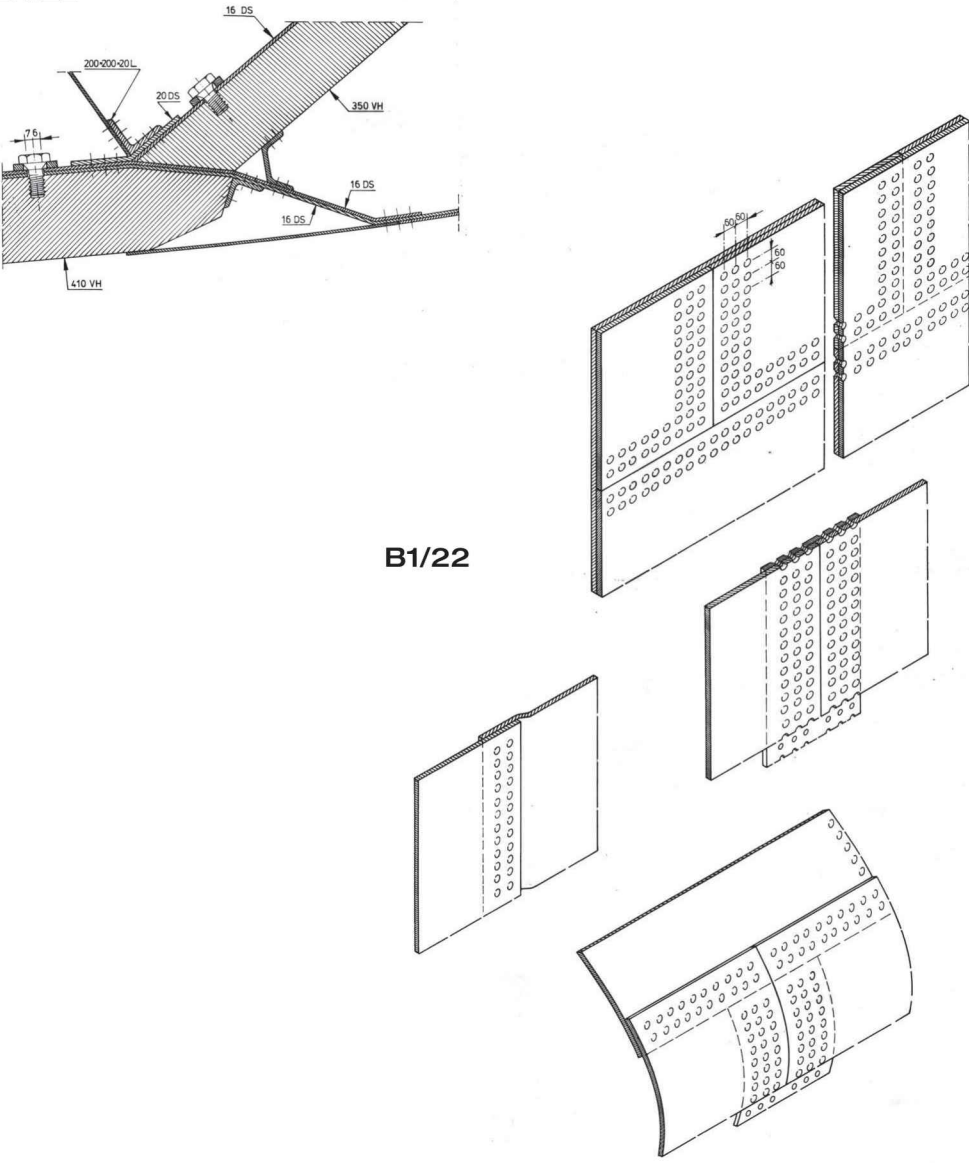
B1/23



B1/21

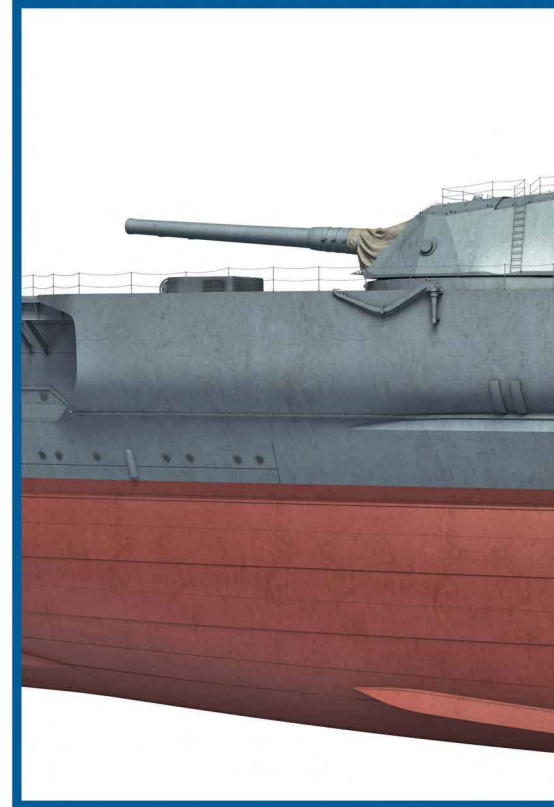
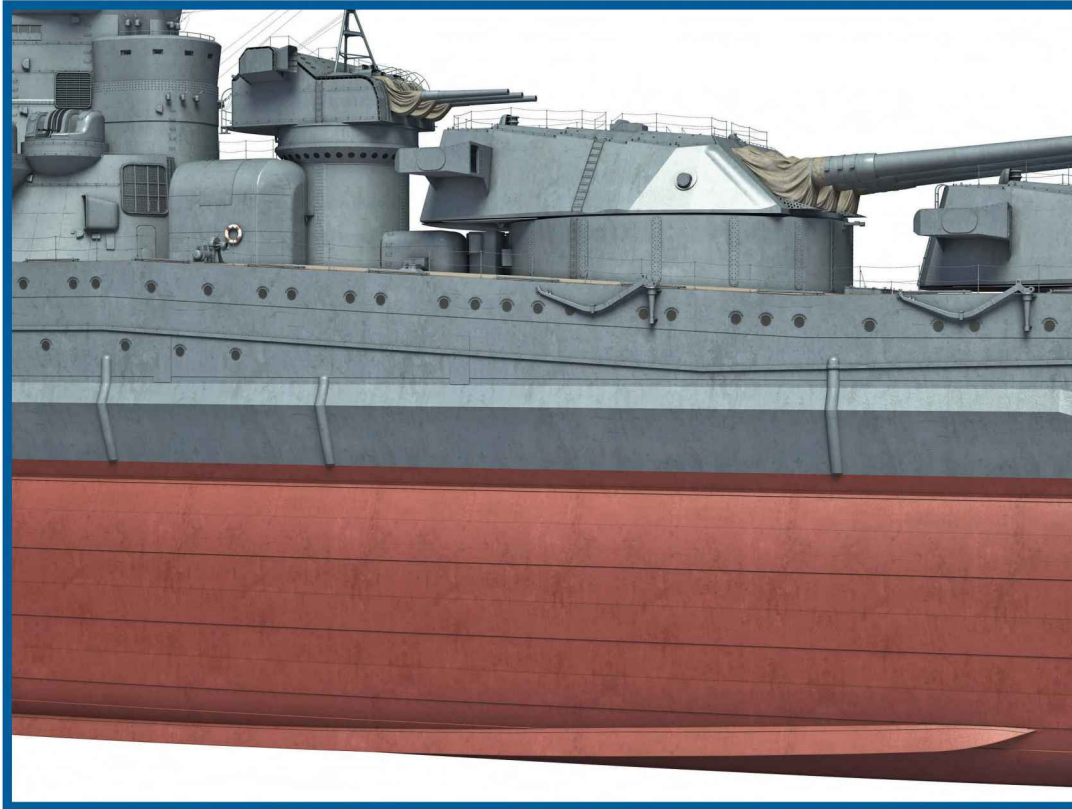
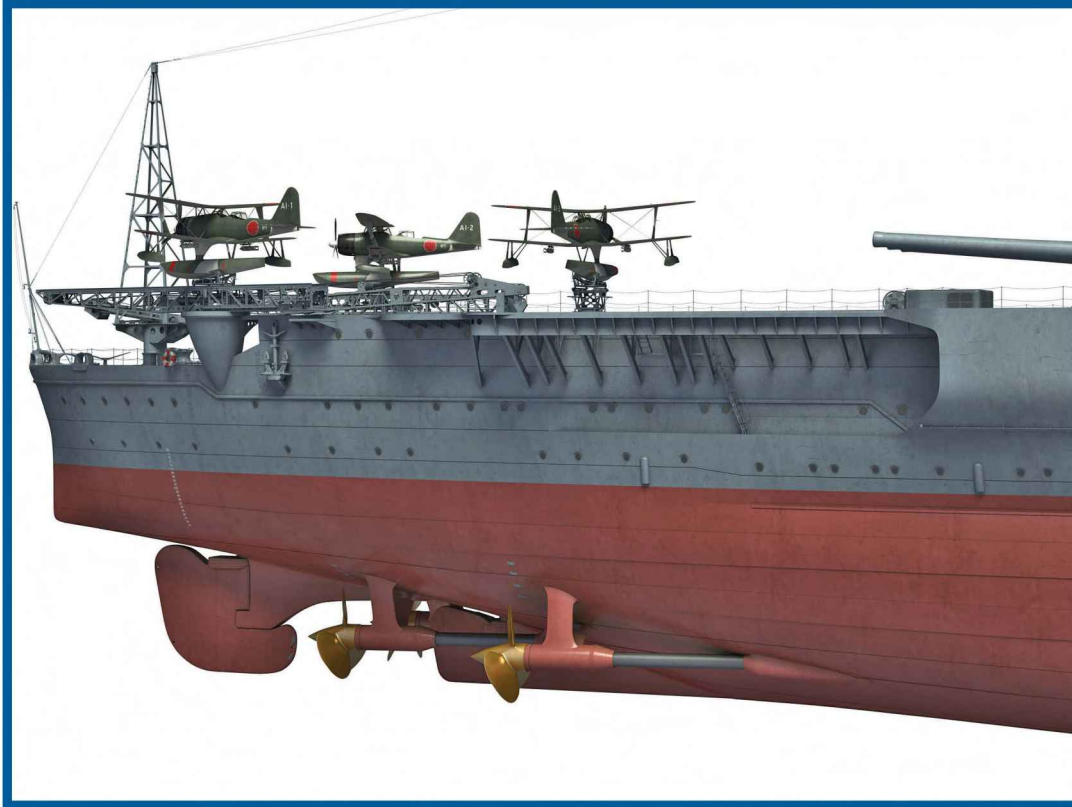


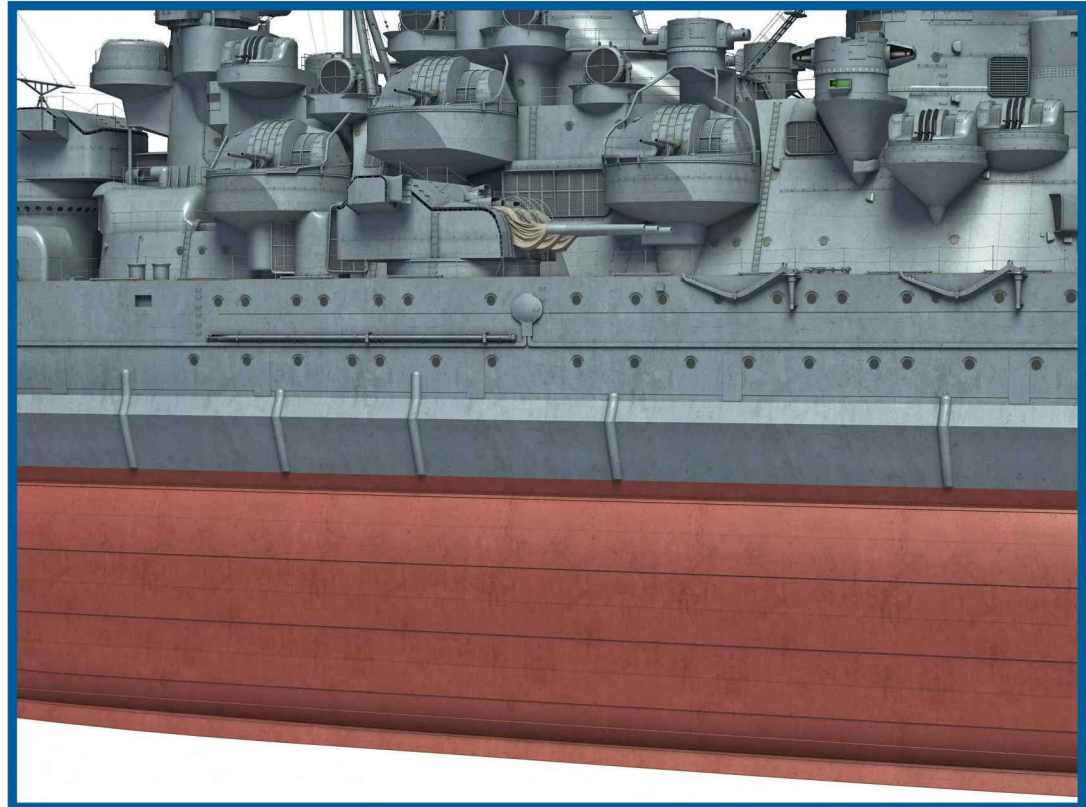
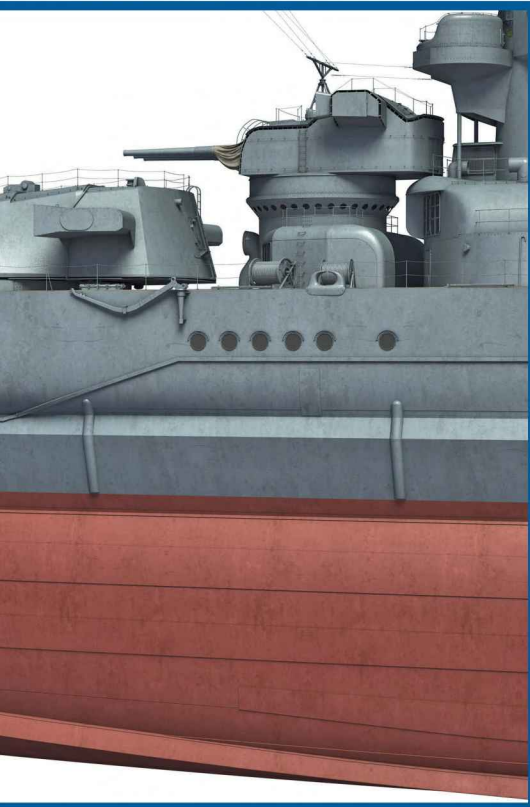
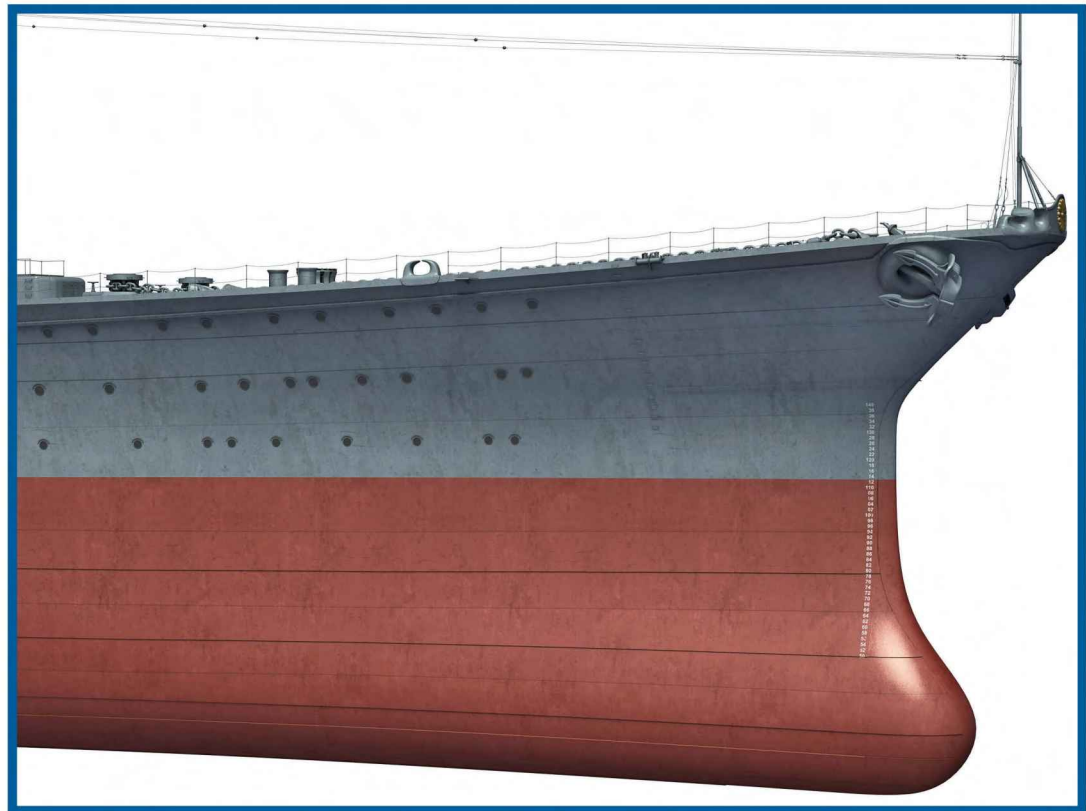
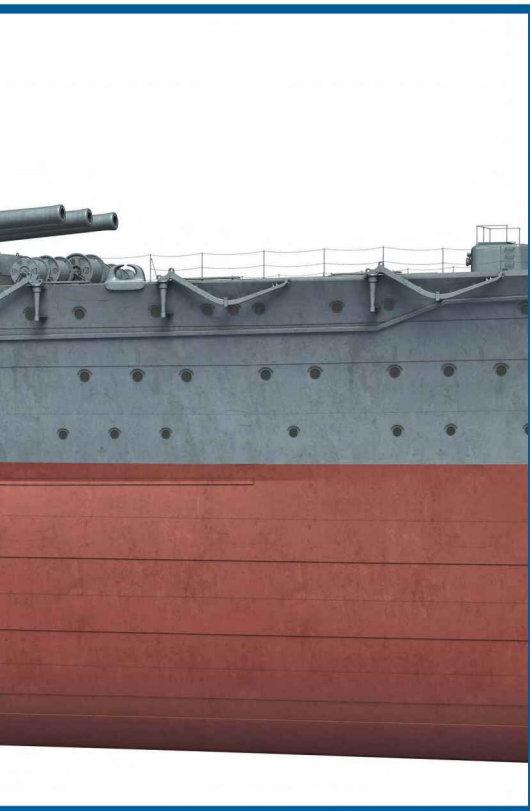
B1/22



B1/22

B Hull Structure – Yamato 1941 starboard side





B Hull Structure

B1/25 Yamato 1941 – starboard profile (1/600 scale)

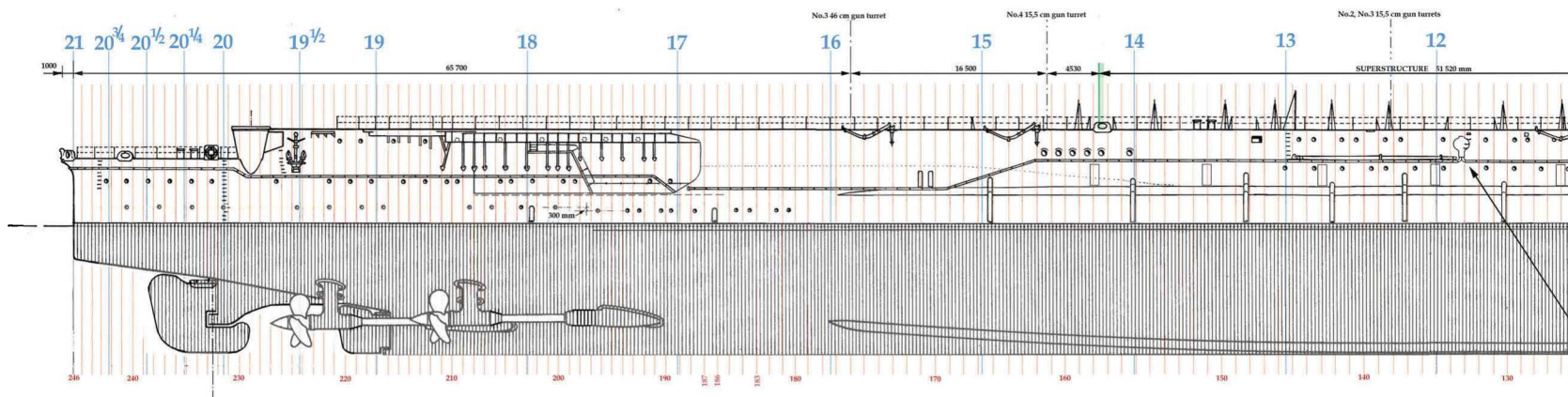
B1/26 Side scuttles

B1/27 Degaussing cable socket

B1/28 Support of aircraft deck edges

B1/29 Scupper pipe

B1/25



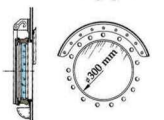
B1/26



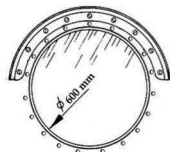
Side scuttle fitted only on *Musashi* staff compartments on frame spaces 101–104 and 116–126 on starboard side upper deck



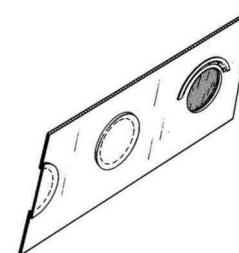
Side scuttle fitted on UD and MD compartments



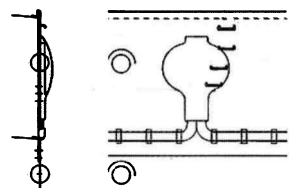
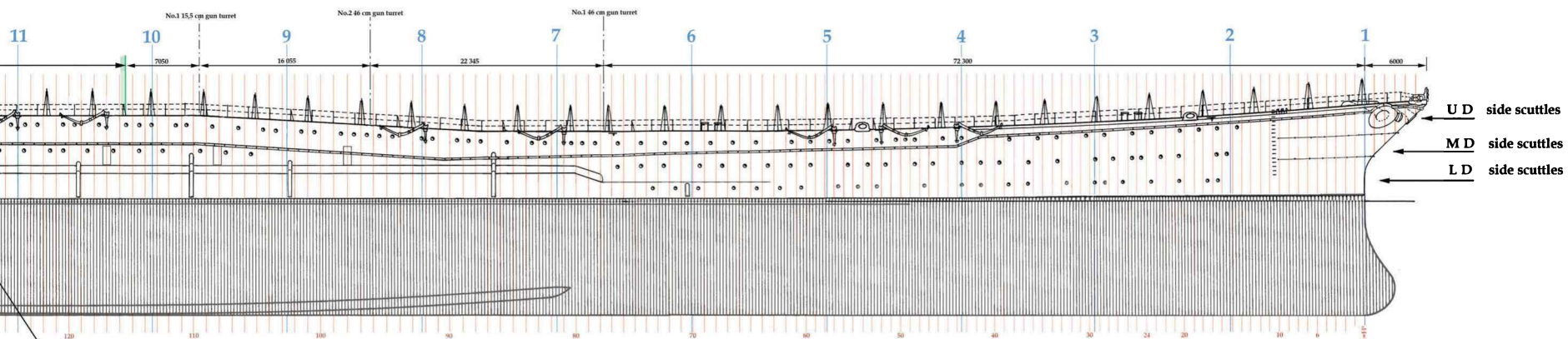
Side scuttle fitted on LD compartments and on the superstructure



Side scuttle on UD compartments (boats stowage) on frame spaces 156–162



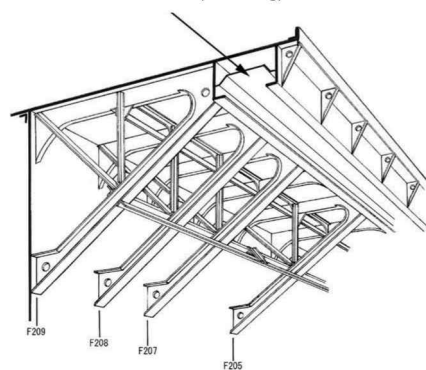
Hull scuttles blanked off by stell rings – 50mm bigger diameter than hole and 25mm thick (after 1944 refit)



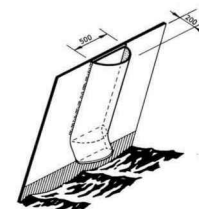
B1/27

B1/28

Boat overhead (travelling) crane



B1/29



B Hull Structure

B1/30 *Yamato* 1941 – port side view (1/600 scale)

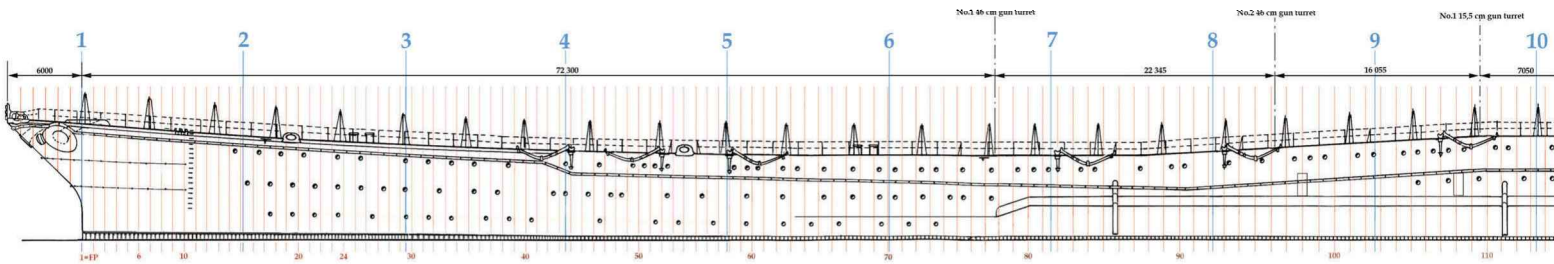
B1/31 Swinging boom

B1/32 Open hangar doors

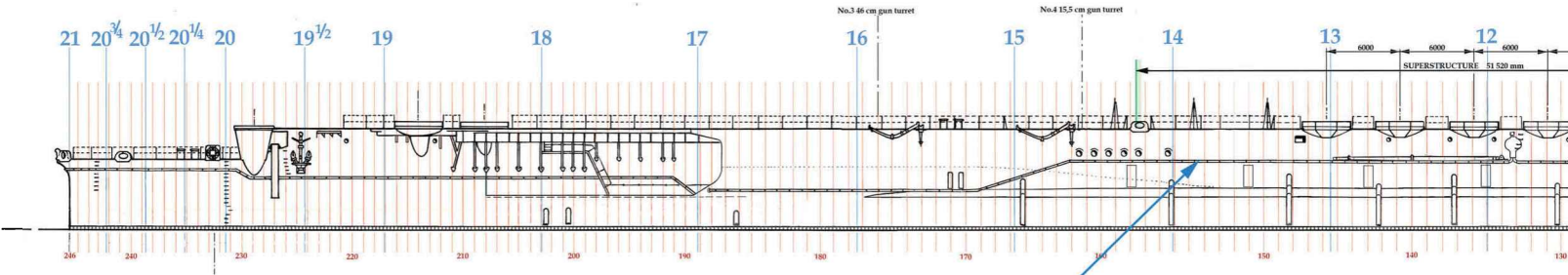
B1/33 *Yamato* 1945 starboard profile

B1/34 Degaussing cable

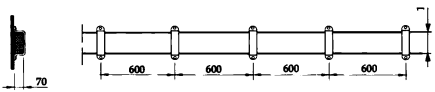
B1/30



B1/33



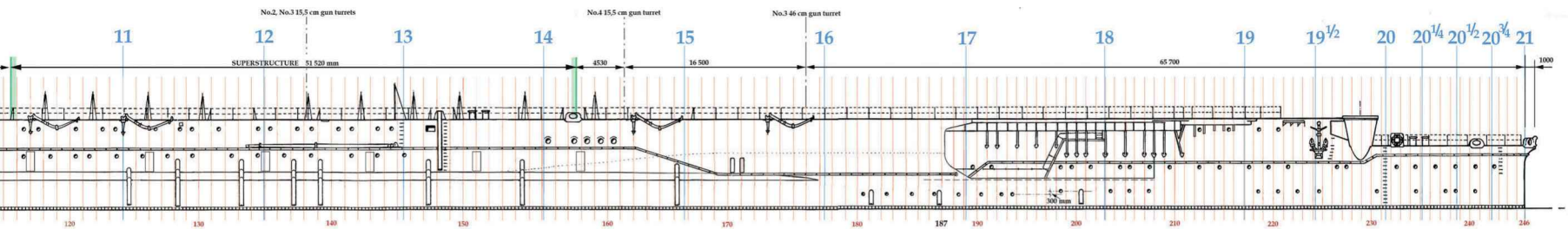
B1/34



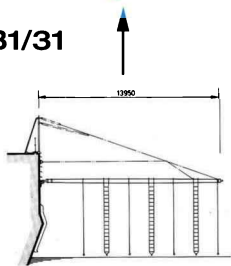
Distance between frames		
FP=1 – 61	900mm	60 frame spaces
61 – 62	1000mm	1
62–78	1100mm	16
78–79	1150mm	1
79–90	1200mm	11
90–104	1225mm	14
104–105	1150mm	1
105–111	1200mm	6
111–113	1150mm	2

Distance between frames		
113–119	1200mm	6
119–121	1150mm	2
121–127	1200mm	6
127–129	1150mm	2
129–135	1200mm	6
135–136	1150mm	1
136–140	1225mm	4
140–162	1200mm	12
162–166	1225mm	4

Distance between frames		
166–179	1200mm	13
179–189	1100mm	10
189–190	1000mm	1
190–243	900mm	43
243–246	800mm	3
Distance square stations (1–21) = 12 800mm		
Frame FP (fore perpendicular) to frame 246 = 256 000mm		
Length overall = 263 000mm		

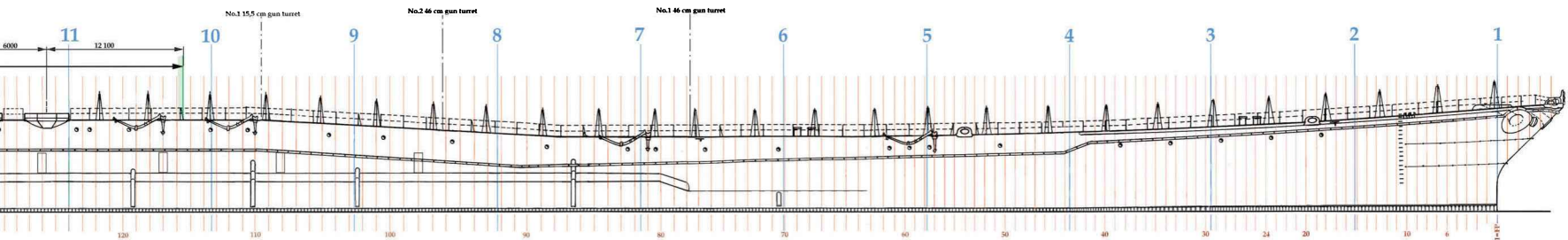
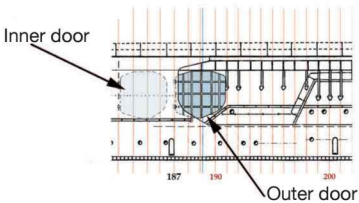


B1/31

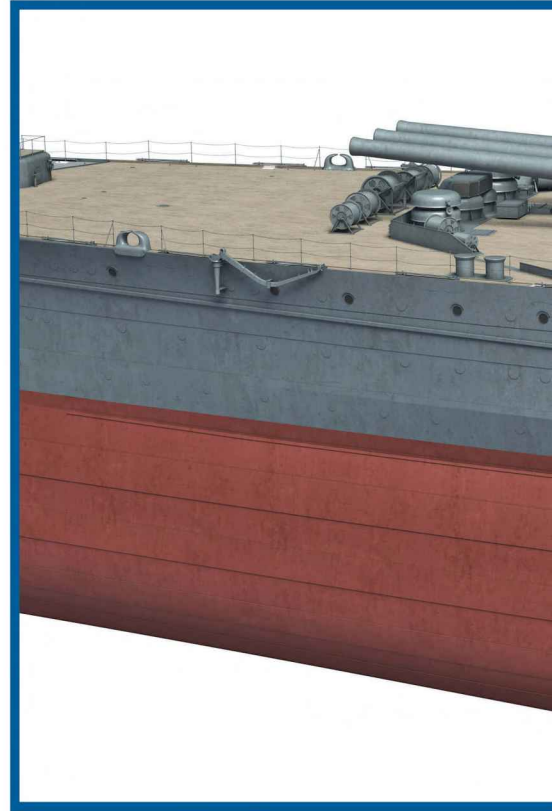
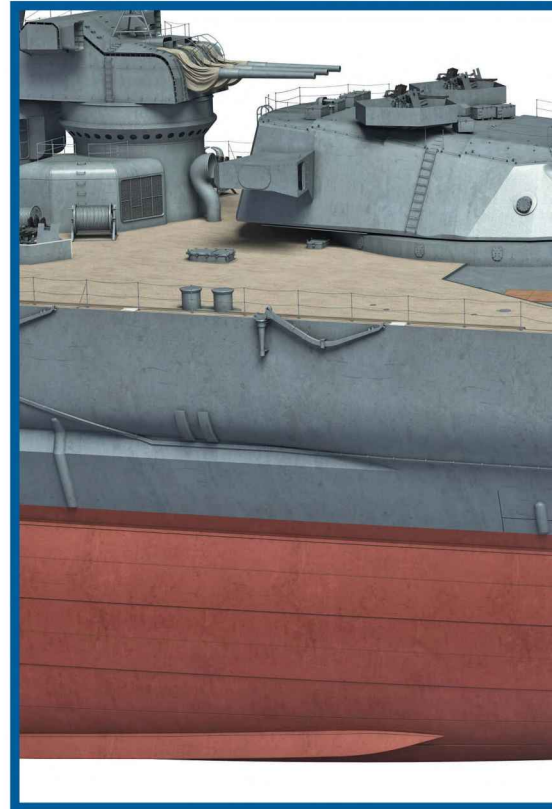
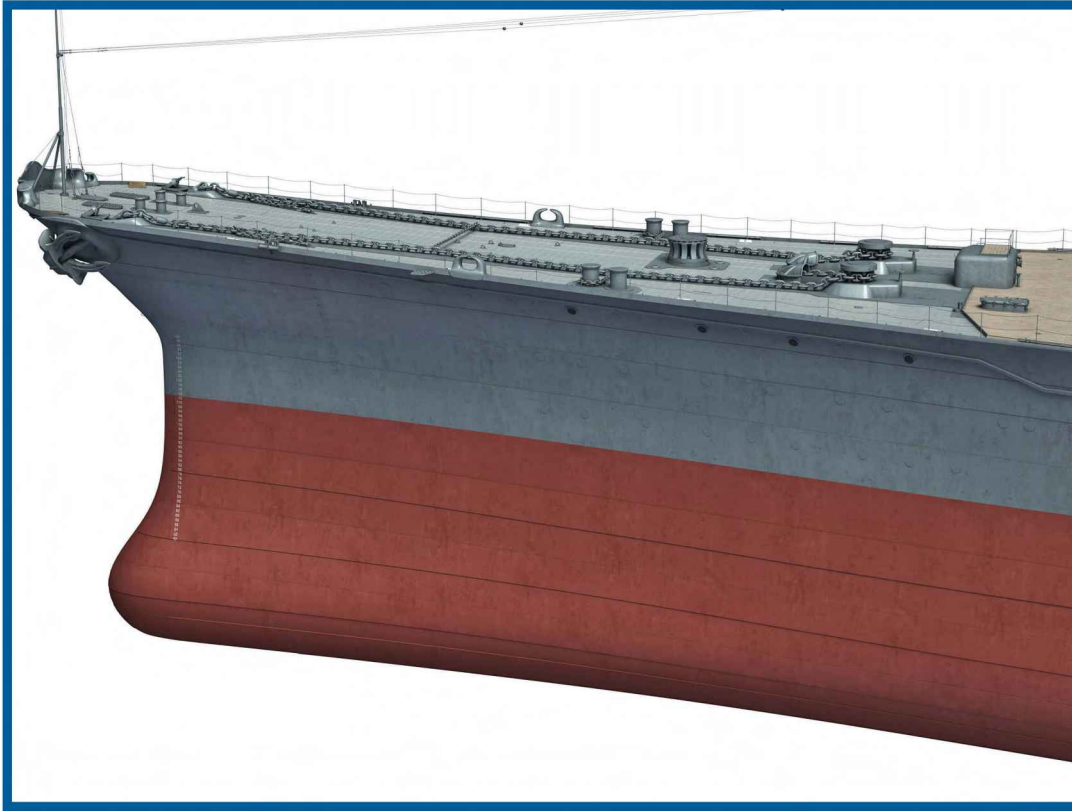
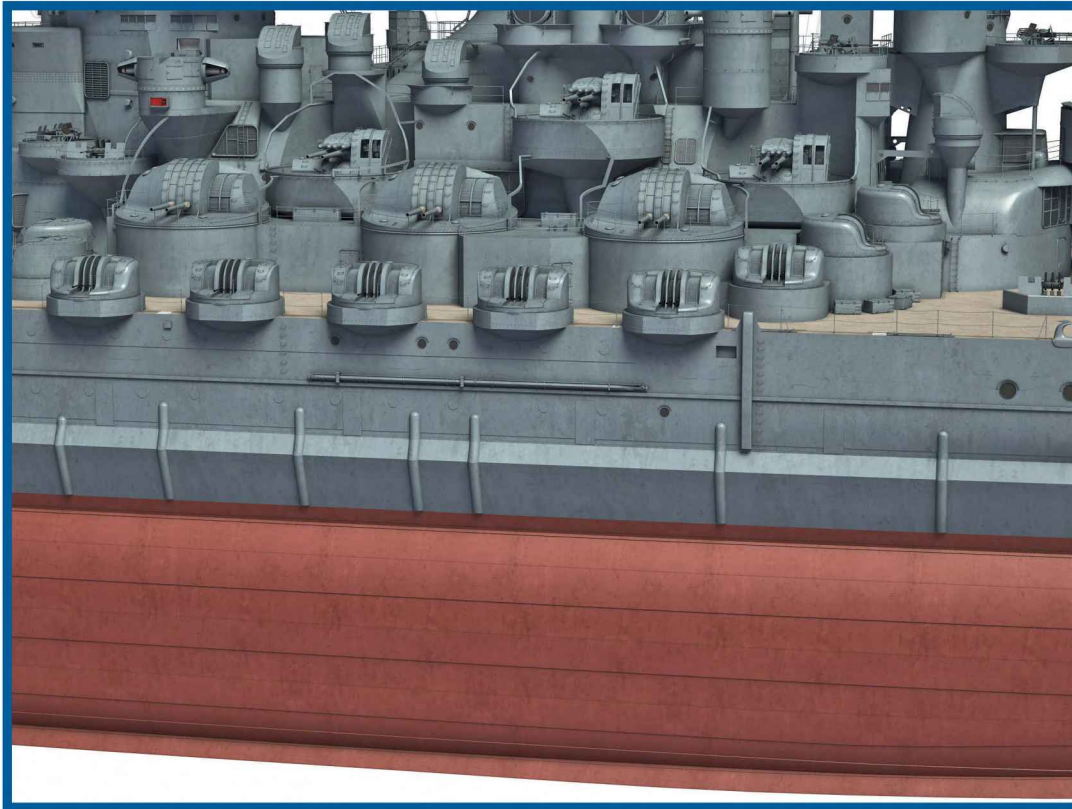


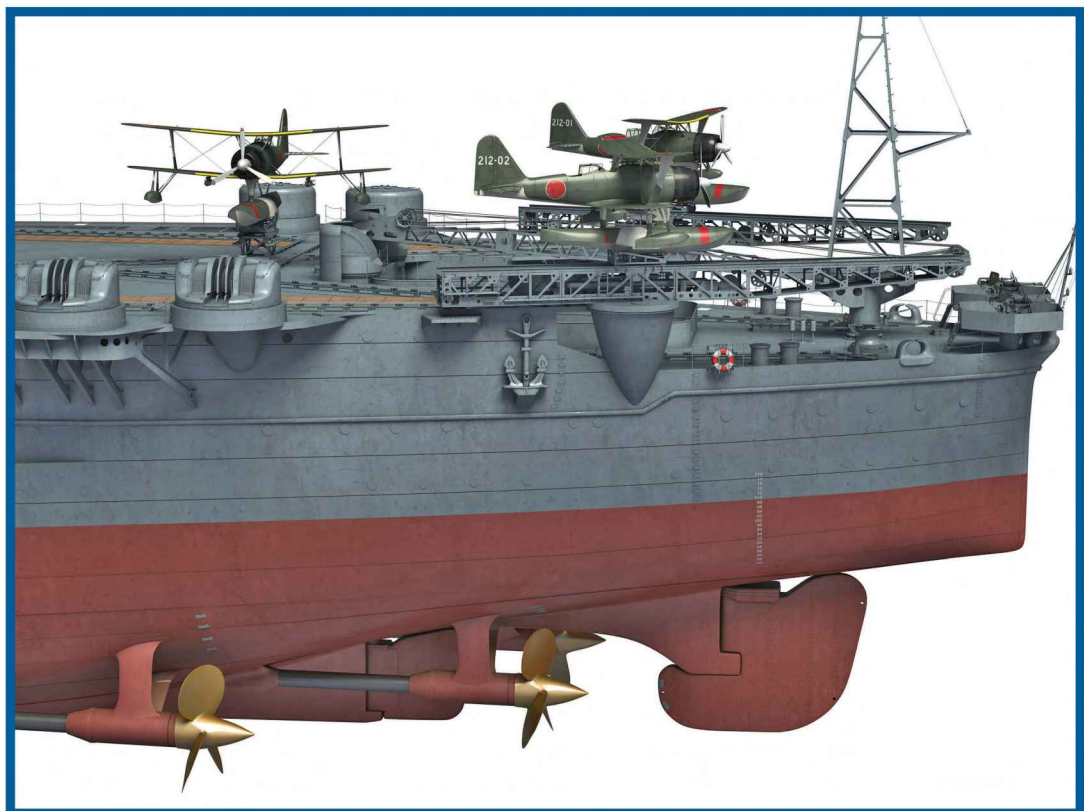
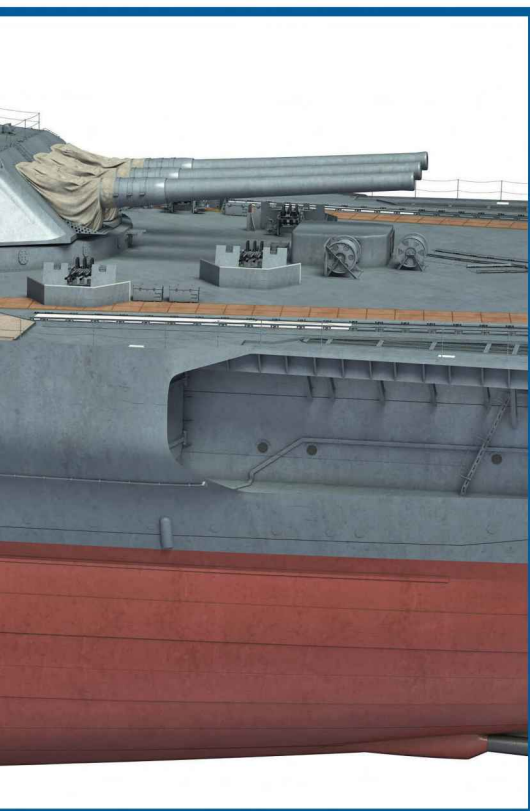
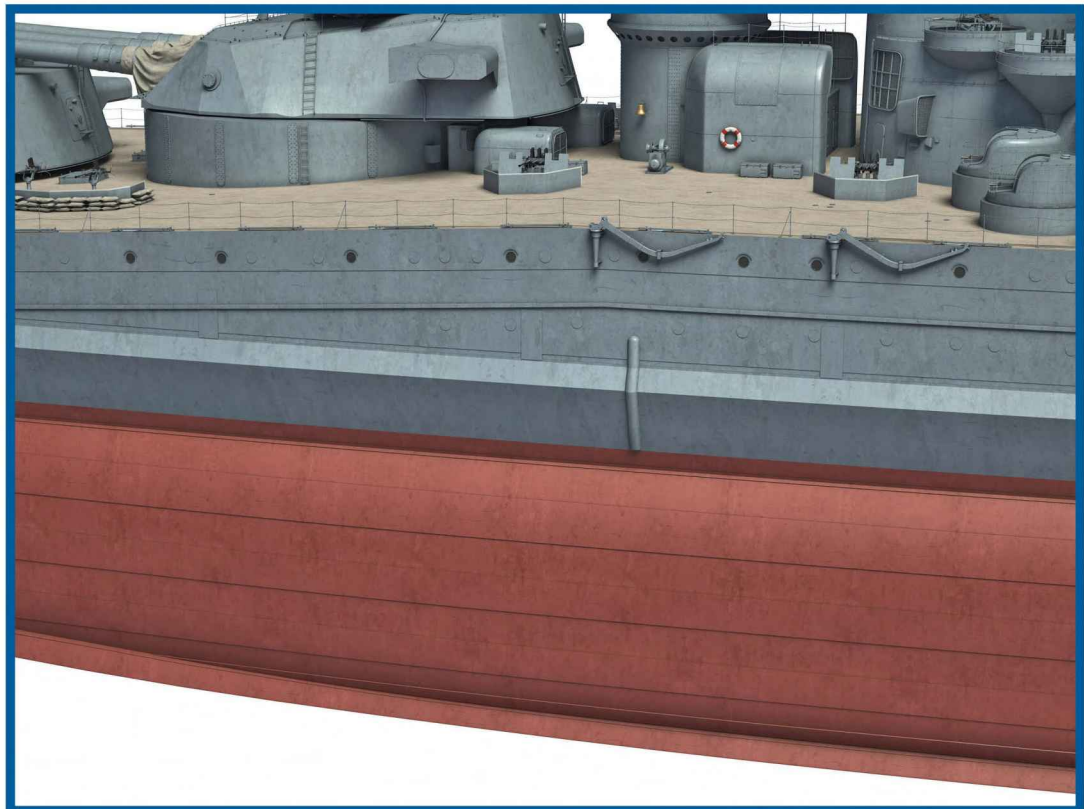
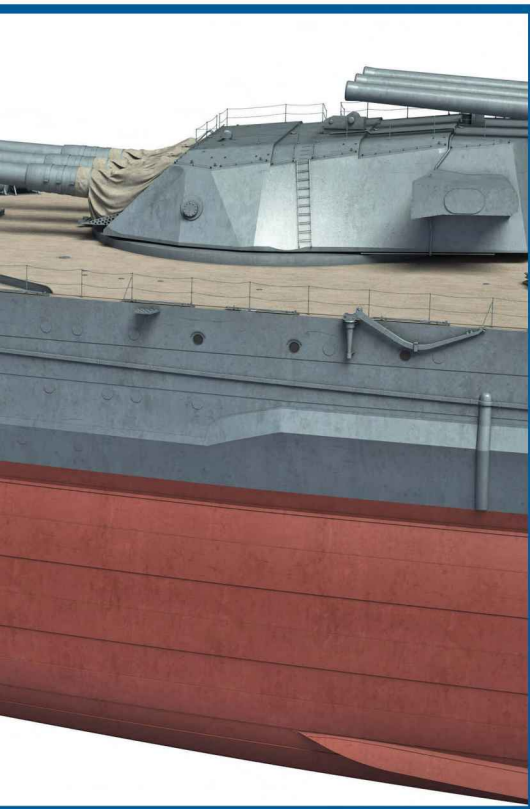
B1/32

17



B Hull Structure – Yamato 1945 port side



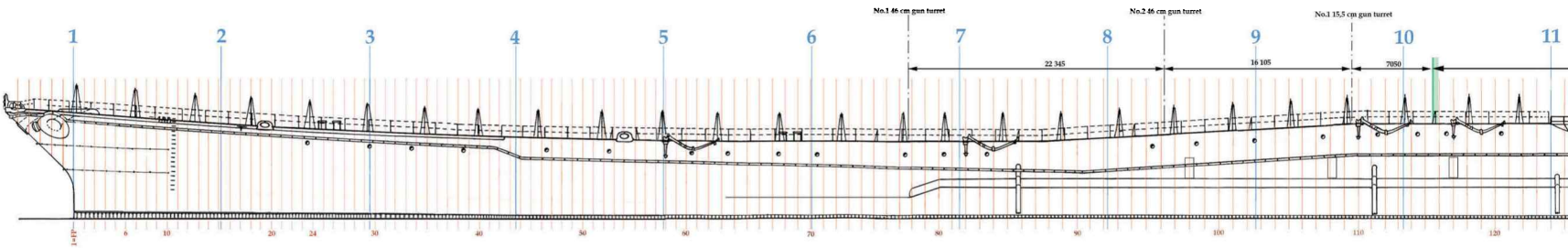


B Hull Structure

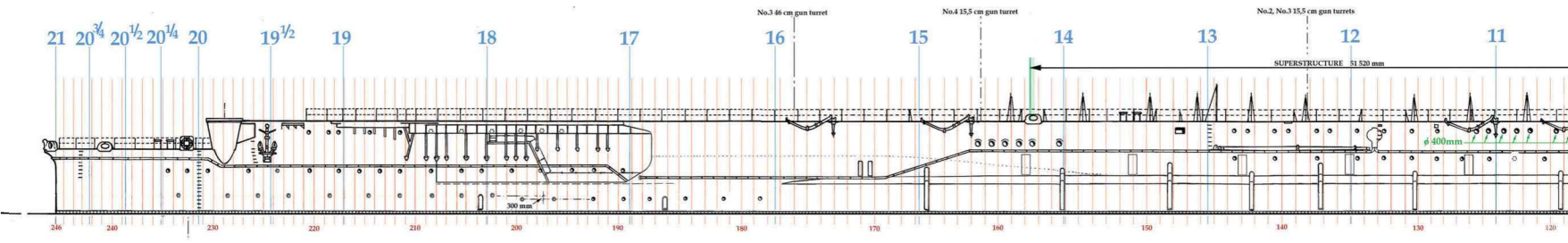
B1/35 *Yamato* 1945 port side view (1/600 scale)

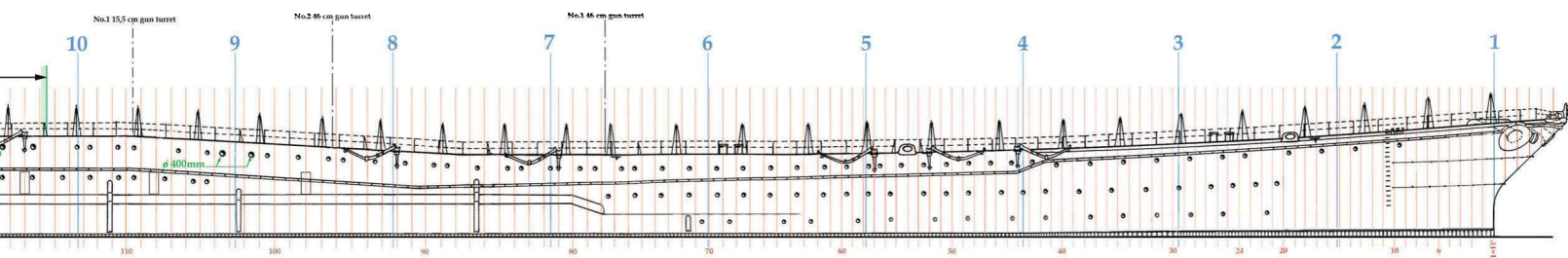
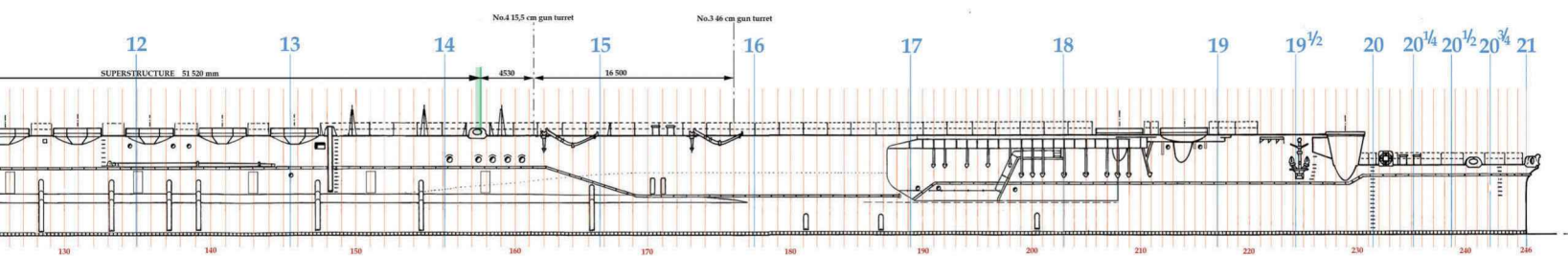
B1/36 *Musashi* 1942 starboard profile

B1/35



B1/36





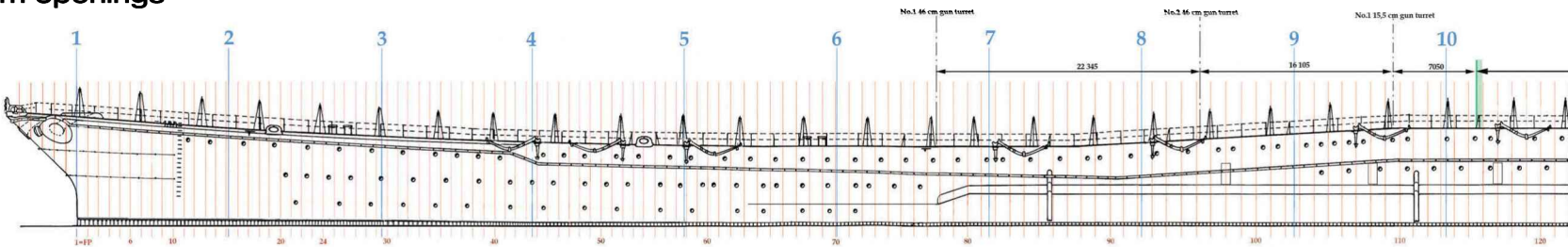
B Hull Structure

B1/37 *Musashi* 1942 port side profile

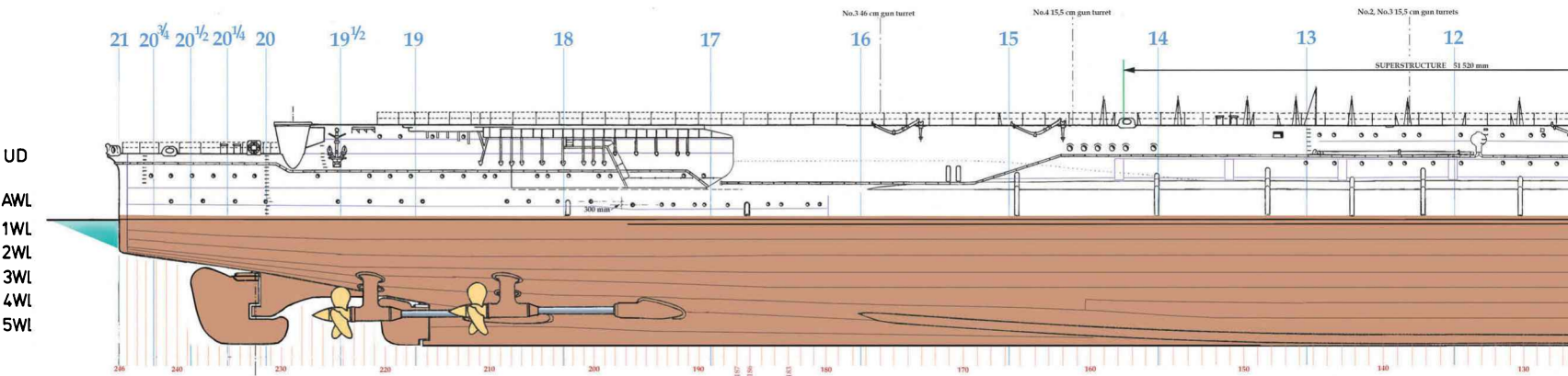
B1/38 Shell plating

B1/39 Bottom openings

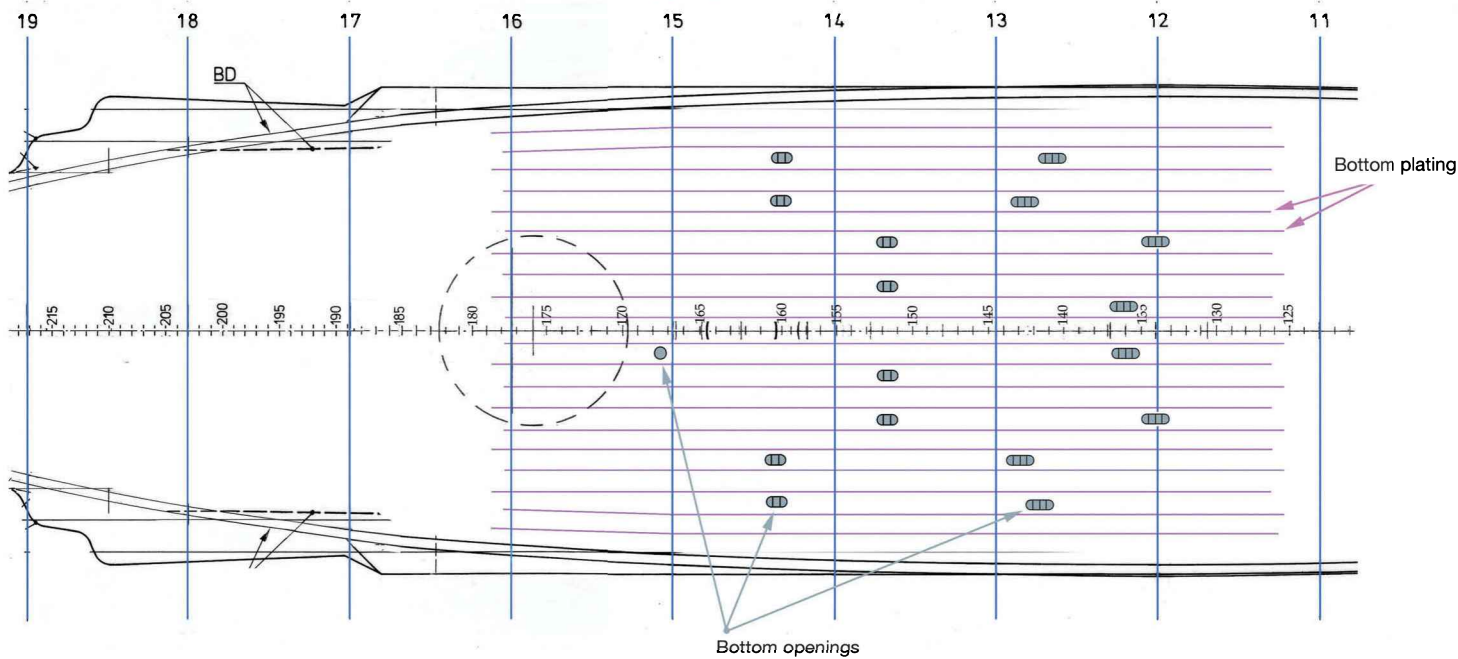
B1/37

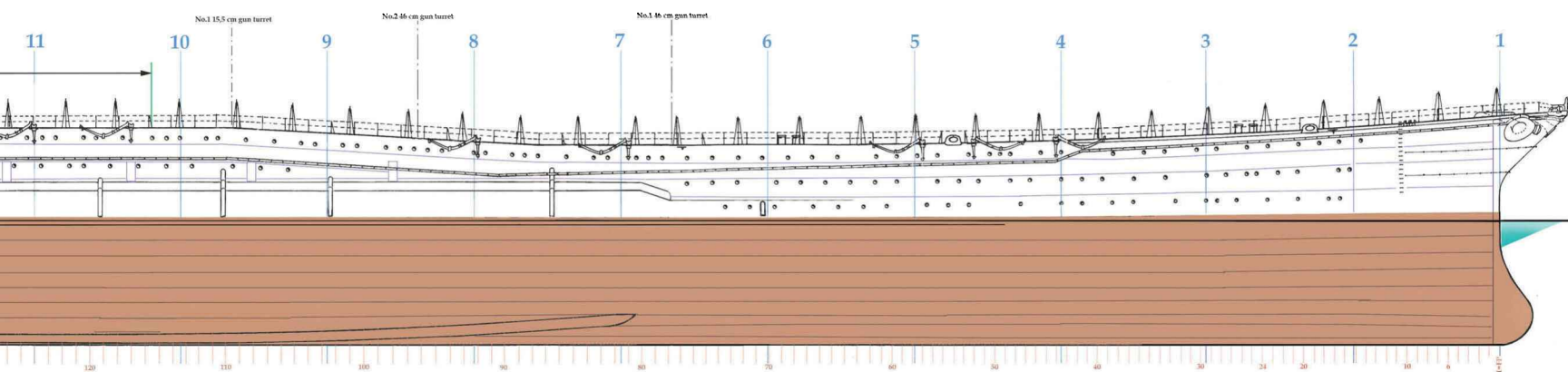
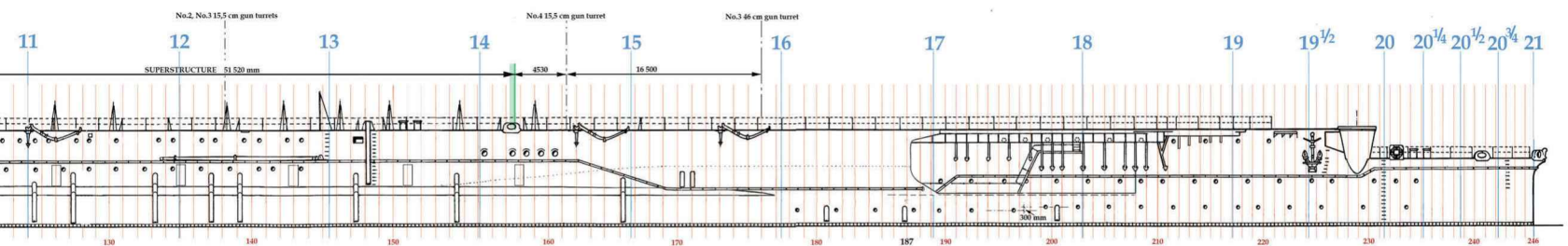


B1/38



B1/39

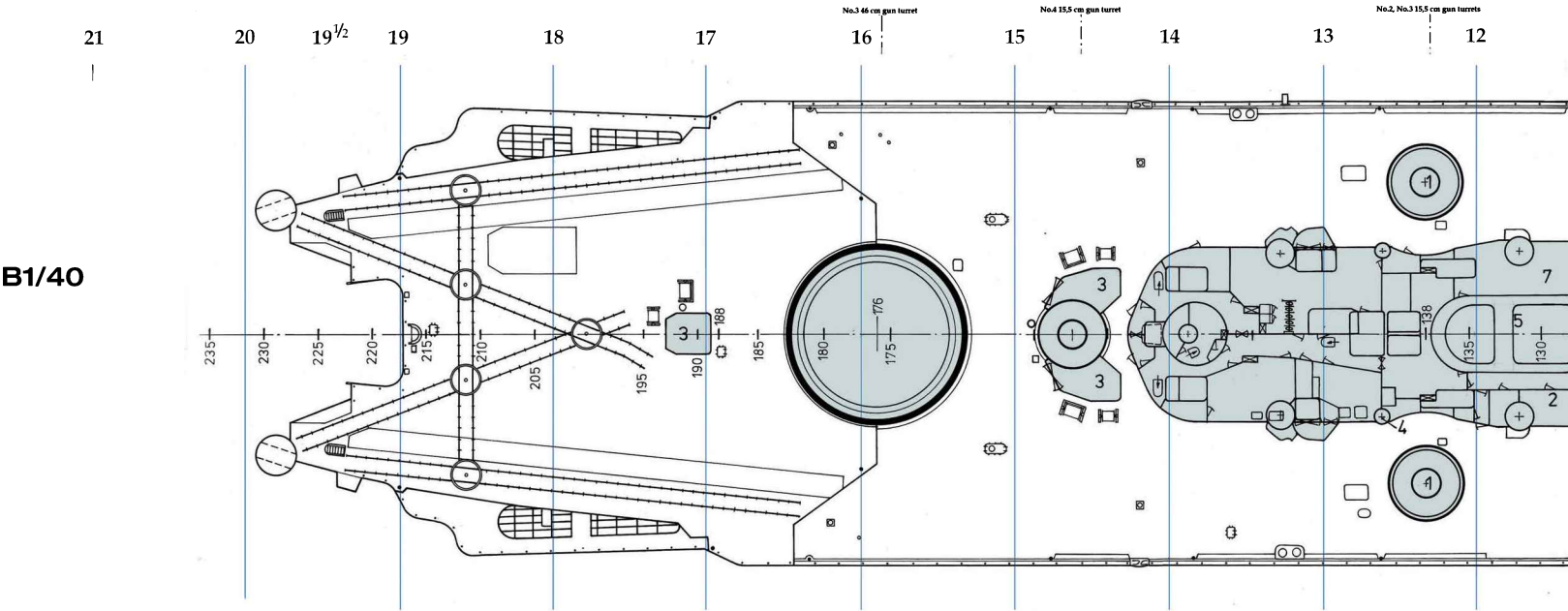




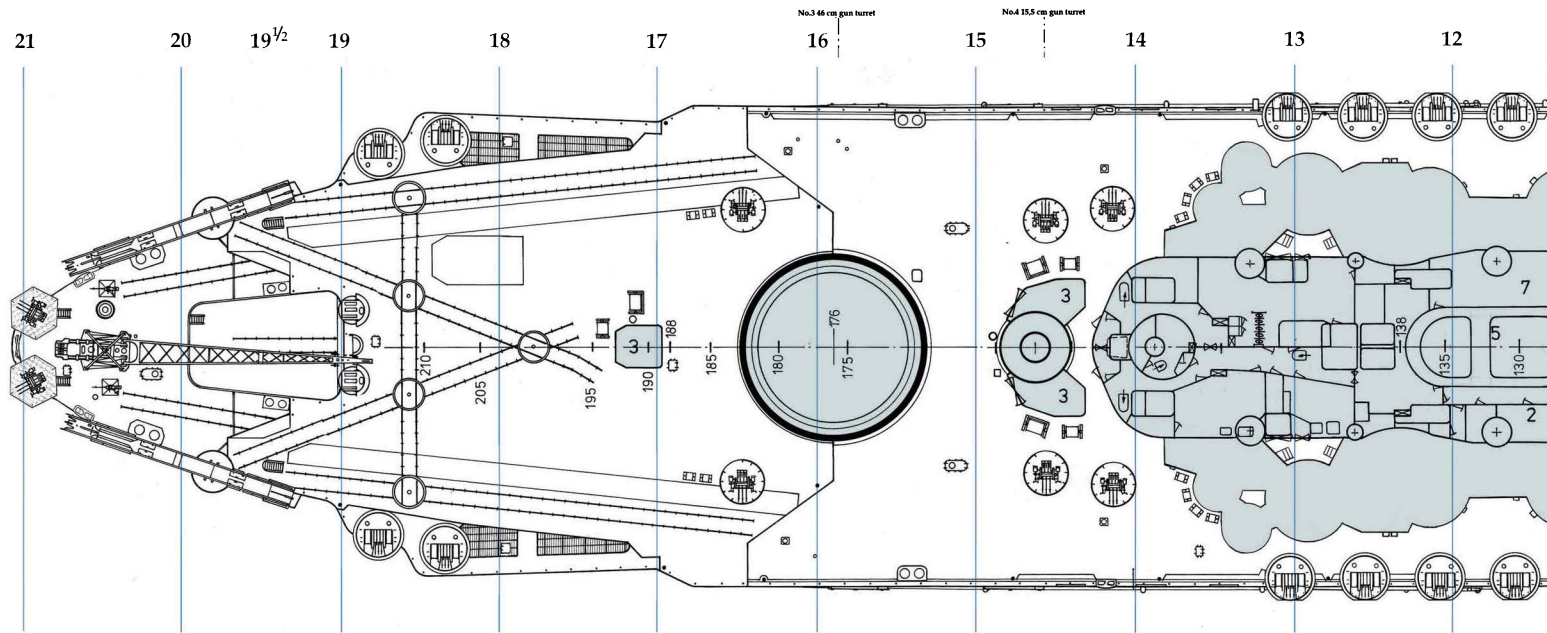
B Hull Structure

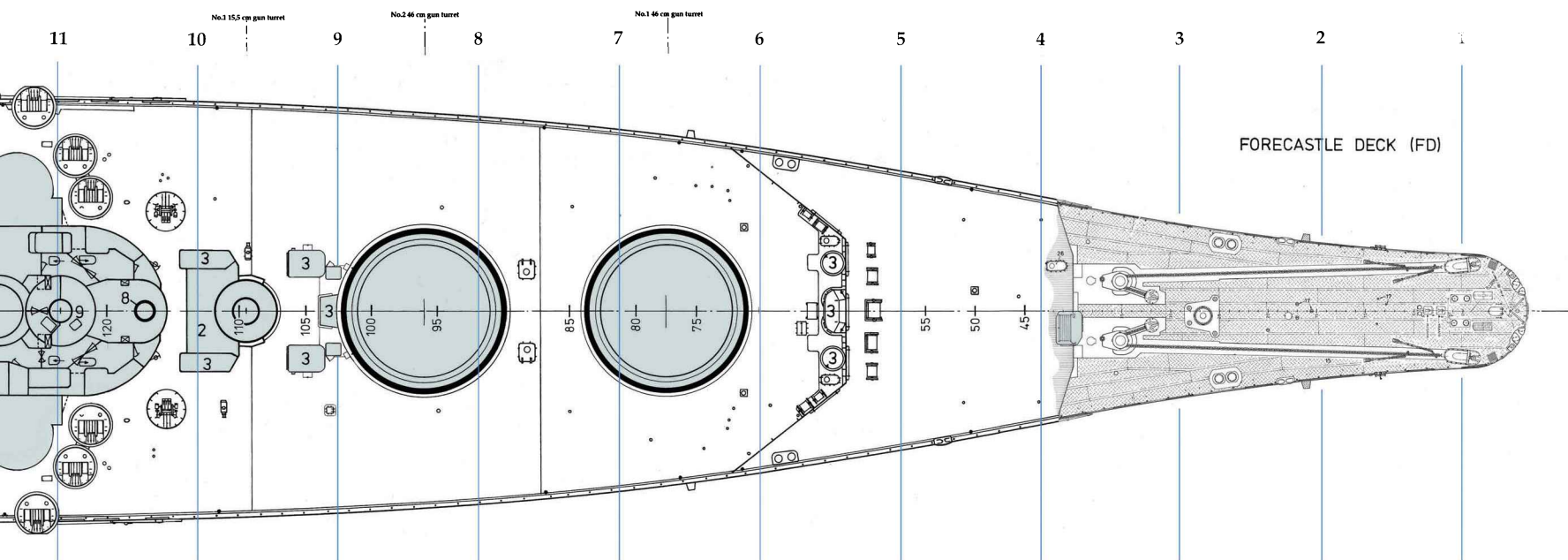
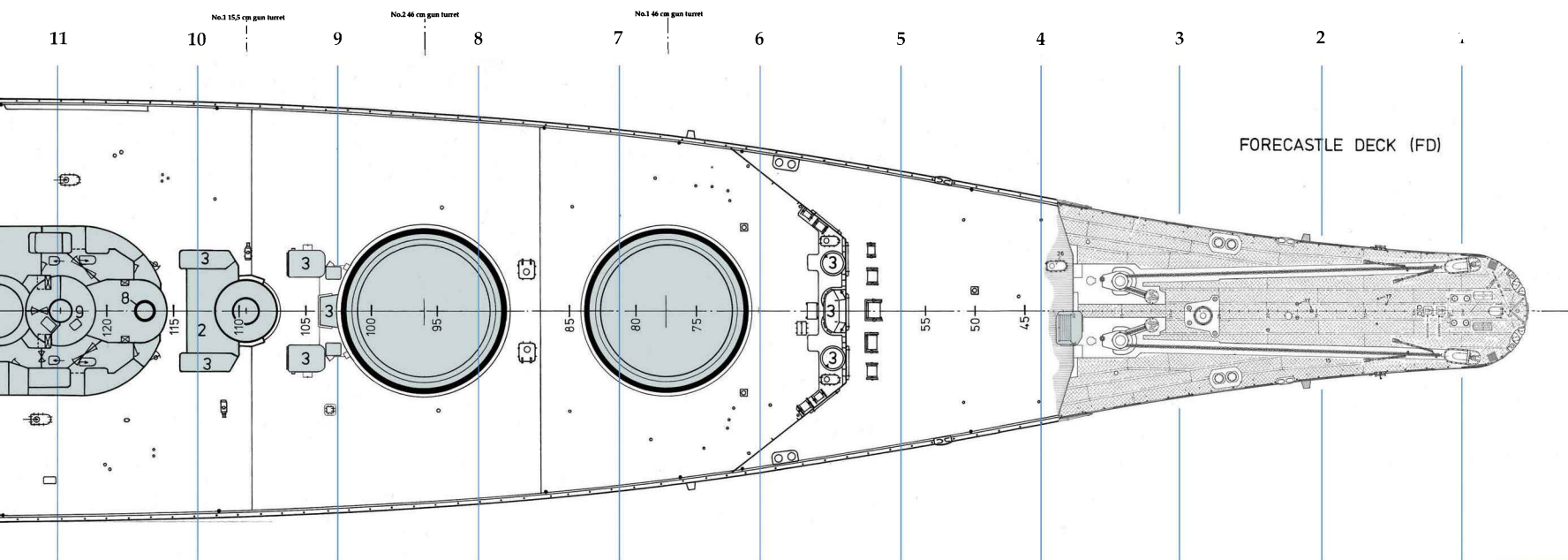
B1/40 *Yamato* 1941 forecastle deck plan (1/600 scale)

B1/41 *Yamato* end of 1944 forecastle deck plan



B1/41





B Hull Structure

B1/42 *Yamato* – September 1943, *Musashi* – July 1942

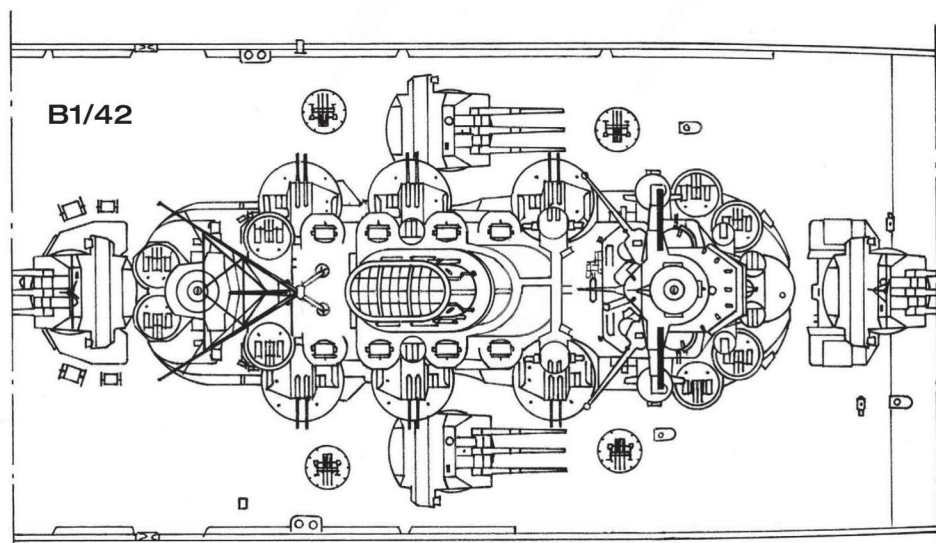
Fitting four triple open 25mm MG mountings

B1/43 *Musashi* – October 1944

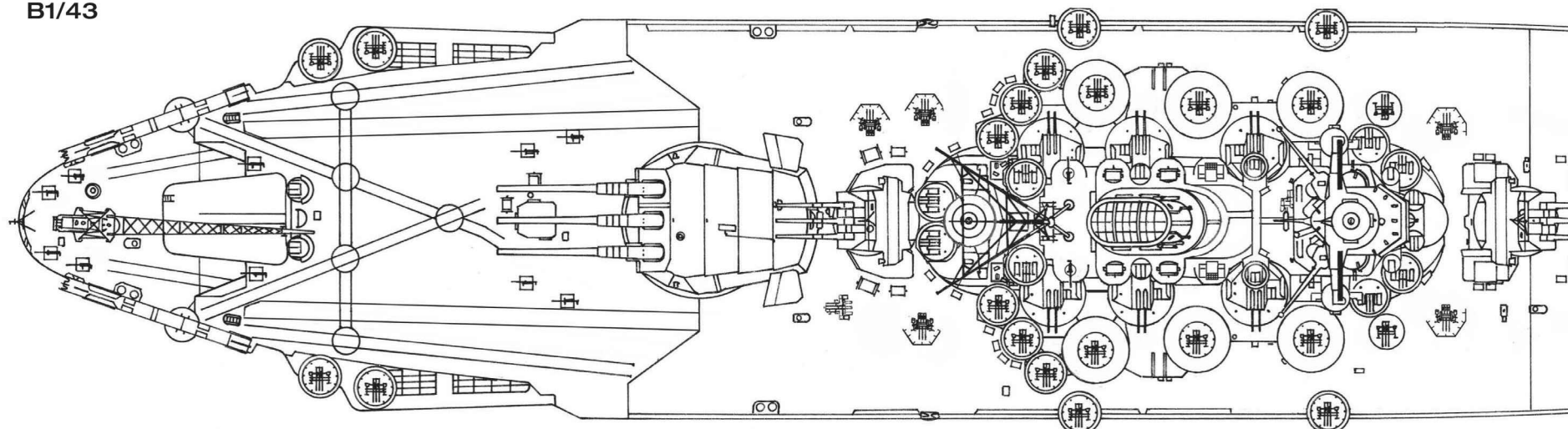
12 x 12.7cm HA guns, 130 x 25mm MG (35 x III, 25 x I), 4 x 13.2mm MG (2xII), two 12cm rocket launchers

B1/44 *Yamato* – April 1945

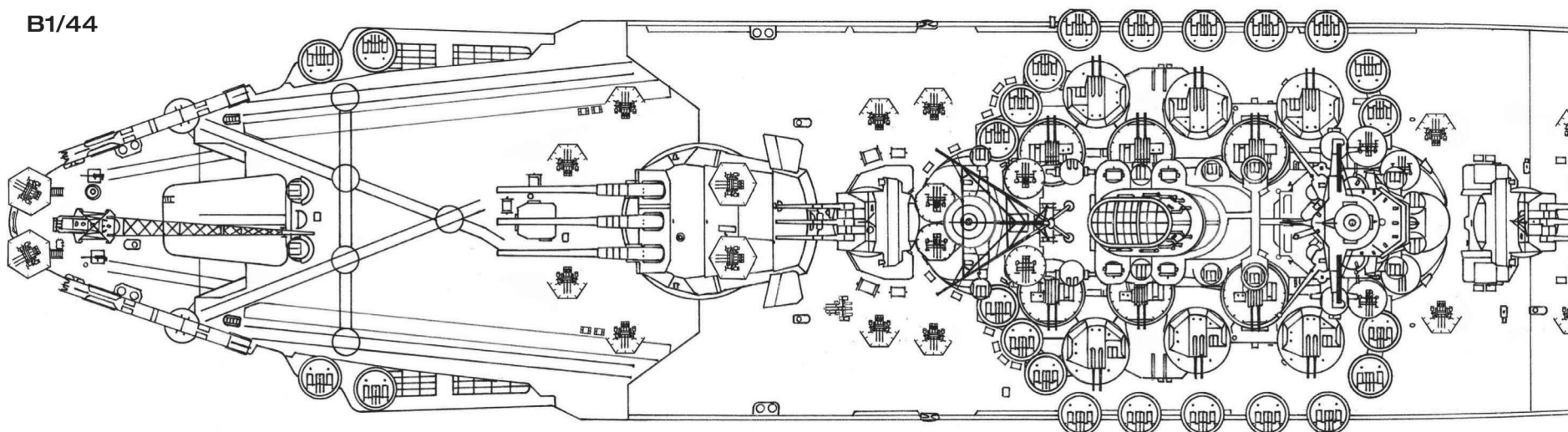
24 x 12.7cm HA guns, 156 x 25mm MG (50 x III, 6 x I), 4 x 13.2mm MG (2 x II)

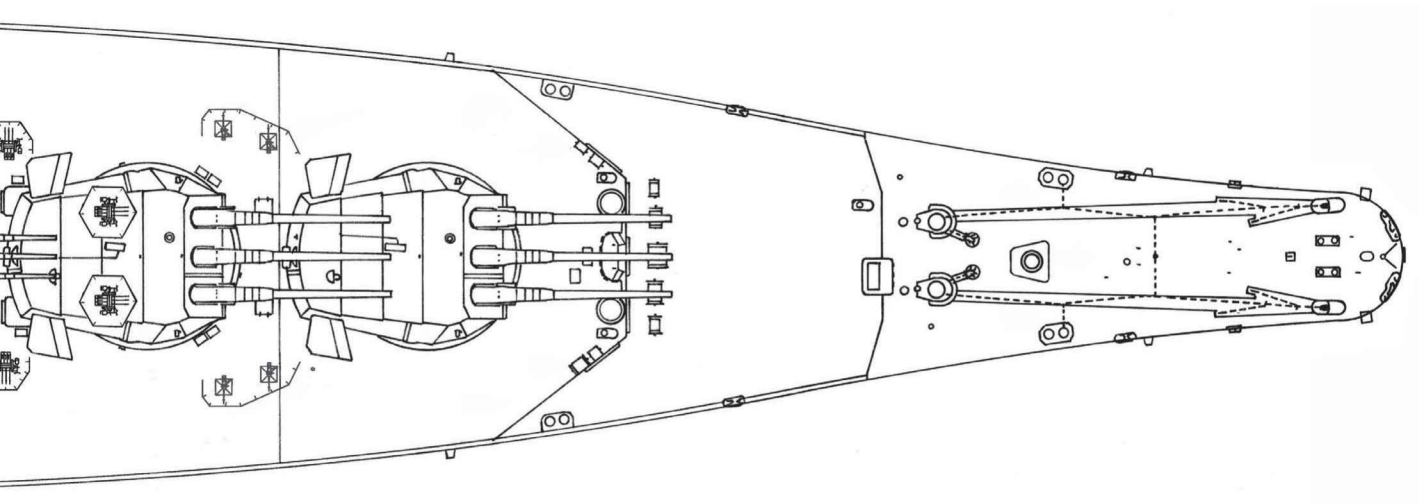
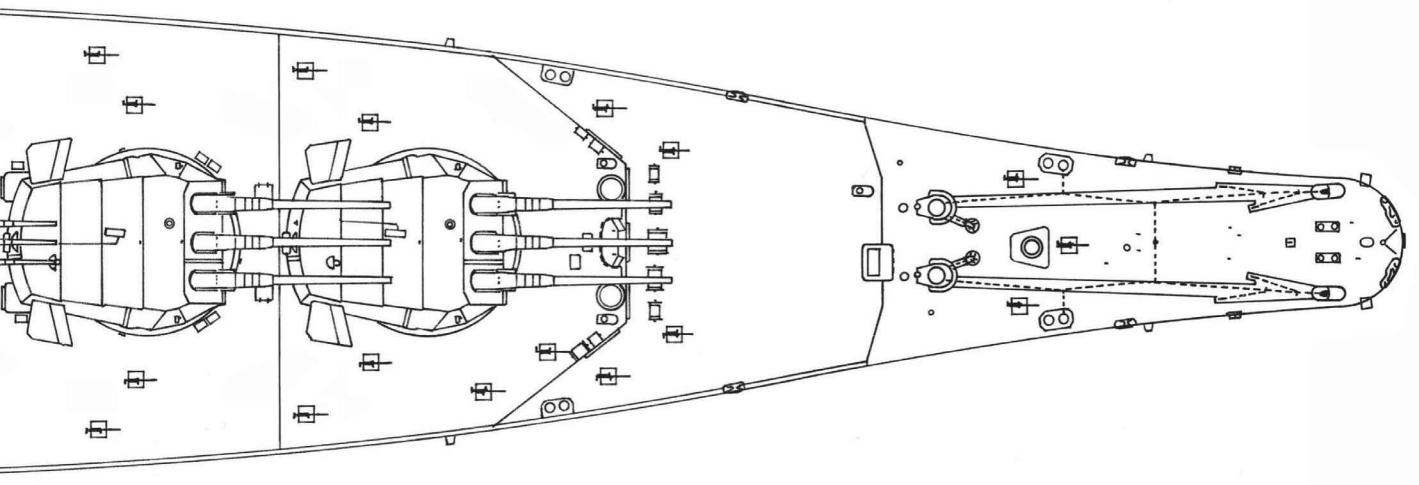


B1/43



B1/44

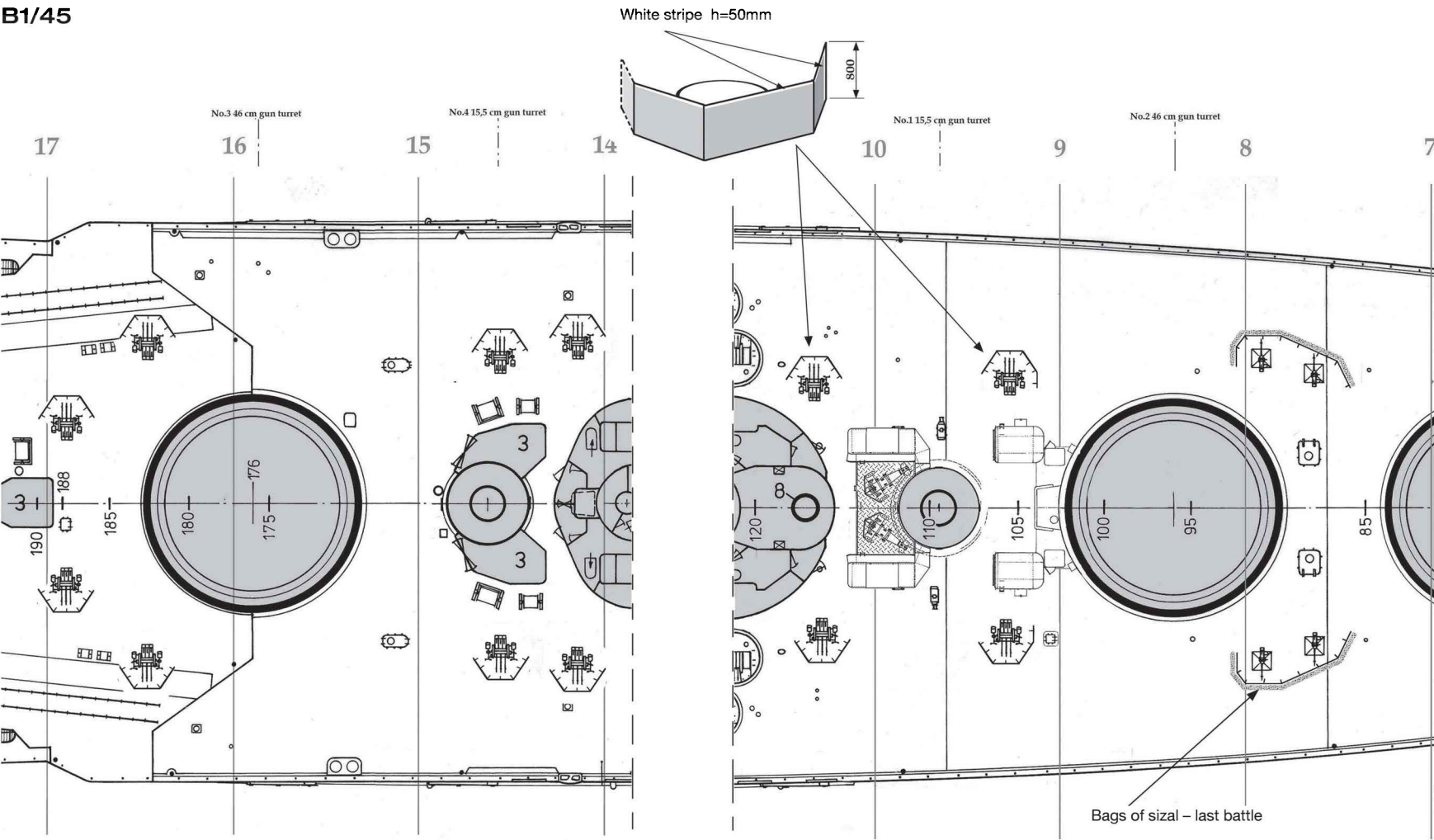




B Hull Structure

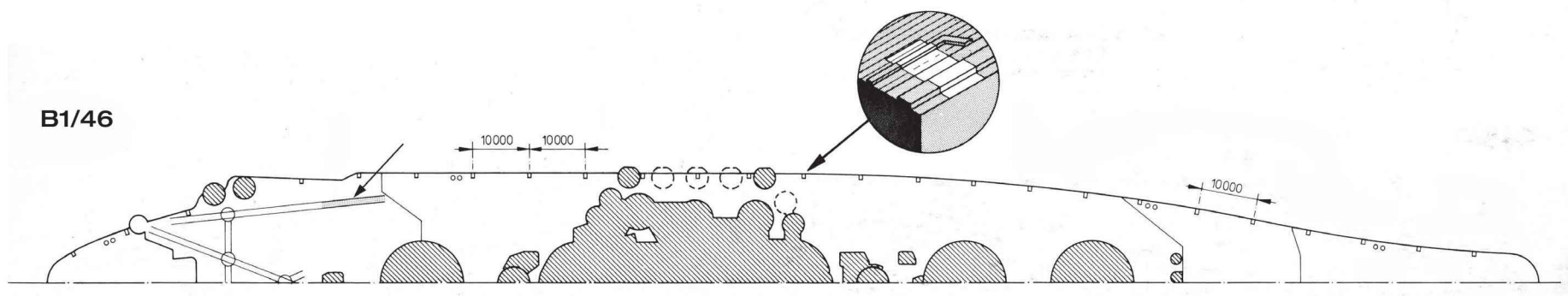
B1/45 *Yamato* – April 1945 detail of 25mm MG placement

B1/45



B1/46

White painted rectangles on deck edge and white stripes between rails – October 1944 – April 1945 (for crew orientation at night)



B Hull Structure

B1/47 Forecastle anchor deck plan

B1/48 Chequer plate

B1/49 Chequer plate joints

B1/50 Chrysanthemum crest, towing fairlead, jack staff, hawse pipe

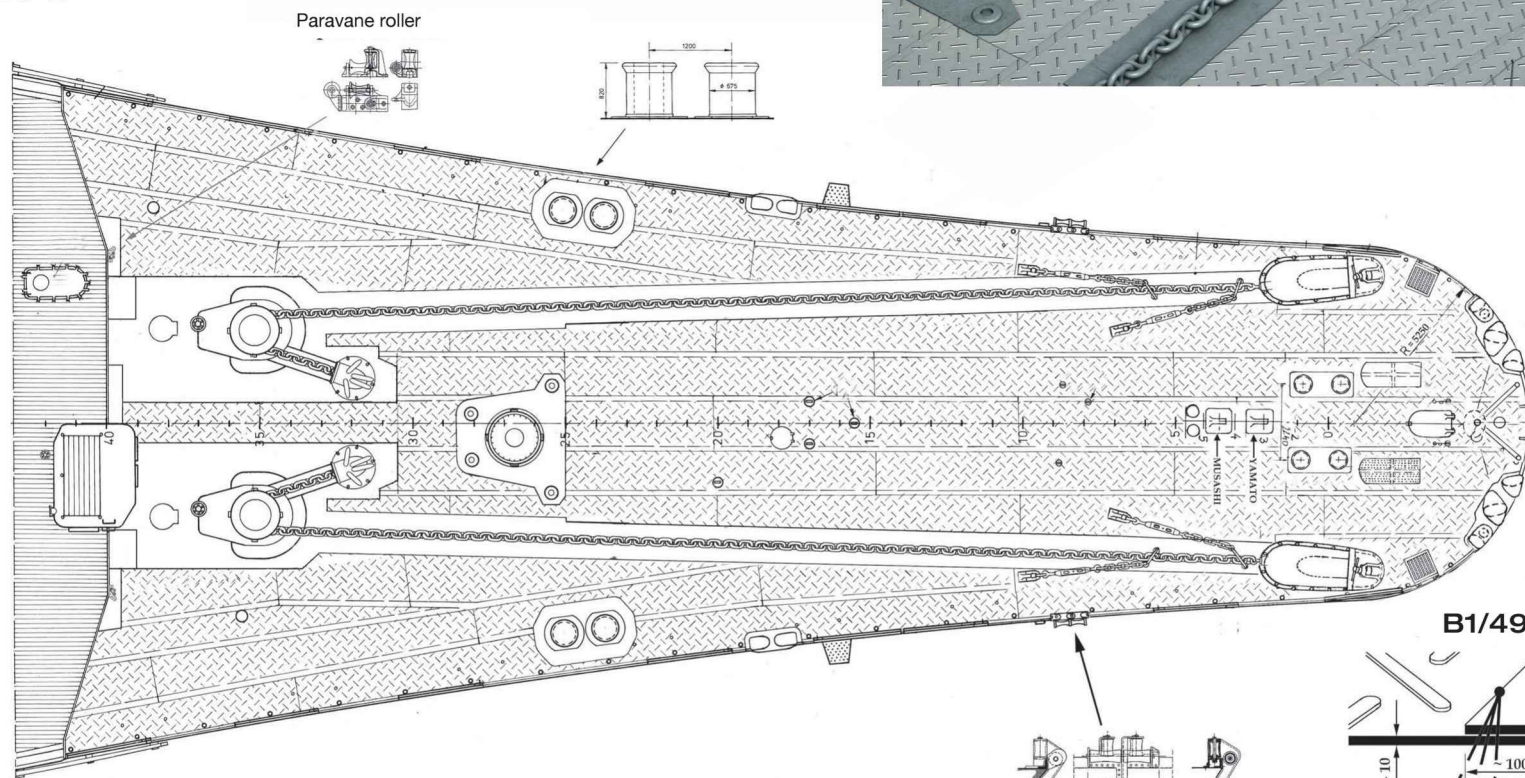
B1/51 Yamato - profile

B1/52 Plan

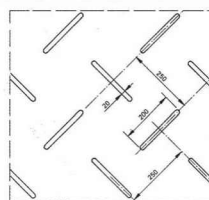
B1/53 Musashi - front view



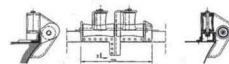
B1/47



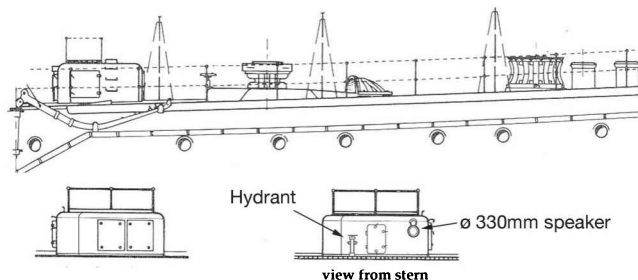
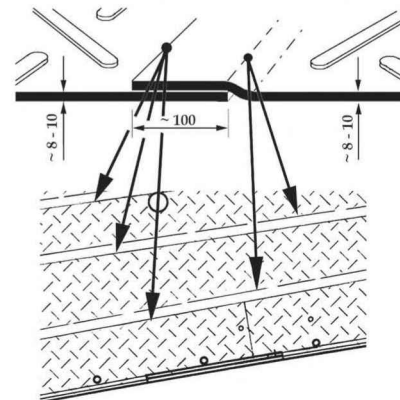
B1/48

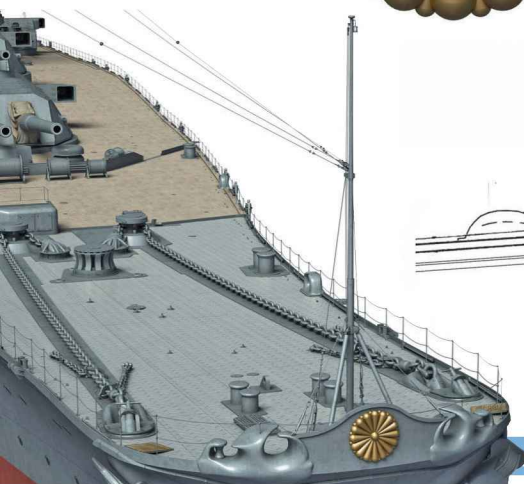
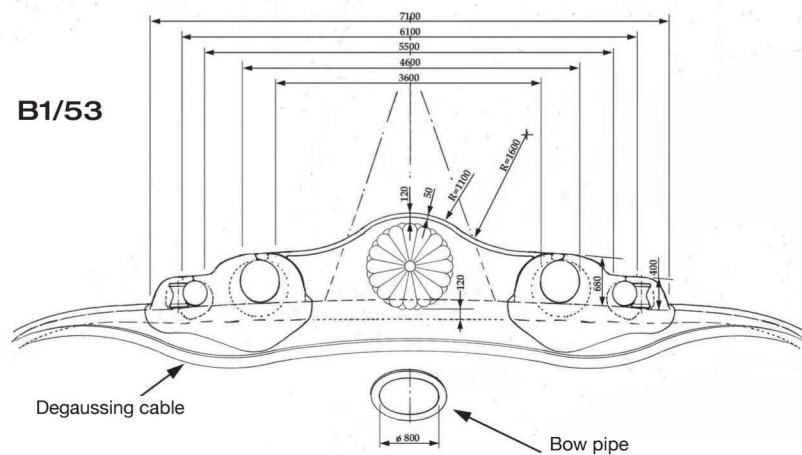
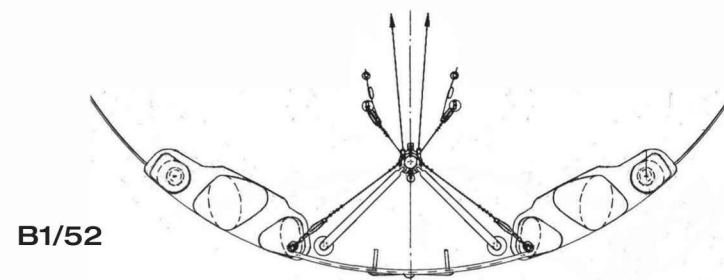
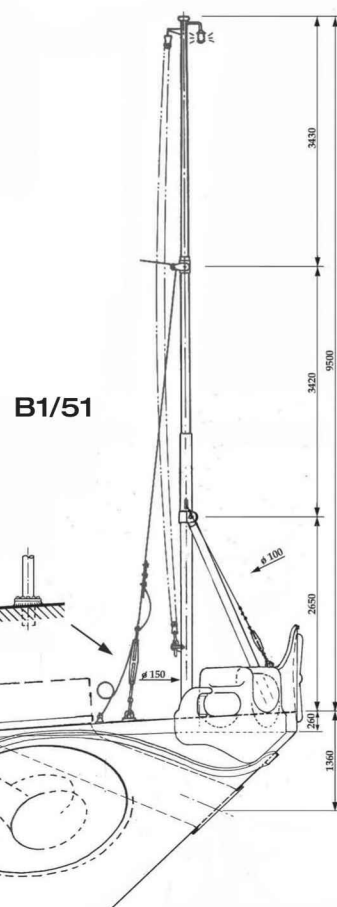
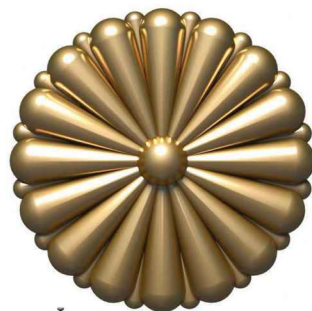
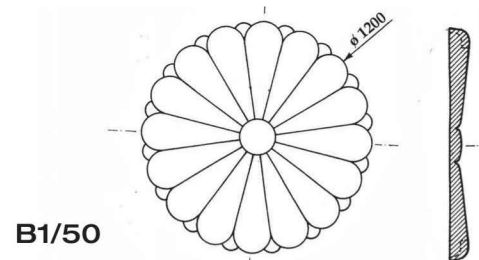
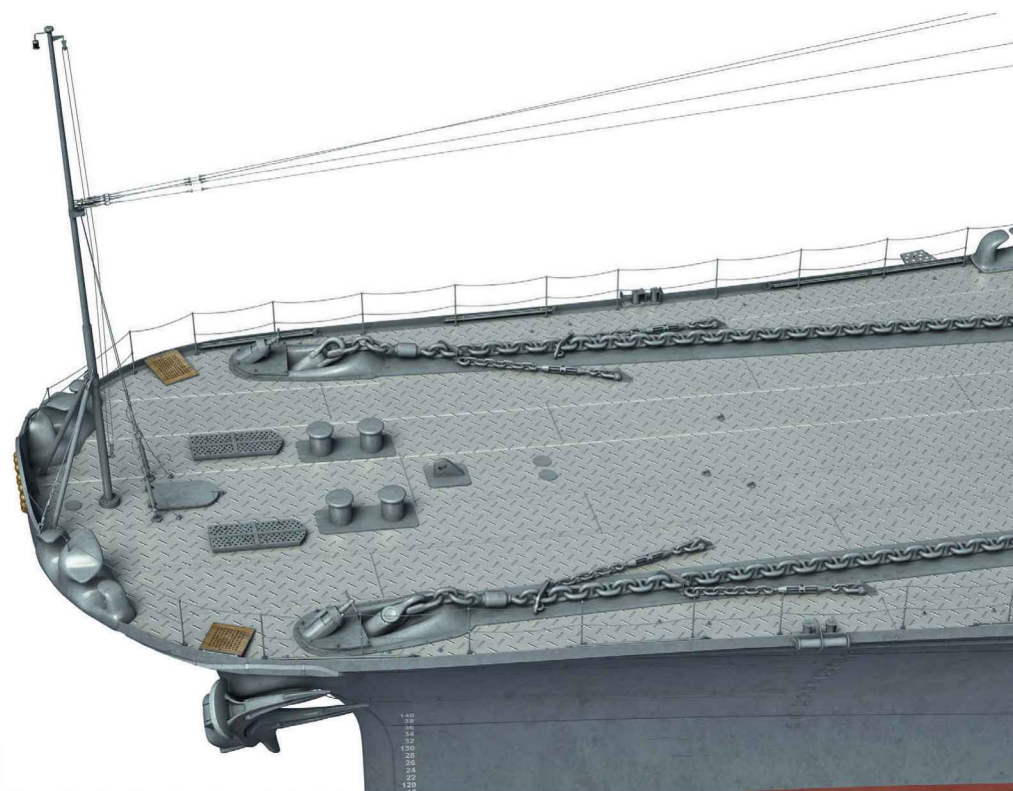
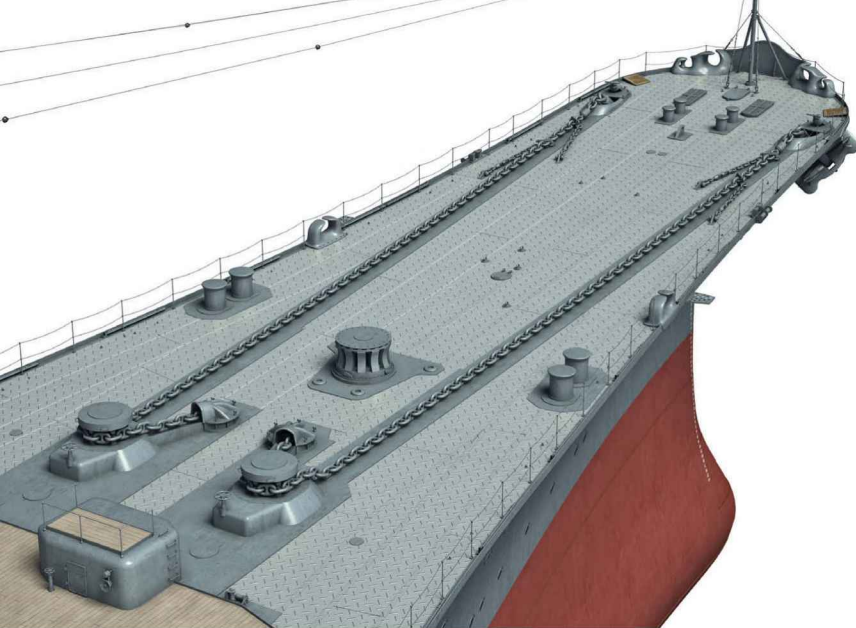


Paravane roller



B1/49





B Hull Structure

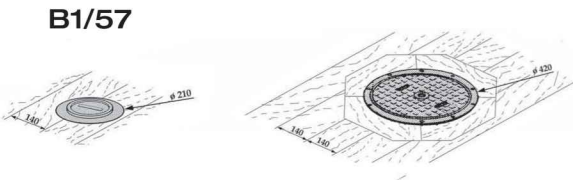
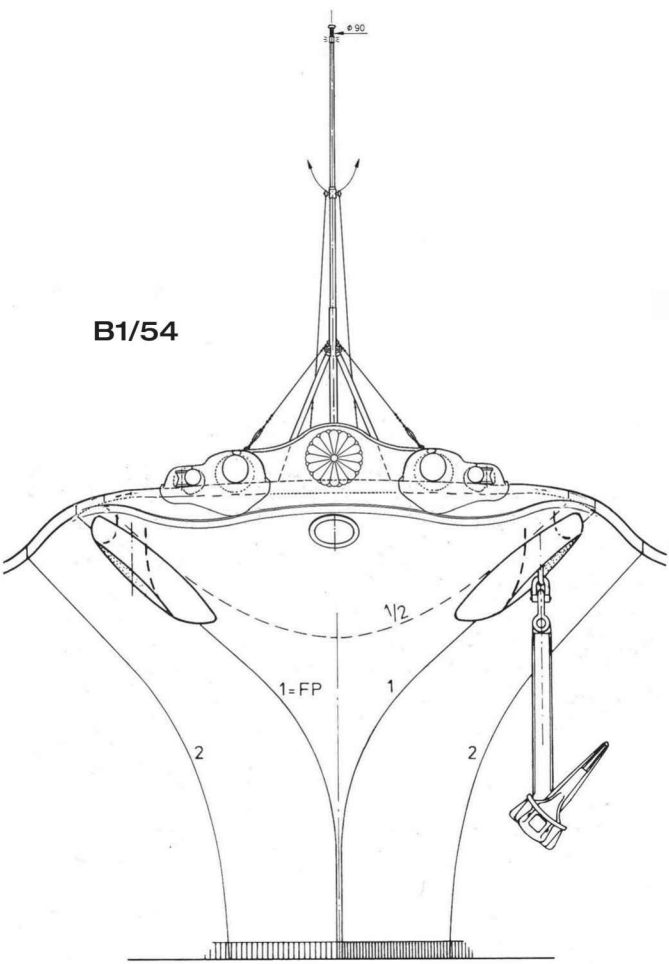
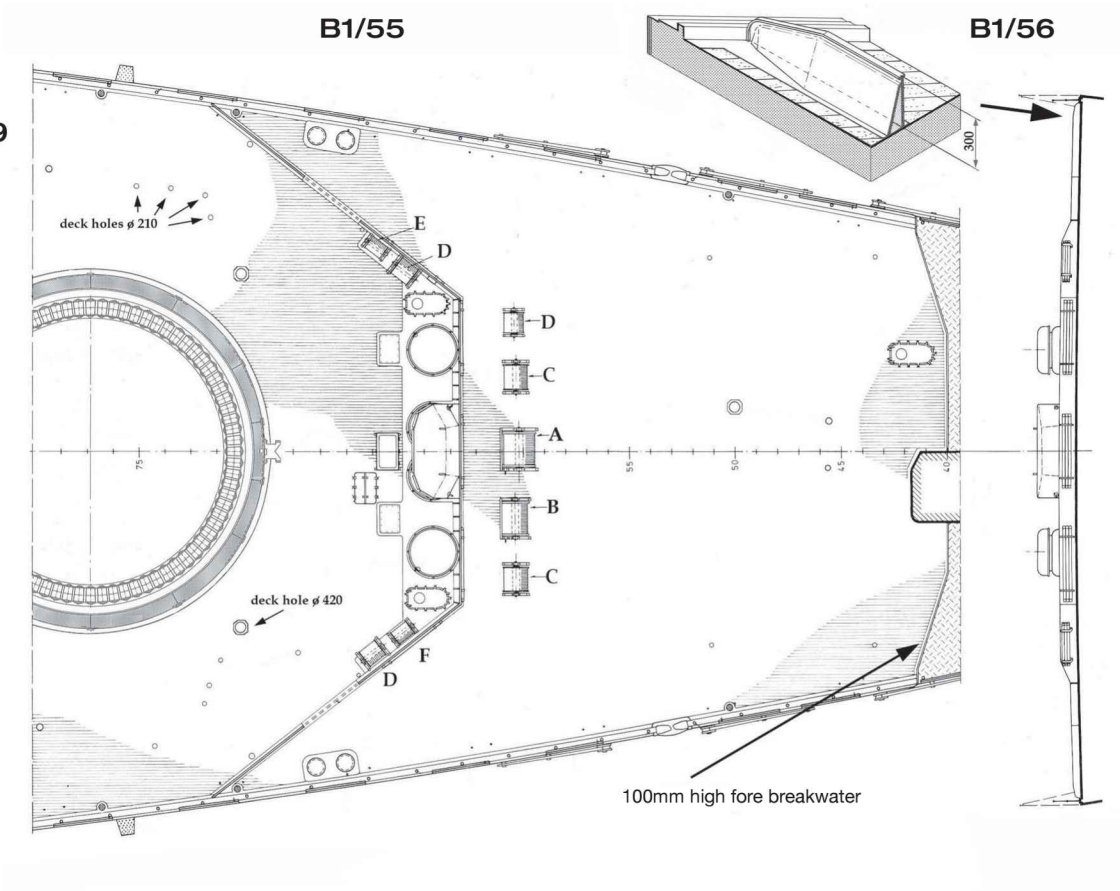
B1/54 Bow view

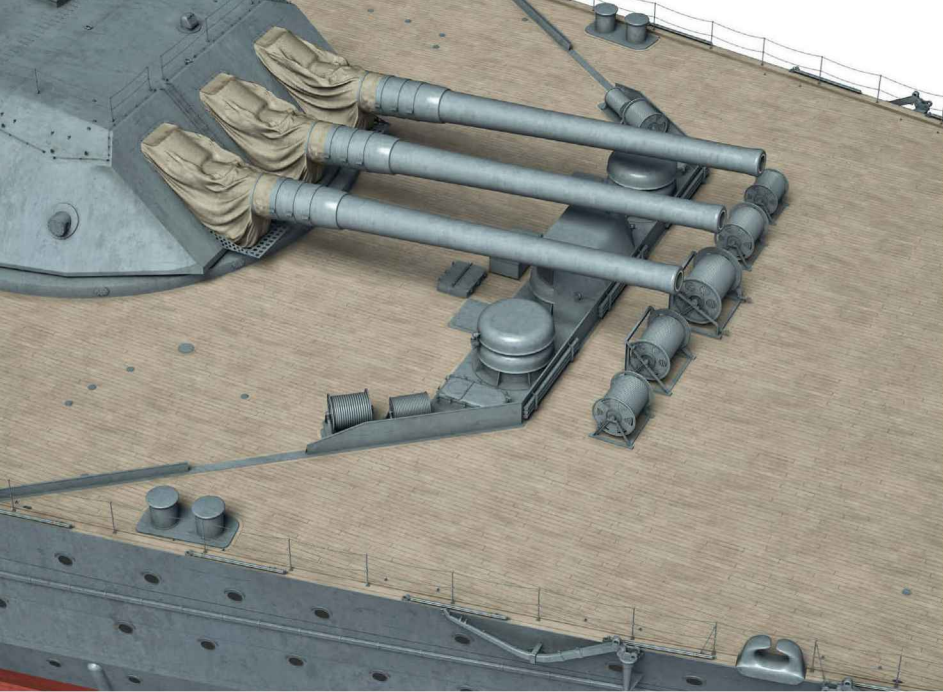
B1/55 Forecastle deck fittings – frames 40–79

B1/56 Main breakwater

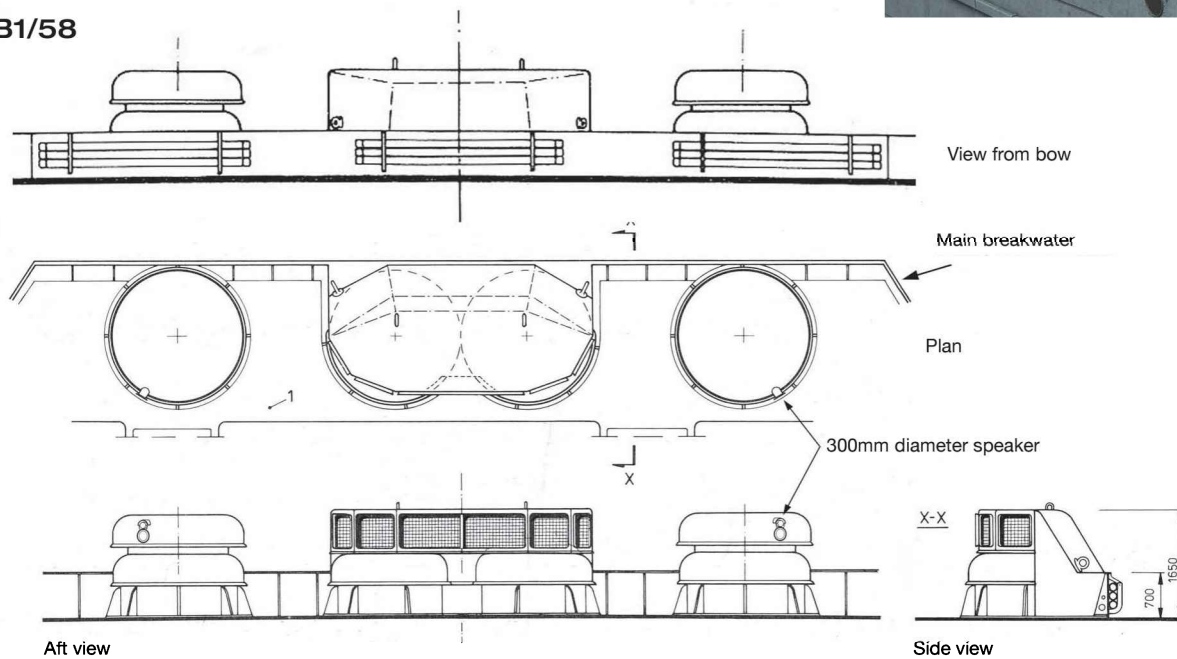
B1/57 Closed deck holes

B1/58 Ventilators on frame 63–64





B1/58



B Hull Structure

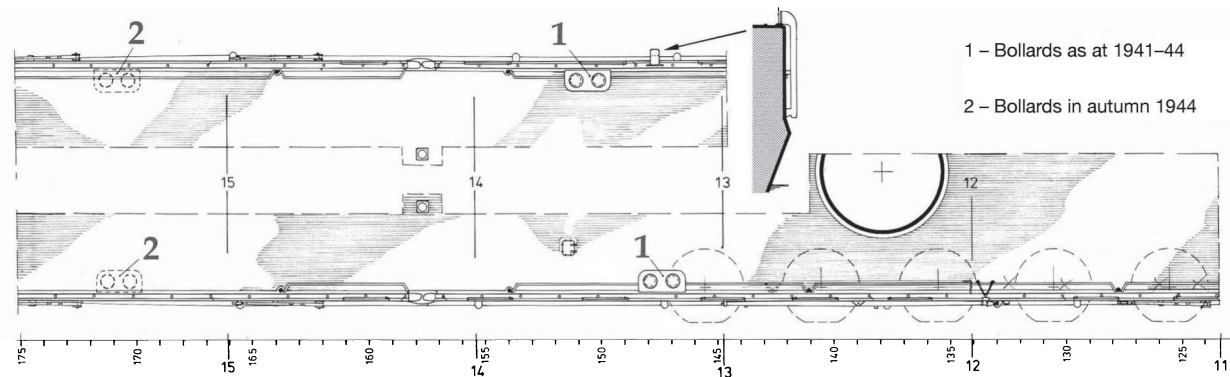
B1/59 Midship deck fittings

B1/60 Aircraft deck of *Yamato* 1941

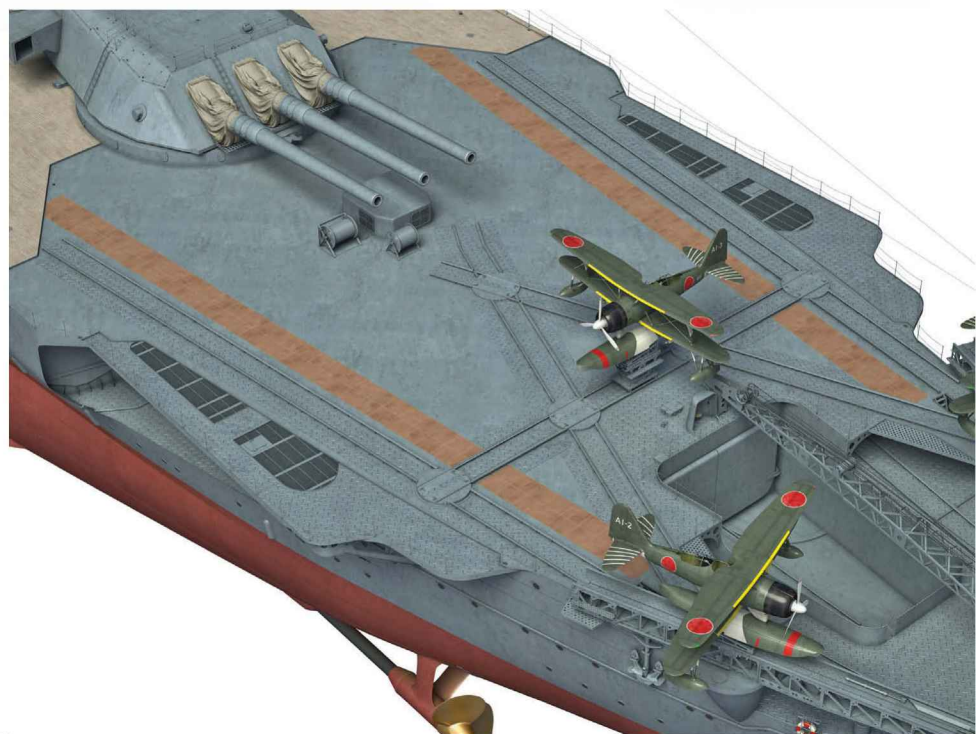
B1/61 Aircraft deck *Yamato* 1944-45

B1/62 Aircraft deck *Musashi* 1942

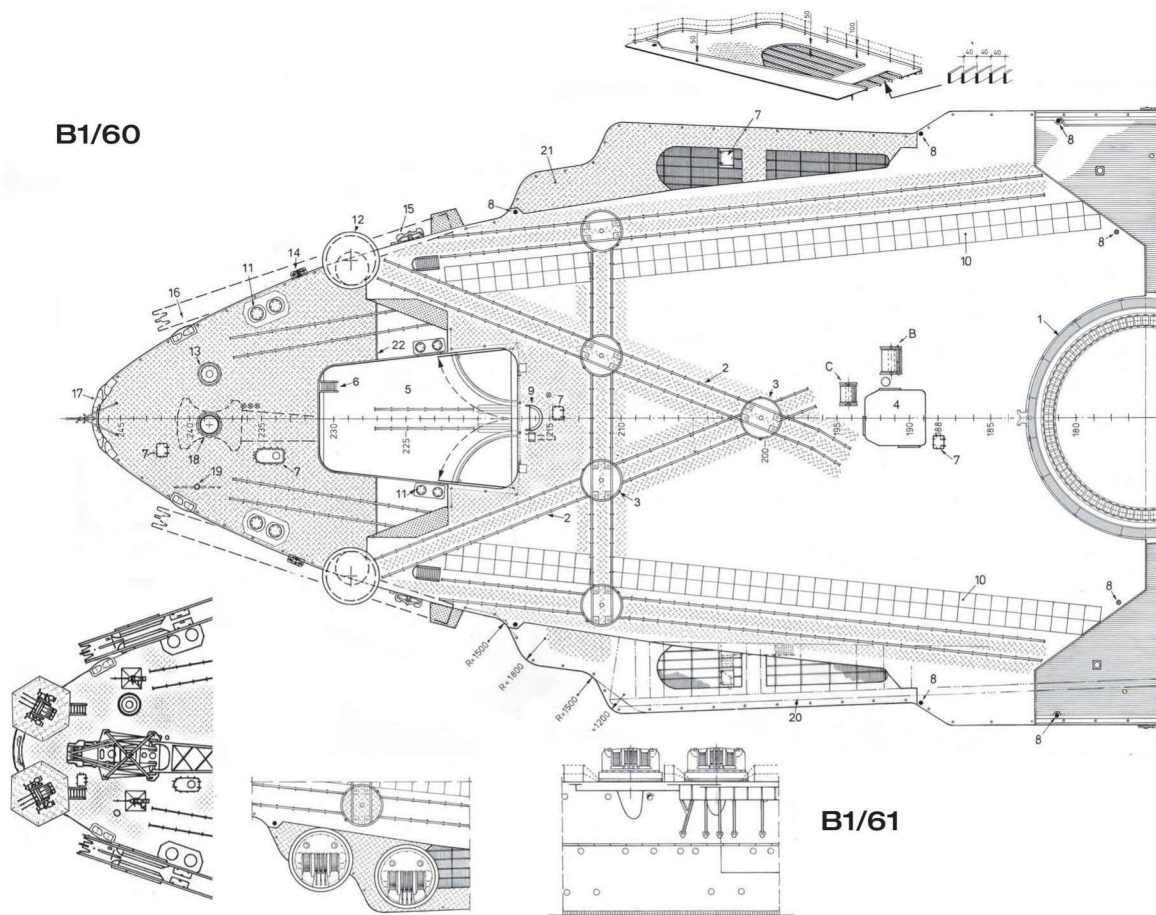
- 1 No.3 46cm gun turret barbette
- 2 Deck rails
- 3 Rail turntable
- 4 Ventilator
- 5 Aircraft hangar platform (middle deck)
- 6 Ladder
- 7 Hatch
- 8 Scupper
- 9 Anti-blast cover
- 10 Non-slip linoleum sheets with brass inset strips
- 11 Bollards
- 12 Catapult ring
- 13 After capstan
- 14 Life buoy
- 15 After anchor
- 16 Fairlead
- 17 After towing fairlead
- 18 Base of aircraft and boat 6-ton crane
- 19 Crane capstan
- 20 Boat overhead travelling crane
- 21 Platform above travelling crane (chequer plate)
- 22 100mm high breakwater



B1/59

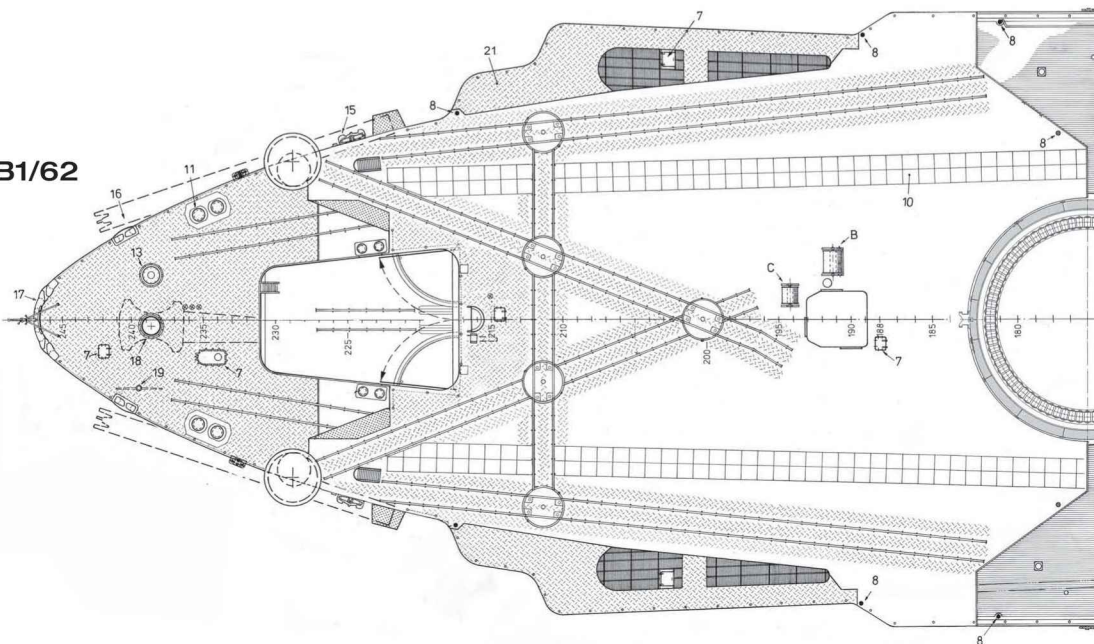


B1/60



B1/61

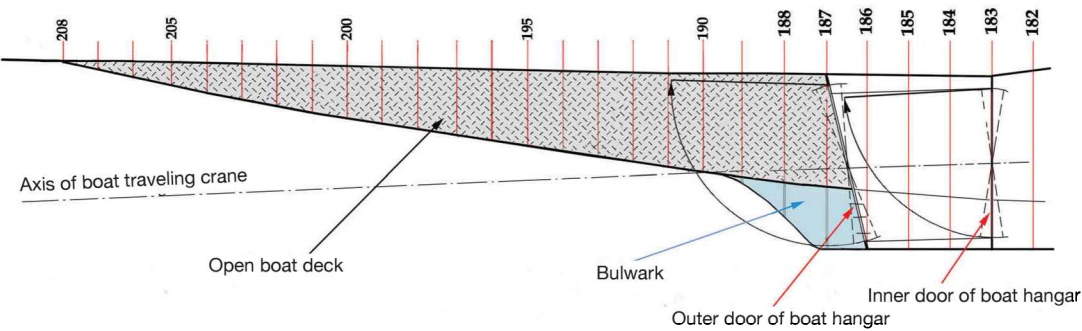
B1/62



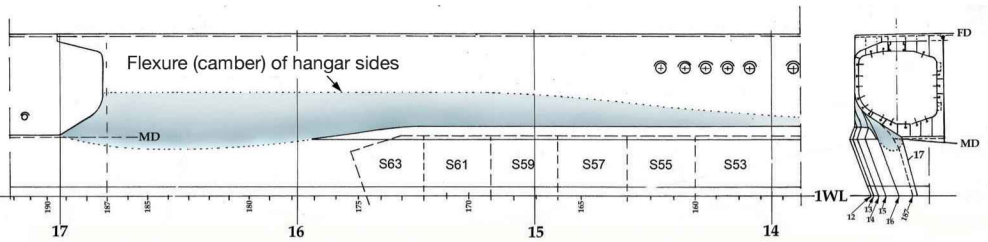
B Hull Structure

- B1/63 Boat hangar doors - plan
- B1/64 Side view of boat hangar
- B1/65 Sections
- B1/66 Bow profile
- B1/67 Boat's hangar doors

B1/63

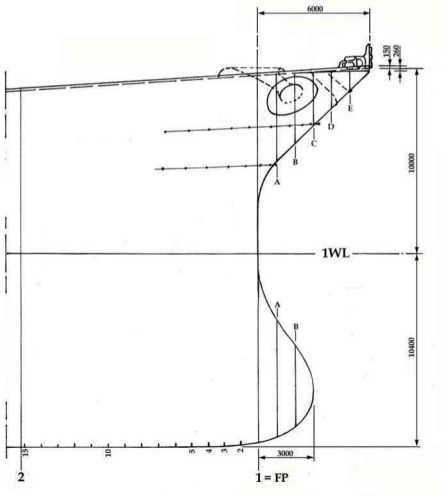


B1/64

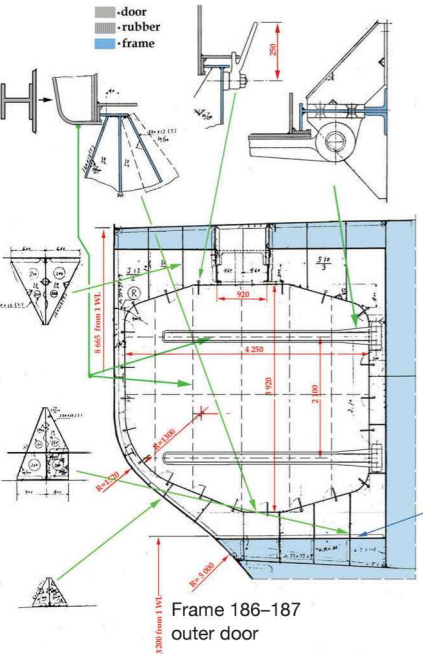


B1/65

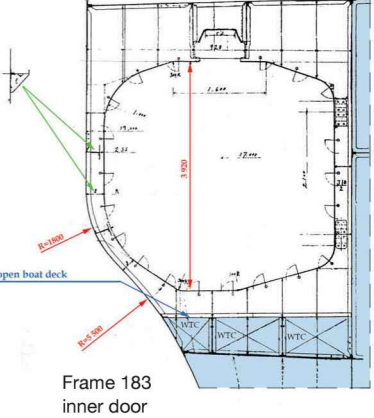
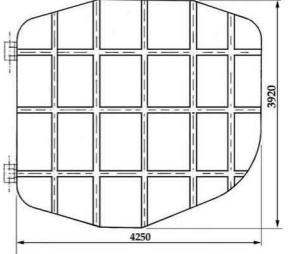
B1/66

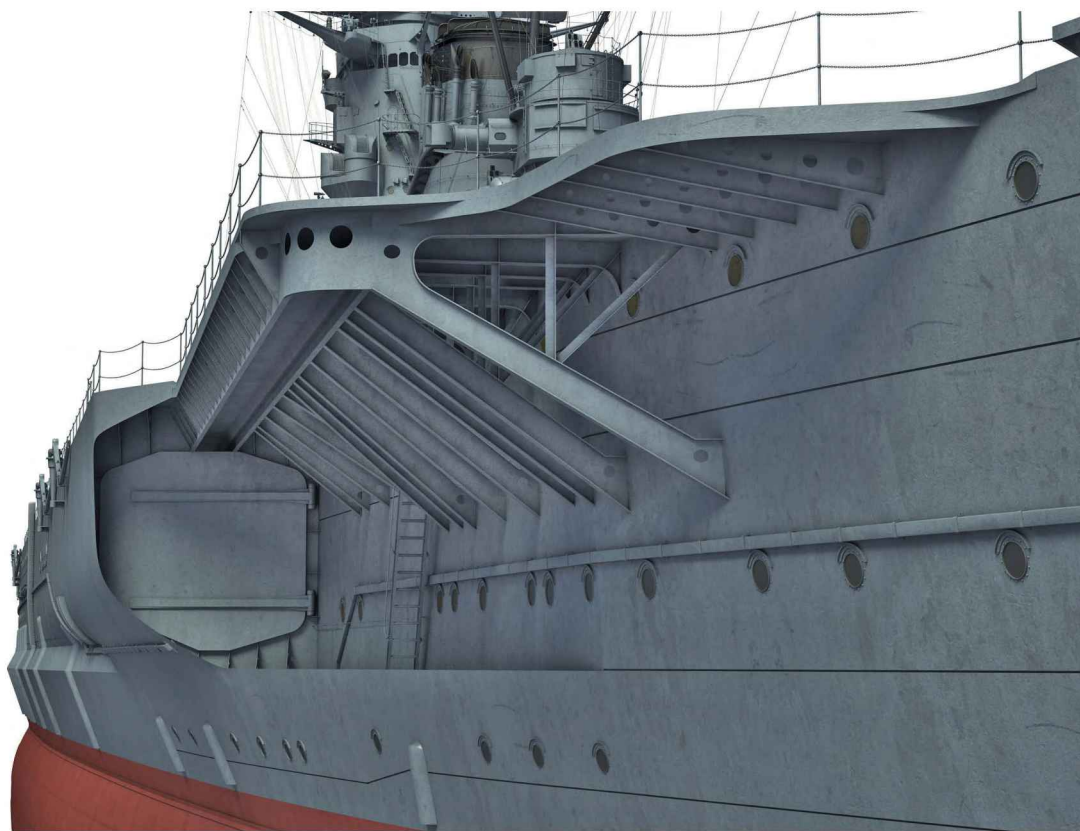
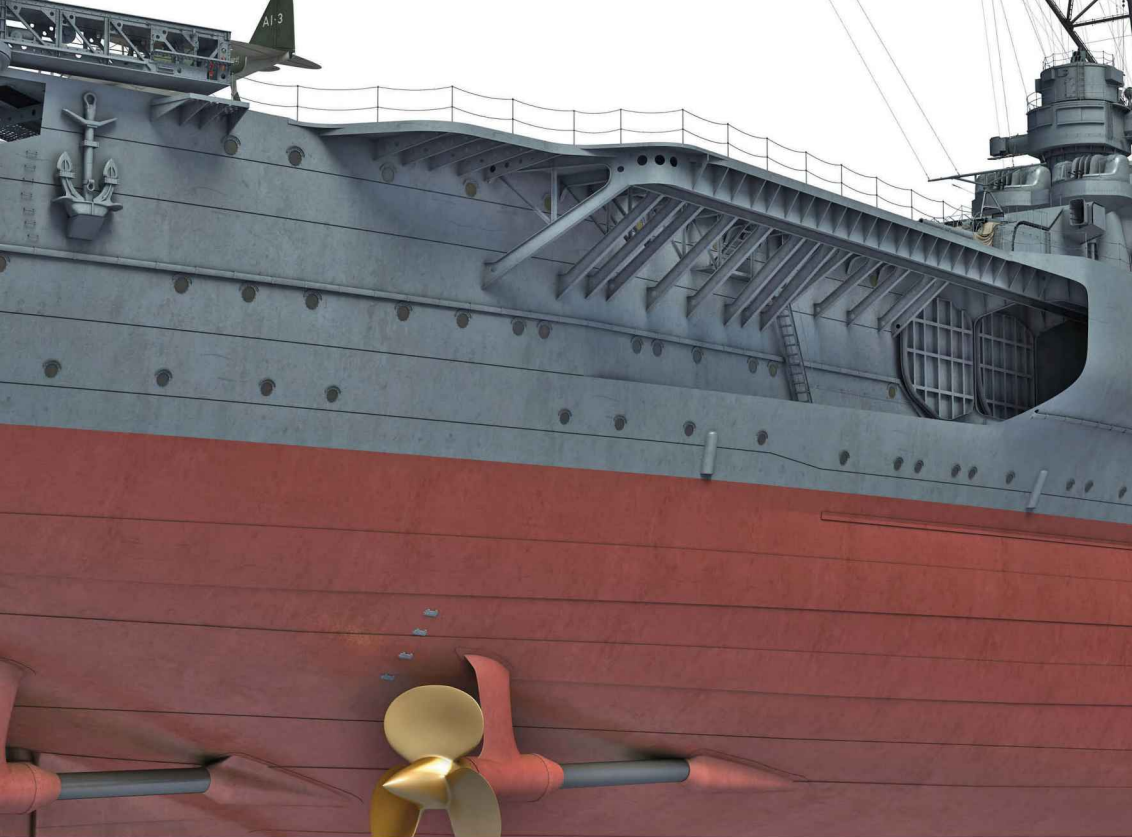


B1/67



Inner surface of outer door



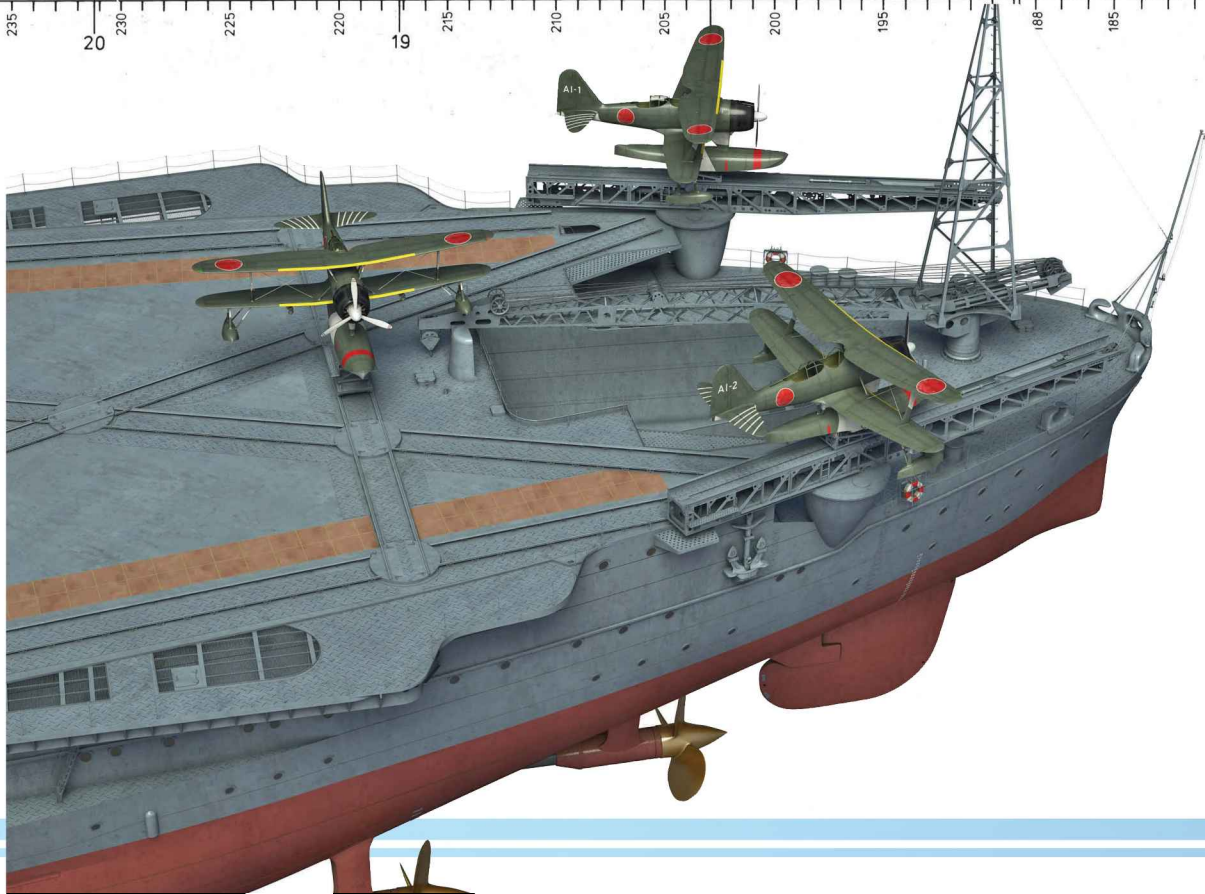
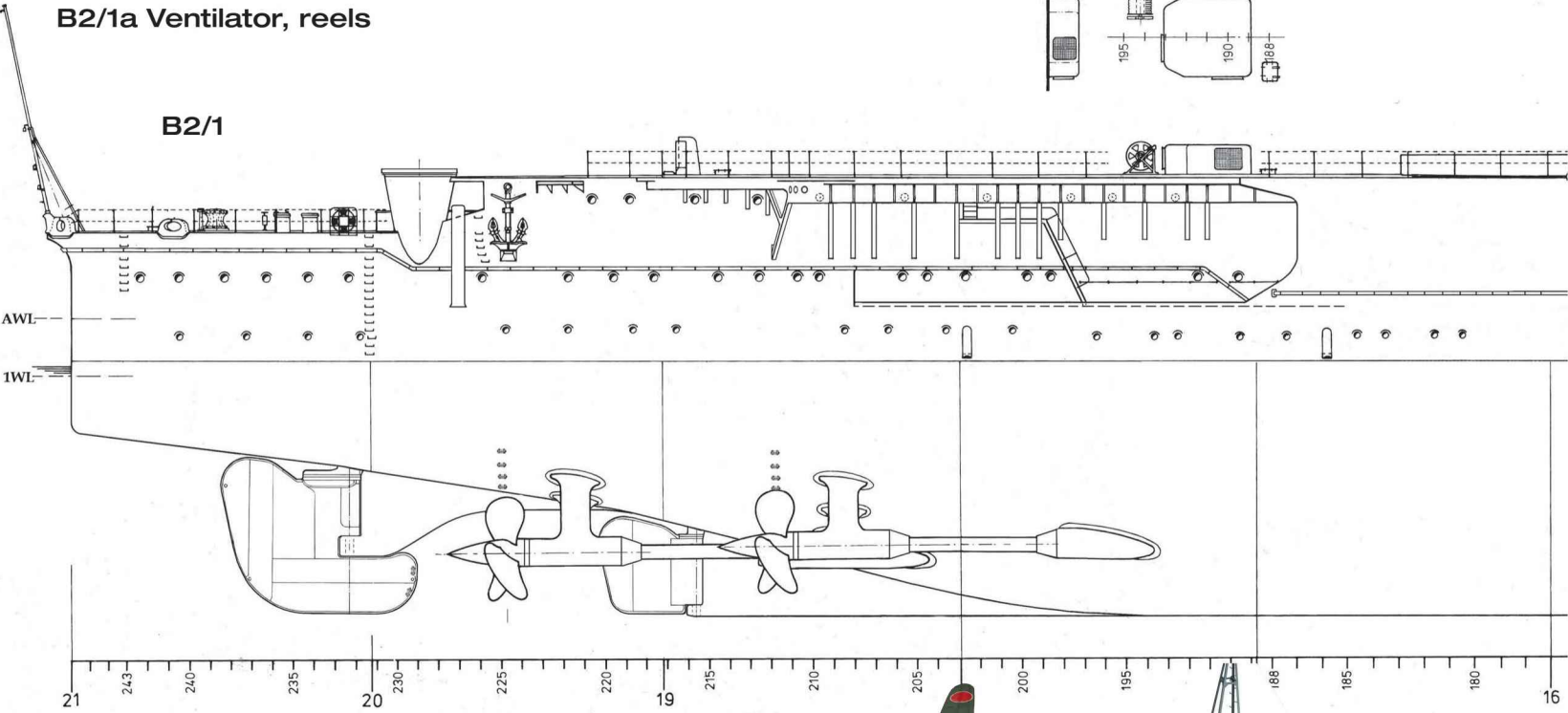


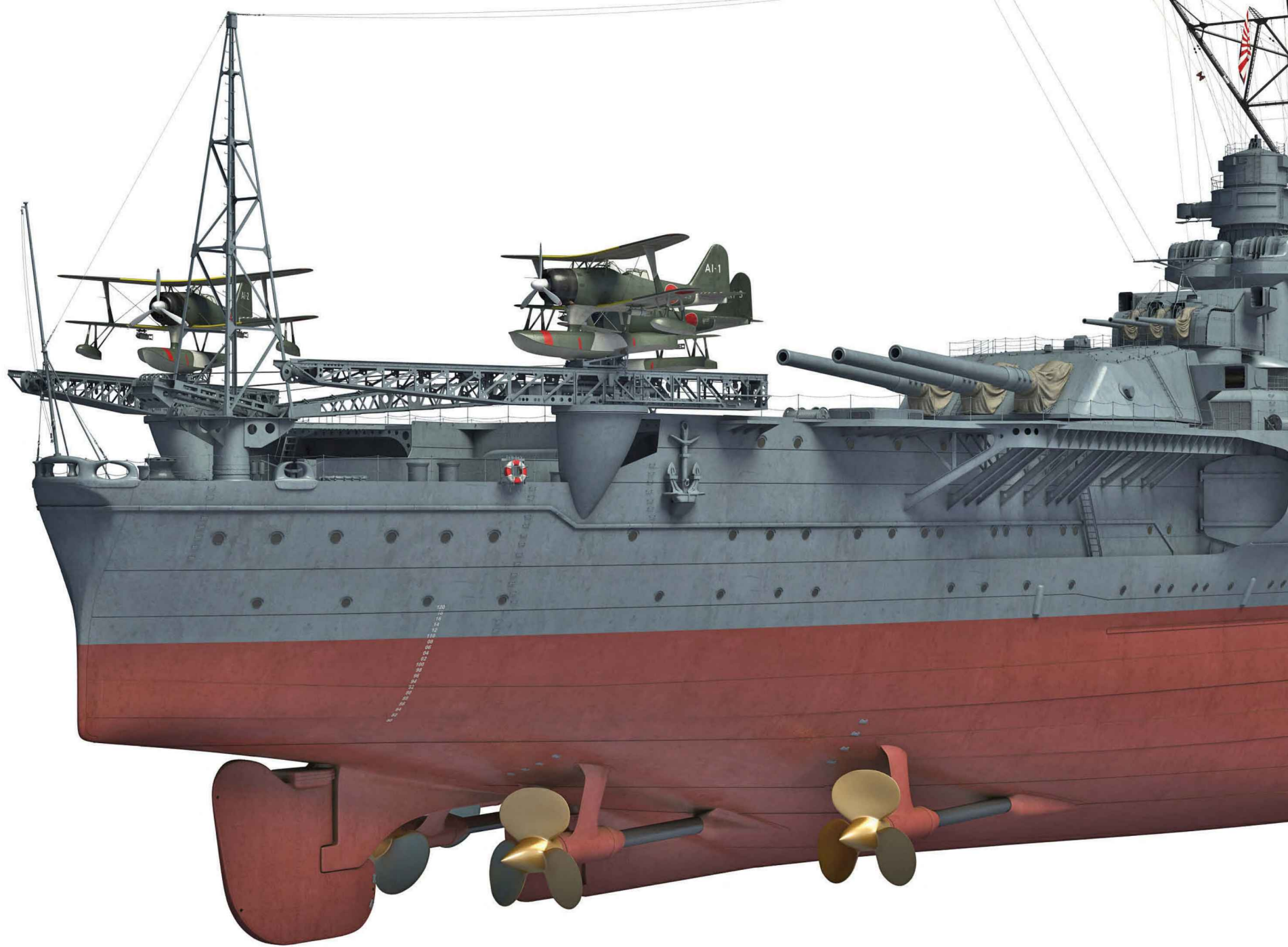
B Hull Structure – Stern

B2/1 Profile of stern part of hull

B2/1a Ventilator, reels

B2/1a





B Hull Structure – Rudders

B2/2 Rudders: fore-auxiliary, rear-main rudder

B2/3 Main rudder side view

B2/4 Main rudder front view

B2/5 Main rudder plan

B2/6 Main rudder bottom view

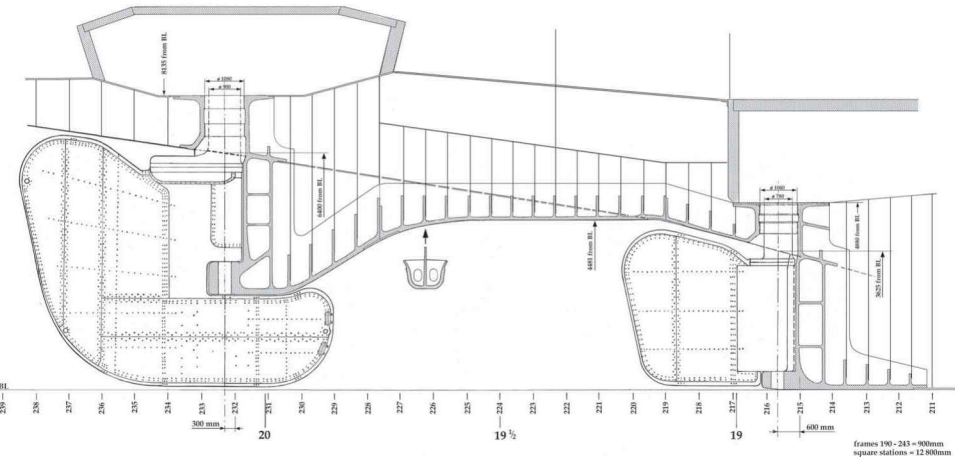
B2/7 Typical screw – used in rudder assembly

B2/8 Fore auxiliary rudder side view

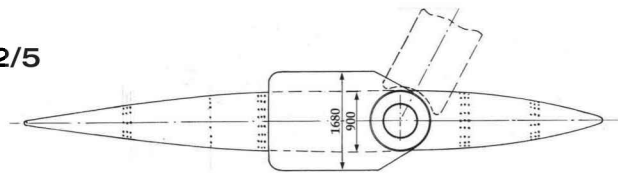
B2/9 Rear view

B2/10 Plan

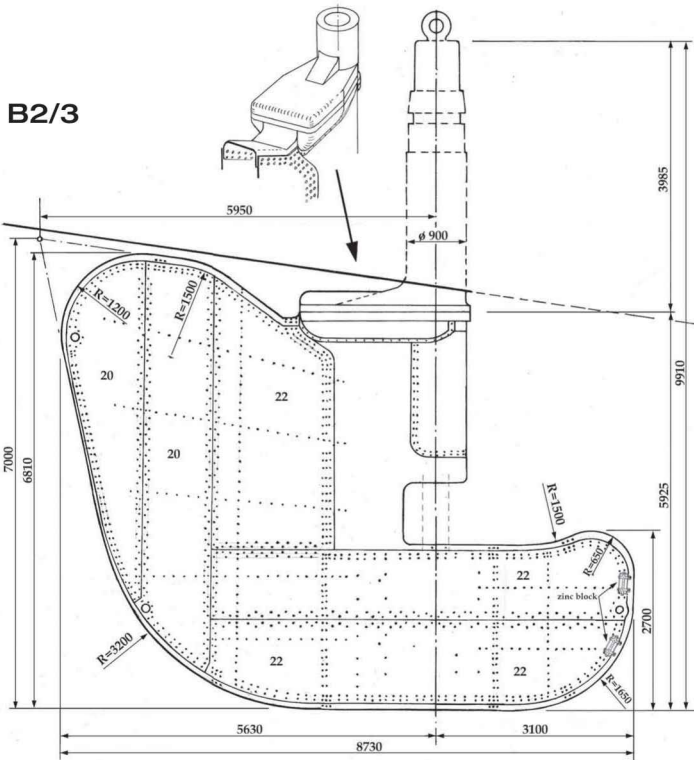
B2/2



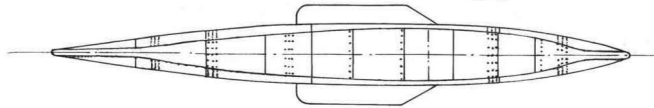
B2/5



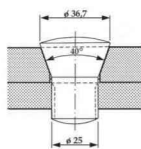
B2/3



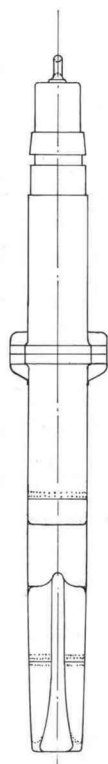
B2/6



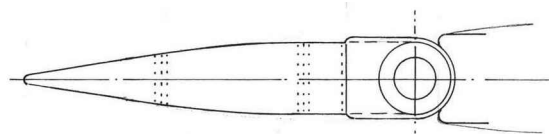
B2/7



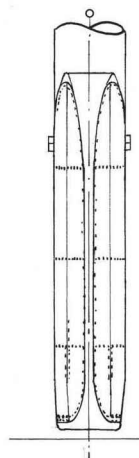
B2/4



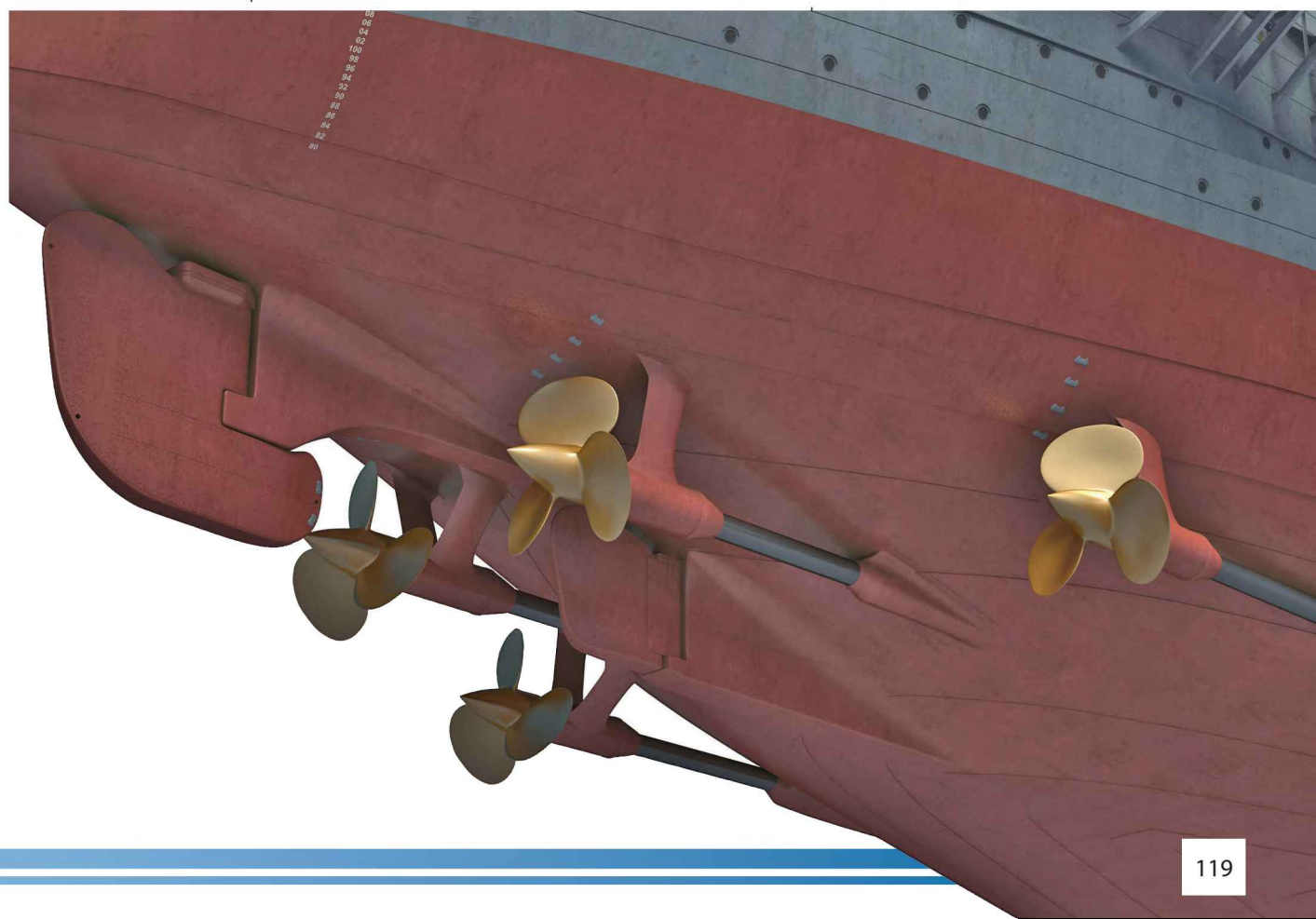
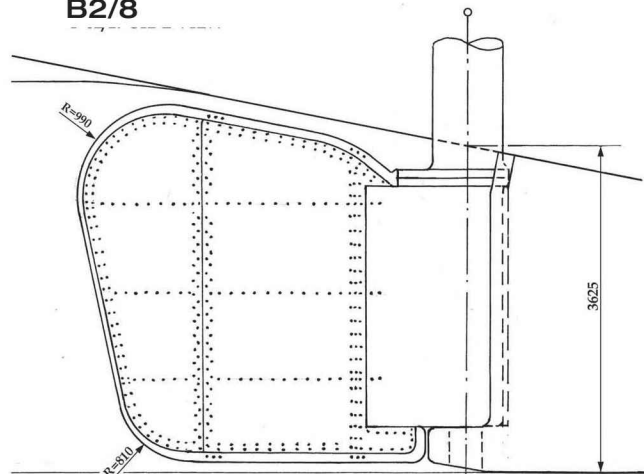
B2/10



B2/9



B2/8



B Hull Structure – Stern

Open aircraft hangar deck

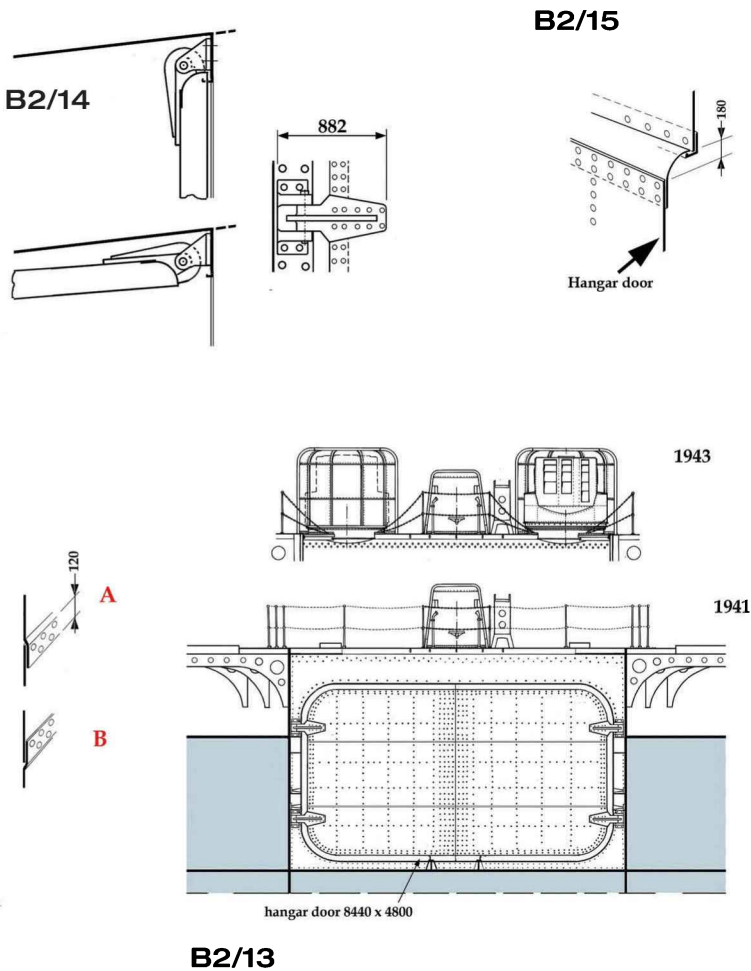
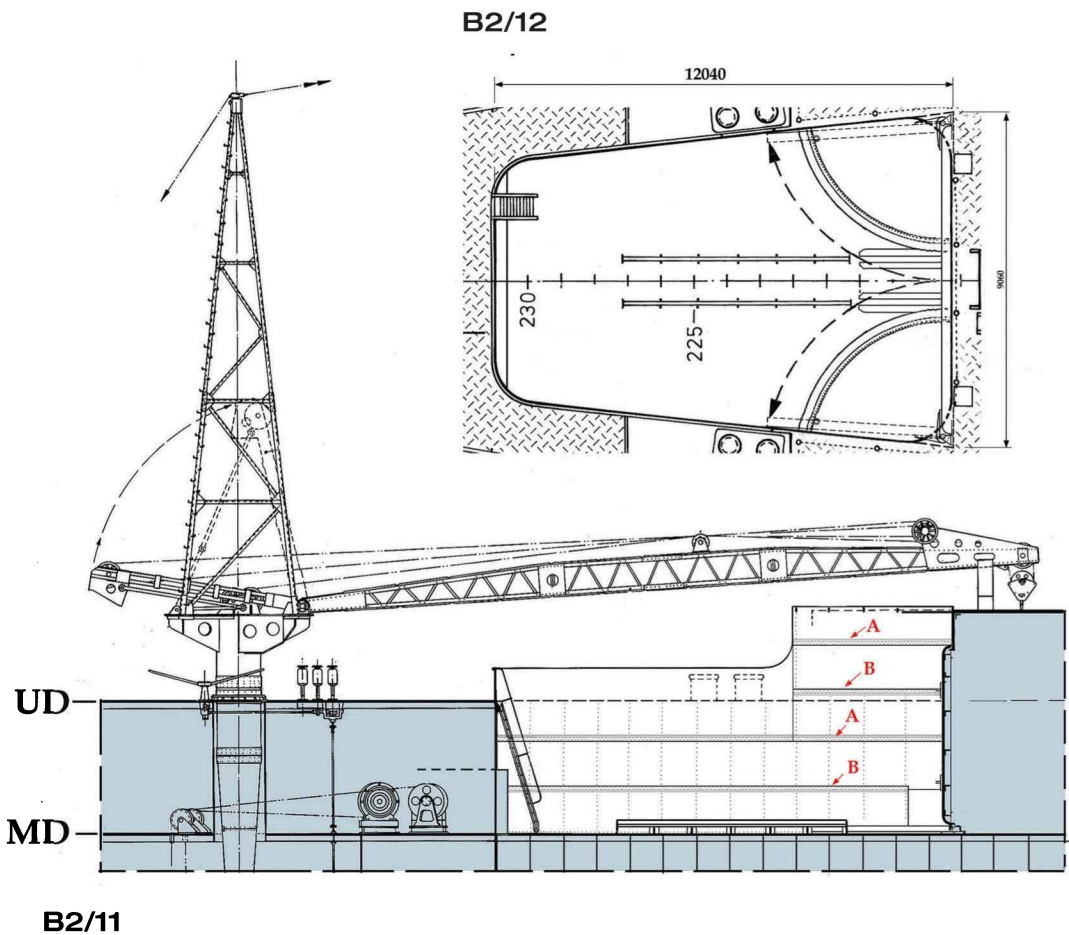
B2/11 Section in ship axis

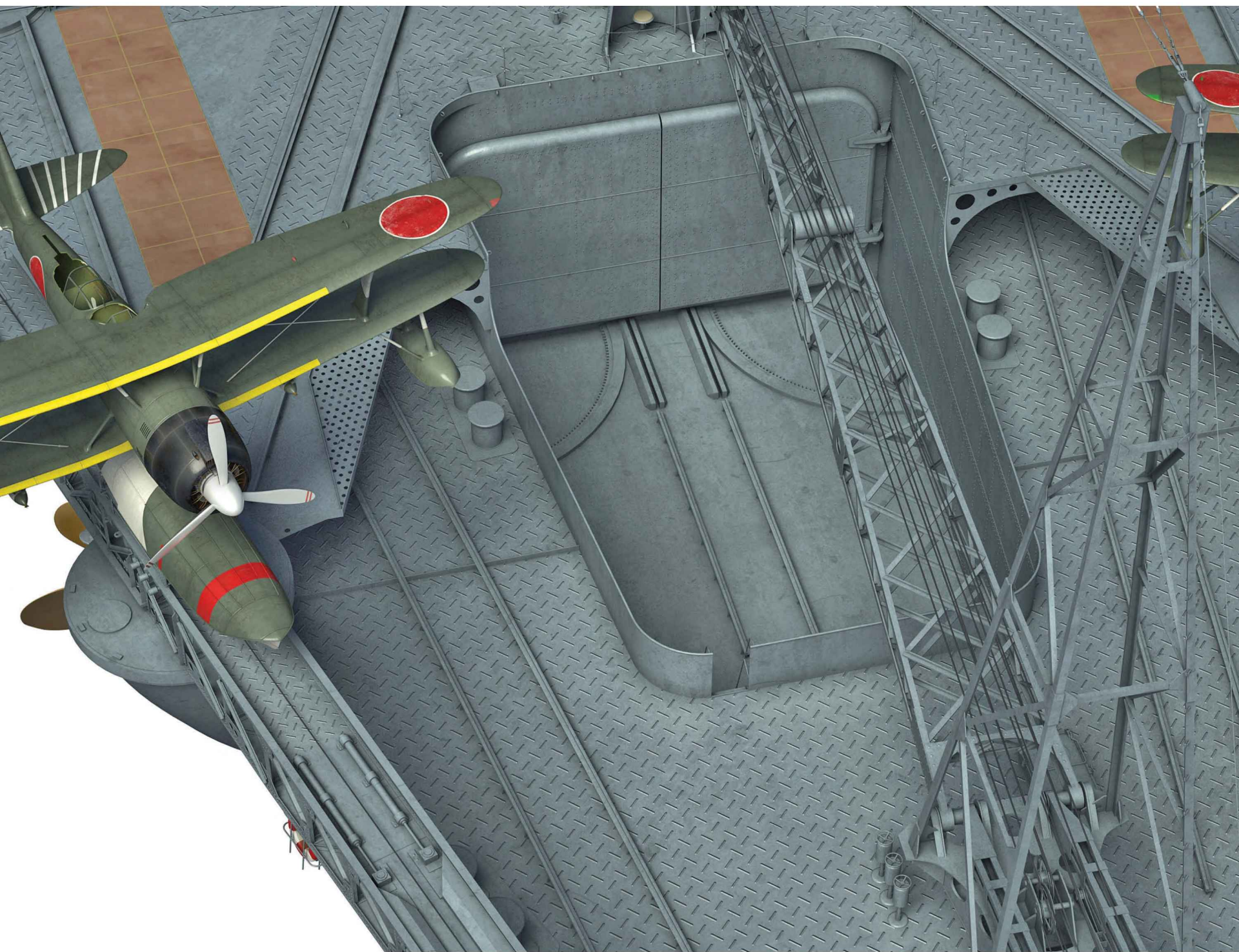
B2/12 Plan

B2/13 View to bow direction

B2/14 Door hinge

B2/15 Door detail



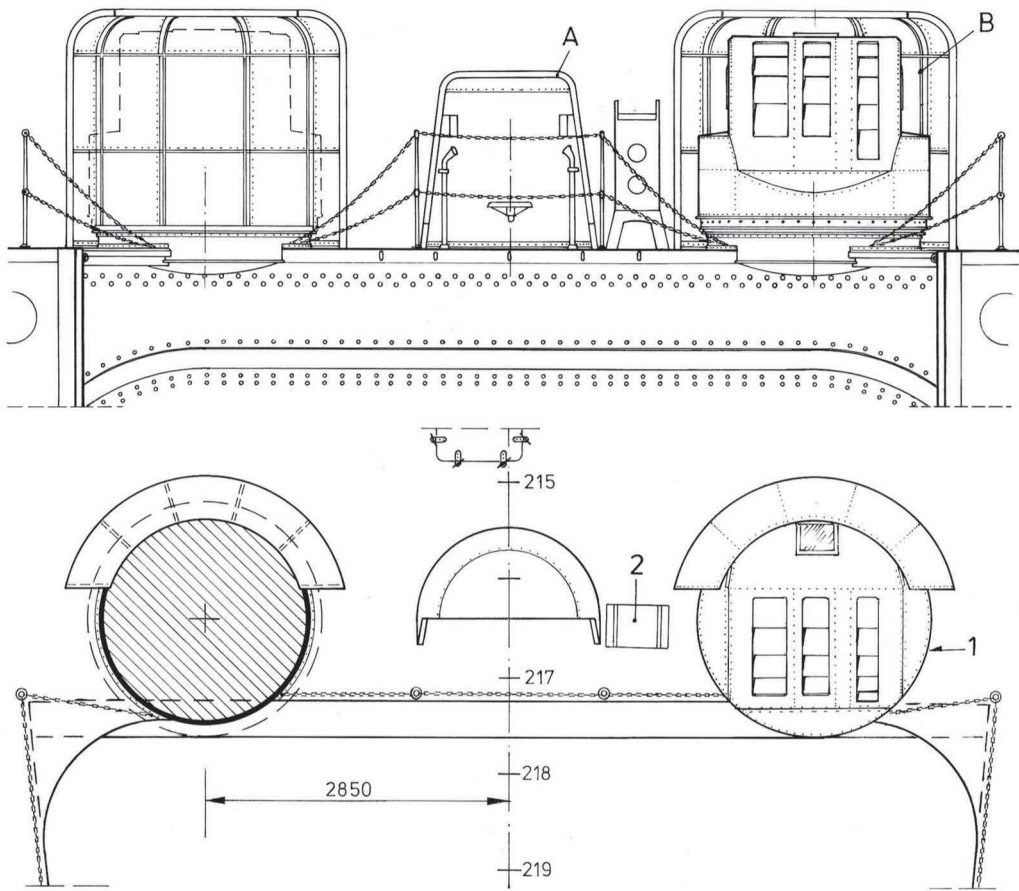


B Hull Structure – Stern

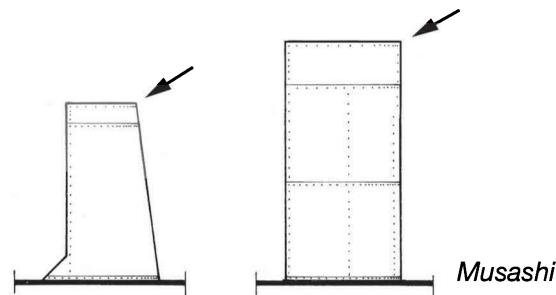
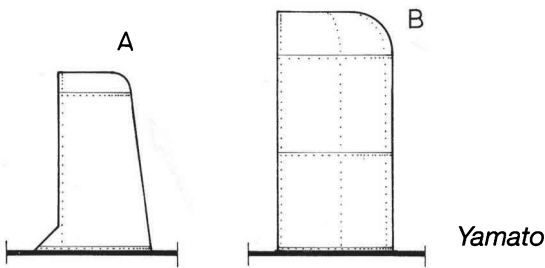
B2/16 Anti blast covers above hangar doors

B2/17 Starboard pipe near catapult base

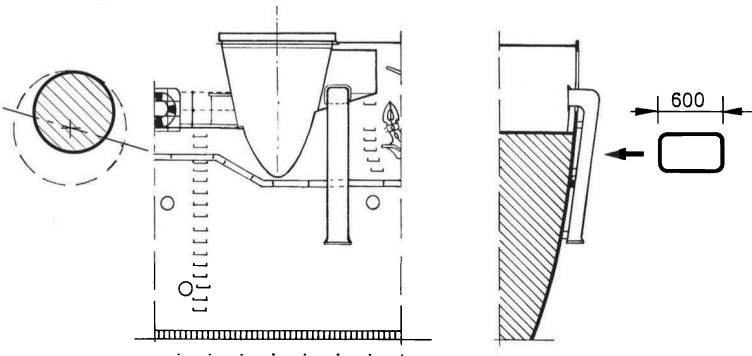
B2/16

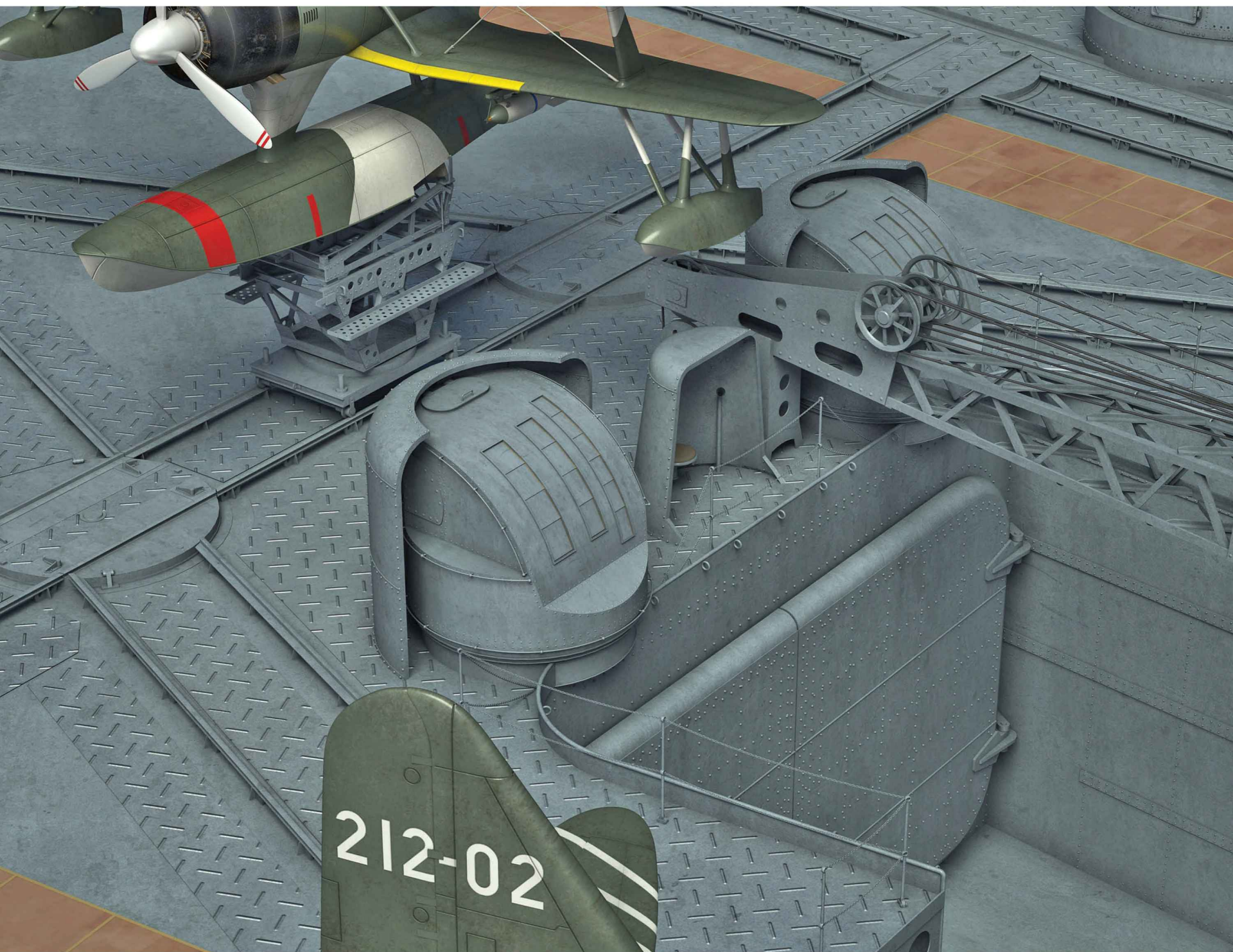


Covers 'B' fitted in 1943



B2/17



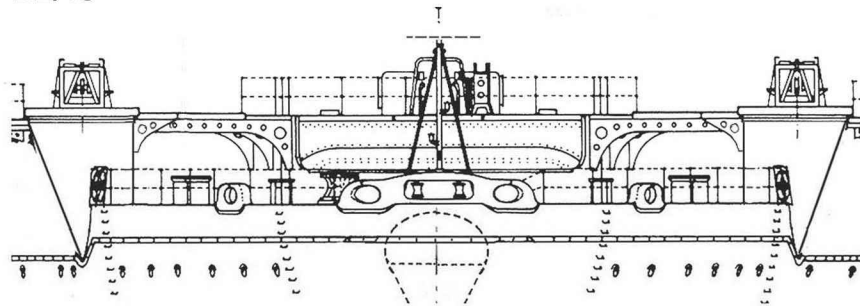


B Hull Structure – Stern and Propellers

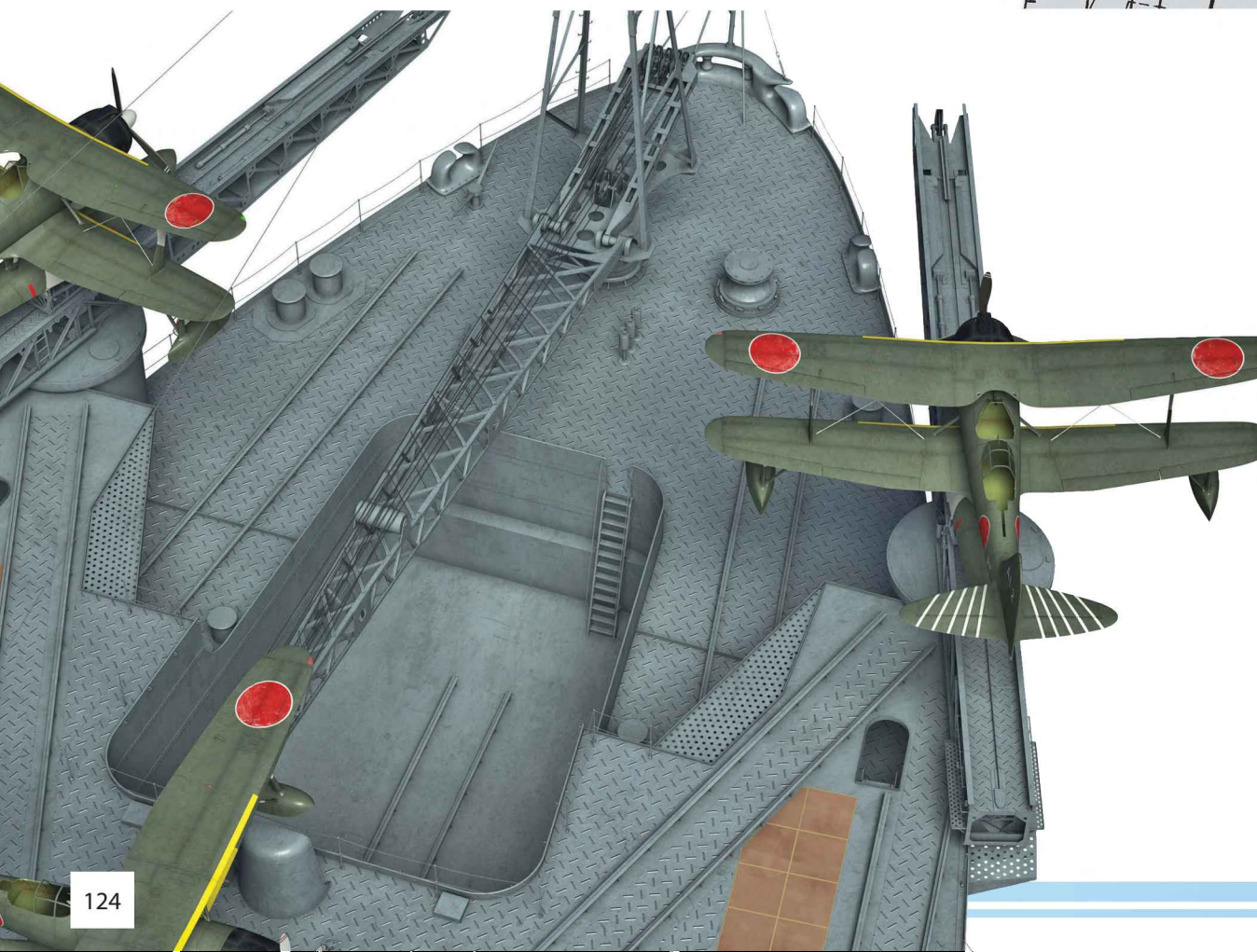
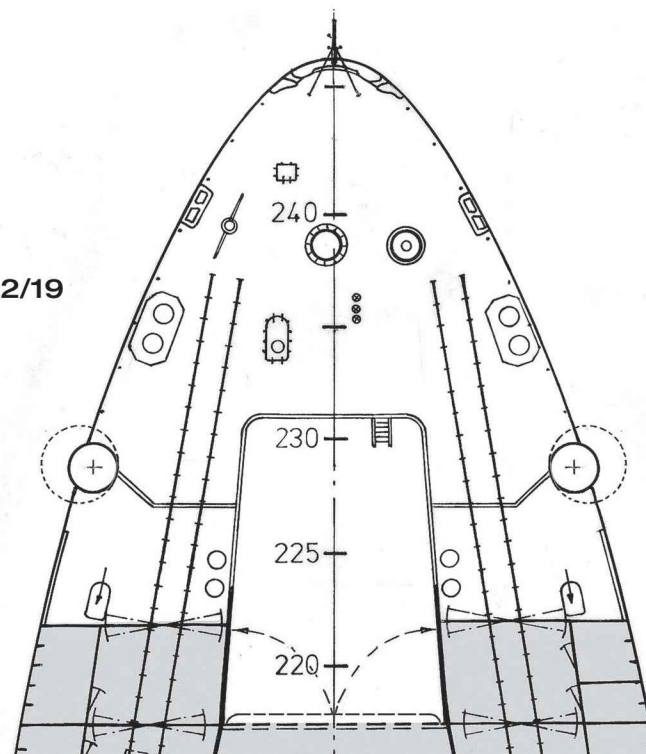
B2/18 Stern deck view from astern

B2/19 Stern deck plan and view

B2/18



B2/19



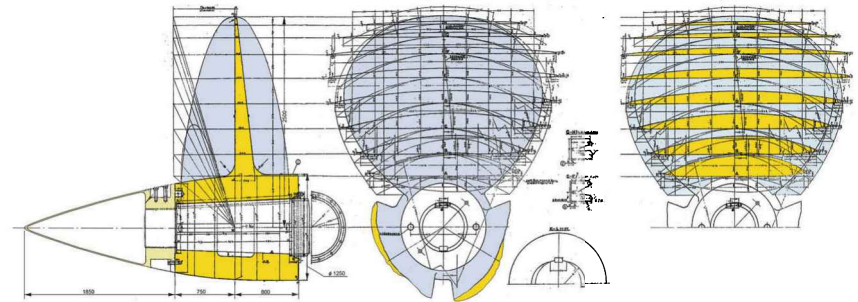
B2/20 5m diameter propeller (section, view)
(1/100 scale)

B2/21 5m diameter propeller (official Japanese Navy drawings)

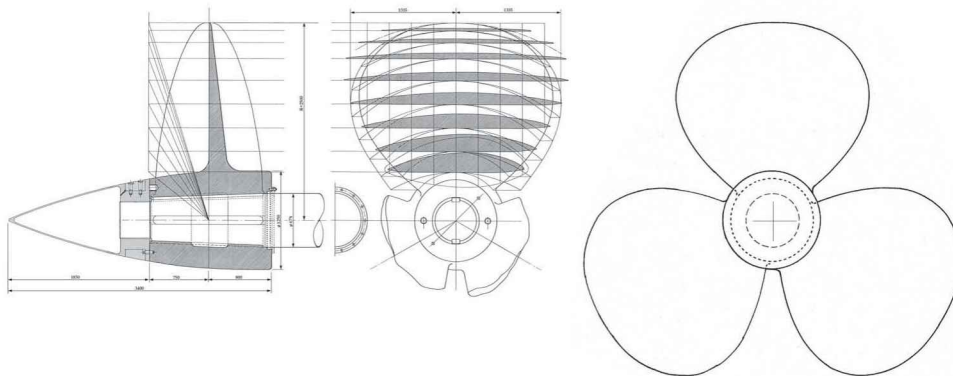
B2/22 Shaft supports (1/150 scale)

B2/23 Anticorrosion zinc plate

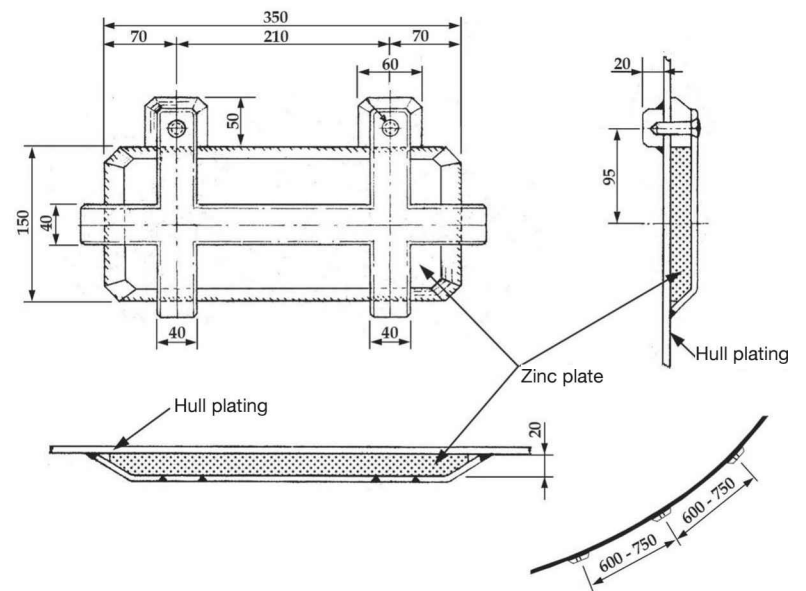
B2/21



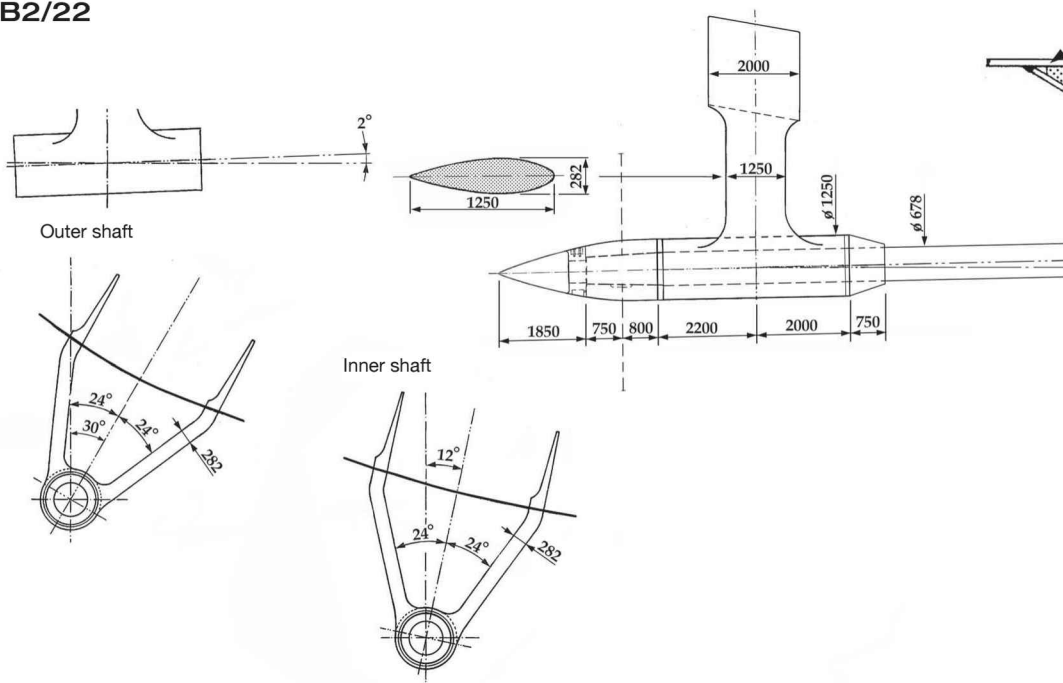
B2/20



B2/23



B2/22



B Hull Structure – Rudder

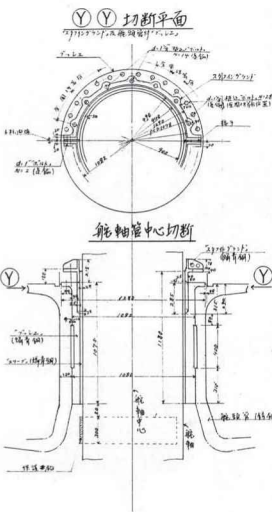
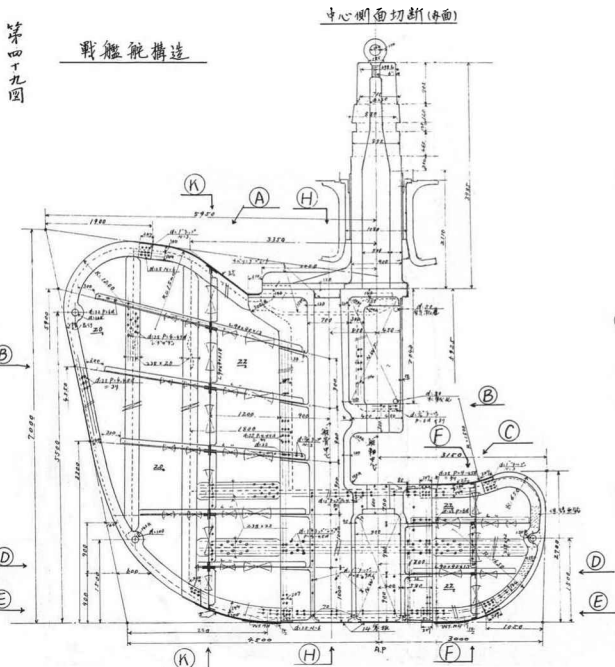
B2/24 Main rudder (official Japanese Navy drawings)

B2/25 Main rudder (official Japanese Navy drawings)

B2/26 Main rudder vertical sections (official Japanese Navy drawings)

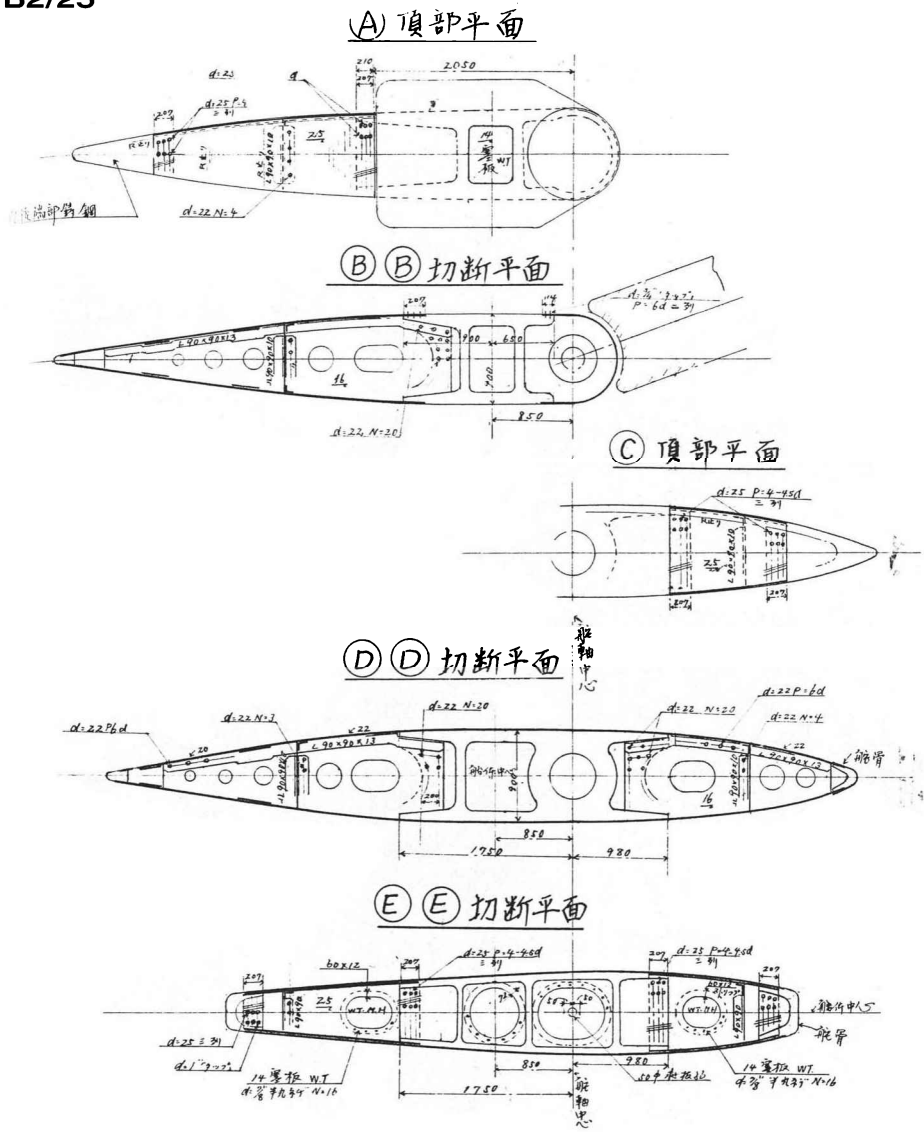
B2/24

第四十九圖



(3/4) A

B2/25



(K)(K) 切断 (H)(H) 切断 舵轴中心切断



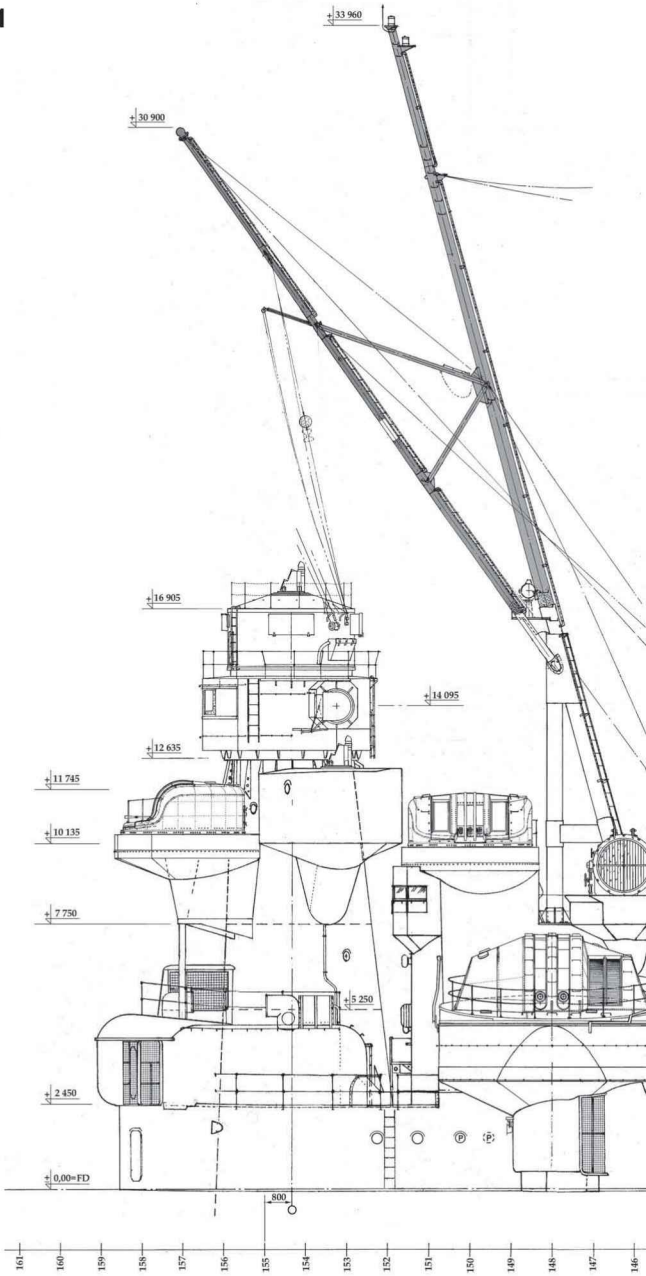
C Superstructure

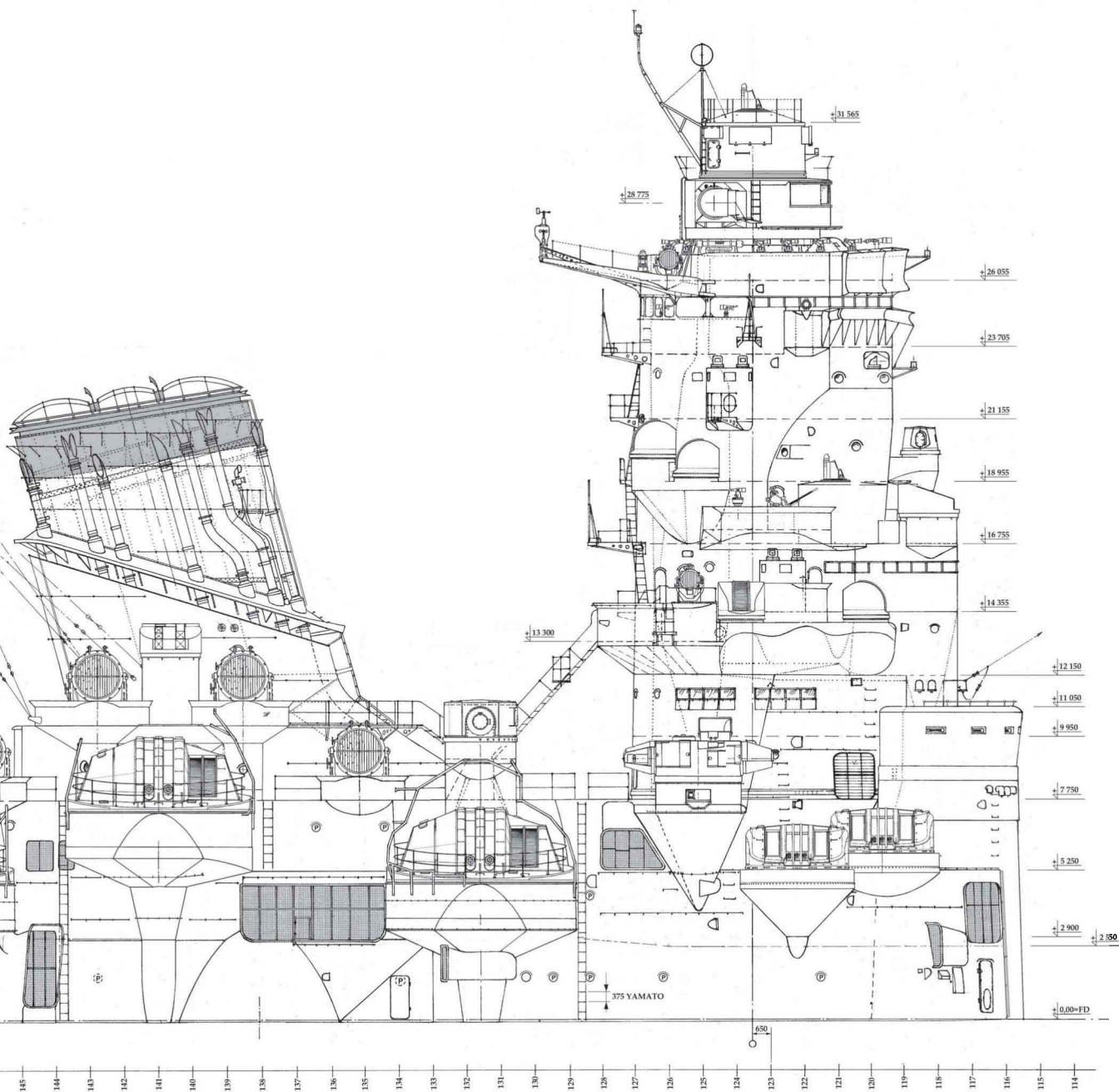
C1/1 Superstructure starboard elevation (1/1200 scale)

December 1941 platform levels:	
	Fore tower:
	+31 565
	+28 775
	+26 055
	+23 705
	+21 155
	+18 955
Rear tower:	+16 755
+16 905	+14 355
+14 095	+13 300
+12 635	+12 150
+11 745	+11 050
+10 135	+ 9 950
+ 7 750	+ 7 750
+ 2 450	+ 5 250
+ 0,000	+ 2 900
	+ 2 550
	+ 0,000

Levels	
+ - 0.00	Forecastle deck (FD)
+2550/+5250	Lower decks of superstructure
+7750	Upper deck of middle part of superstructure
+9950	Conning tower
+13300	Signal deck (rear part of tower bridge)
+14355	Compass bridge – bridge No.2
+16755	MG control tower (two towers) auxiliary Type 98
	LA directors ('Hoiban')
+18955	Fore part – 1.5m navigation rangefinder, aft – four searchlight control towers
+23705	Combat bridge
+26055	Air defence combat platform and map compartment
+28775	Axis of 15.5m rangafinder
+31565	Roof of Type 98 LA director 'Hoiban'

C1/1





Scuttles ○ only starboard ⊙ both sides ⊖ only port side

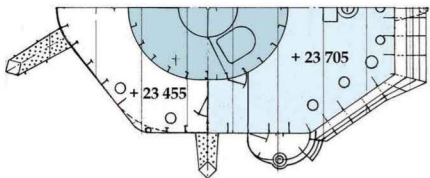
C Superstructure

C1/2 Yamato 1941 level +23 455/+23 705 (1/200 scale)

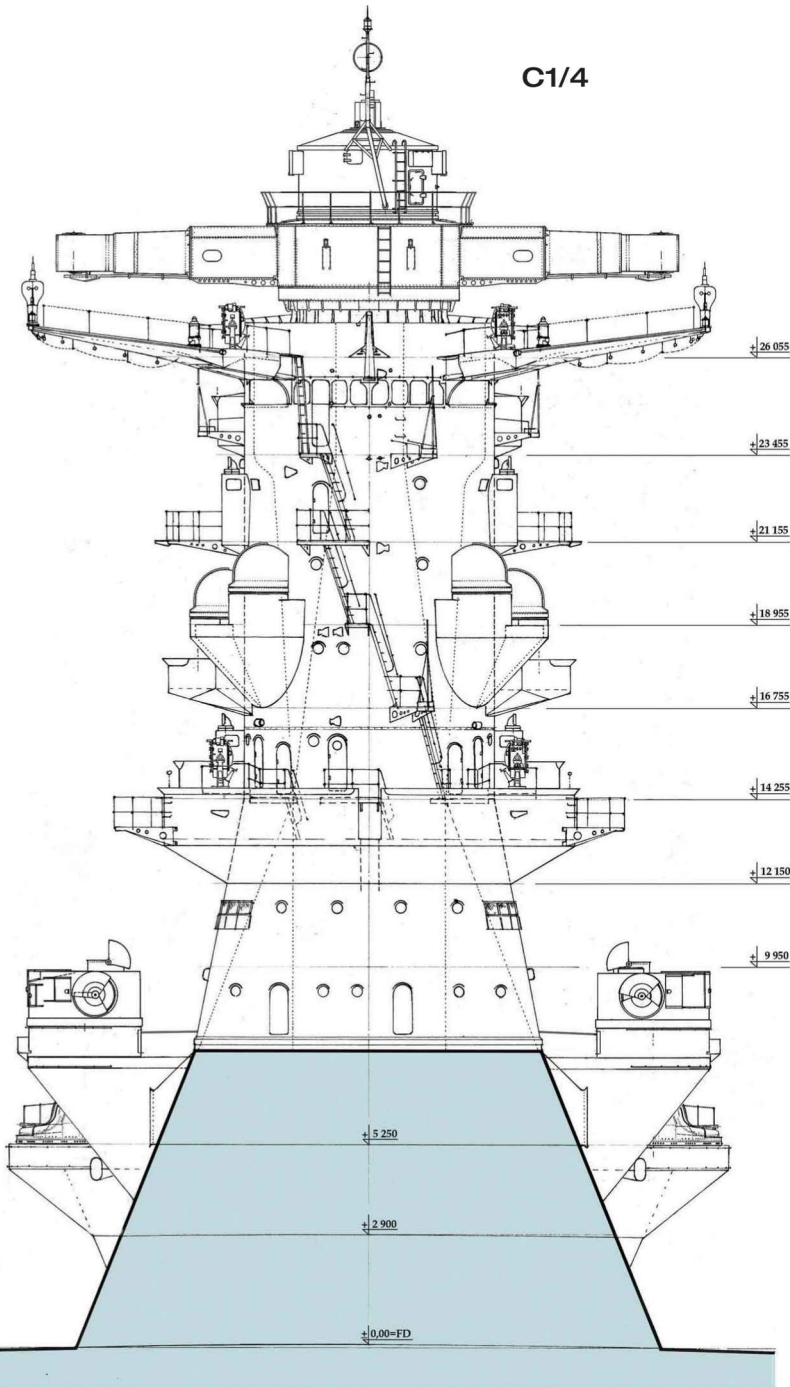
C1/3 Yamato 1941 starboard profile

C1/4 Yamato 1941 rear view of tower

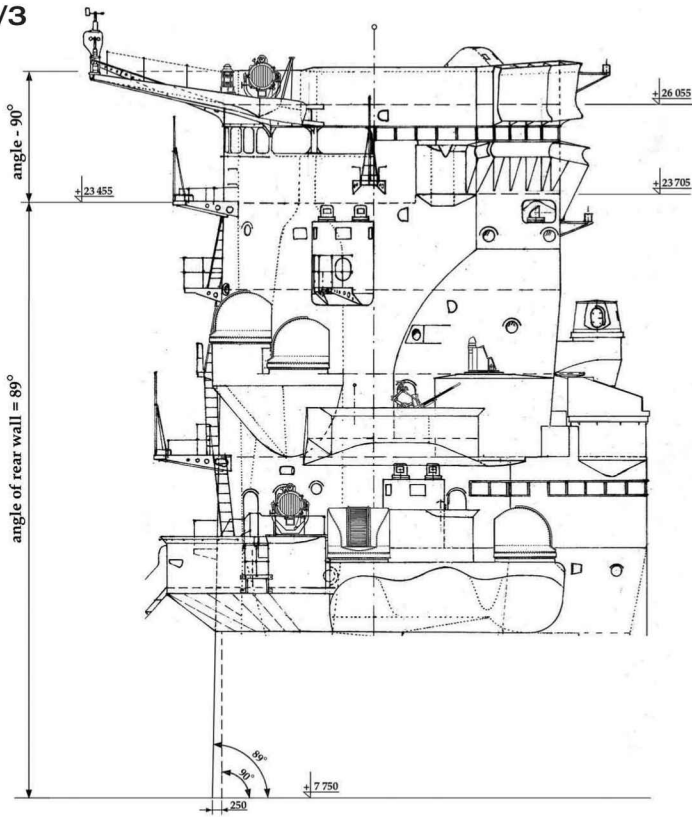
C1/2



C1/4



C1/3



Aft tower of *Yamato* in 1941

C1/5 View from frame 150 from bow

C1/6 View from frame 152 from stern

C1/5

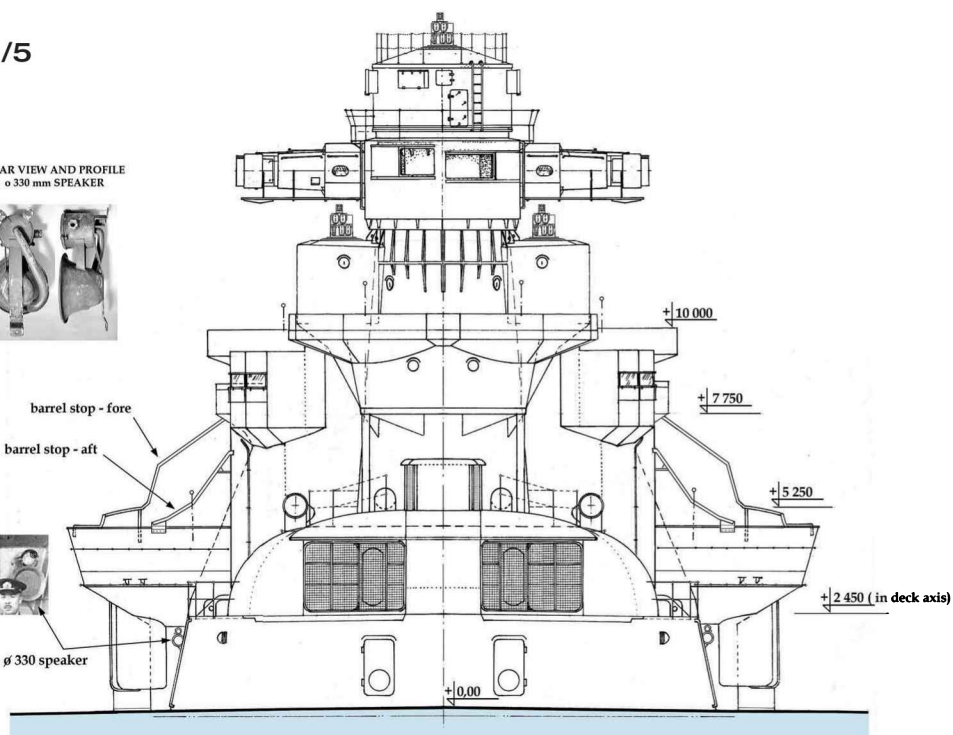
REAR VIEW AND PROFILE
OF ø 330 mm SPEAKER



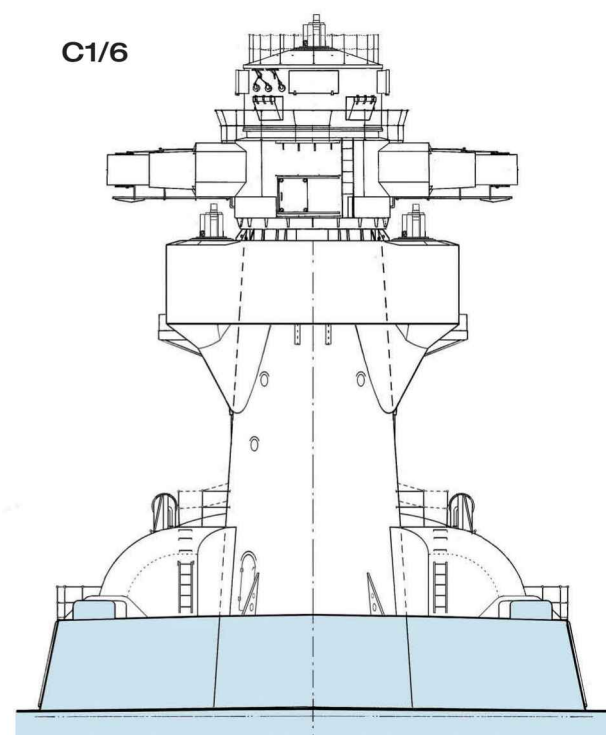
barrel stop - fore
barrel stop - aft



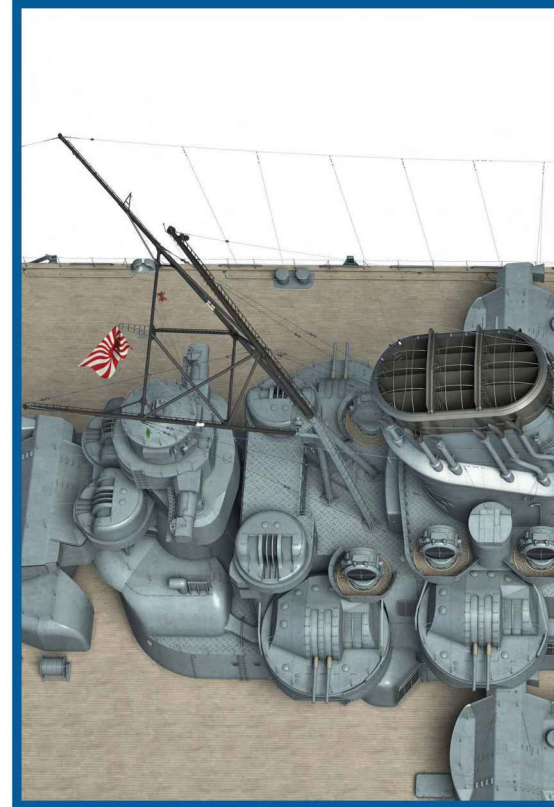
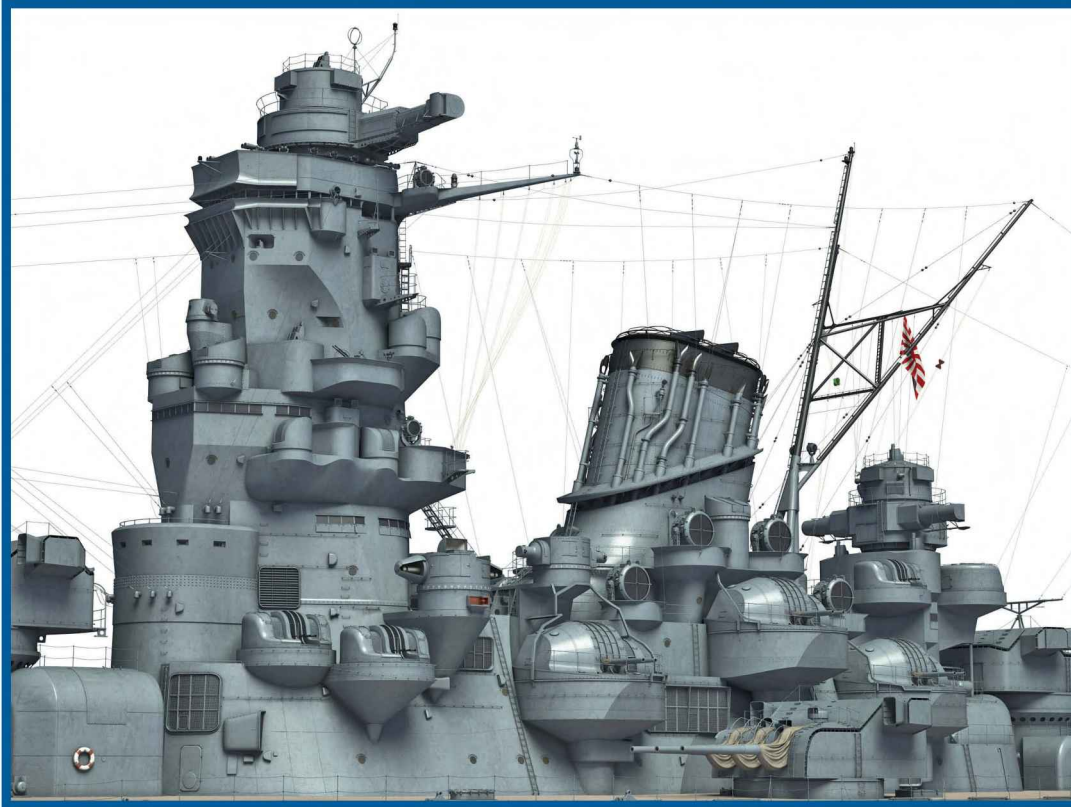
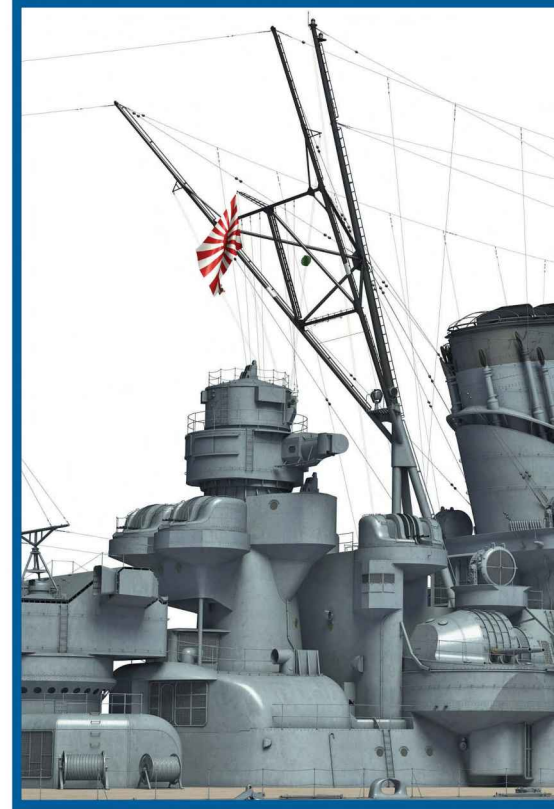
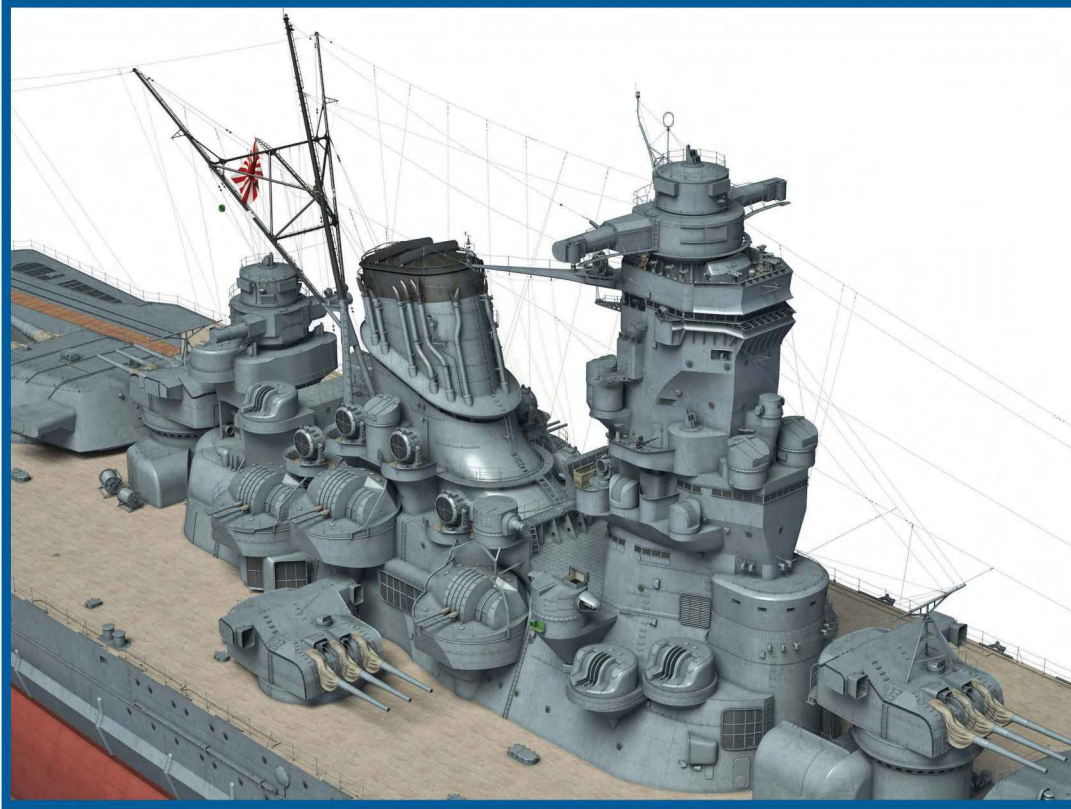
ø 330 speaker

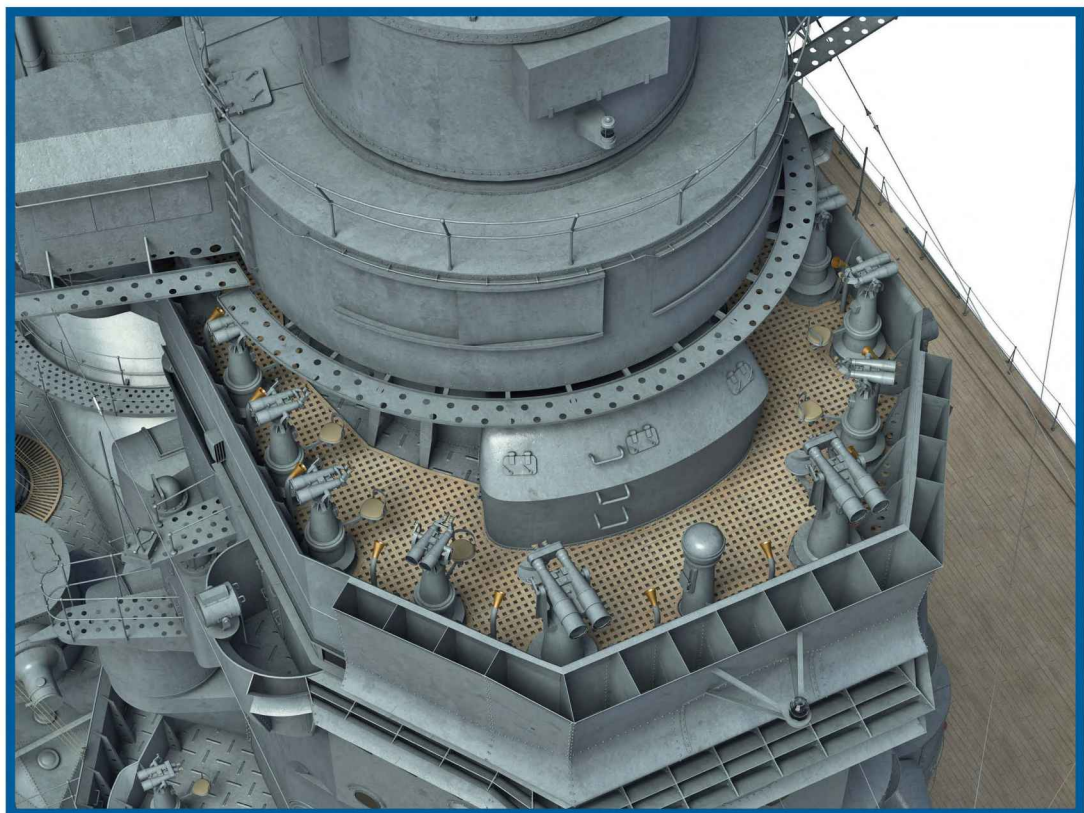
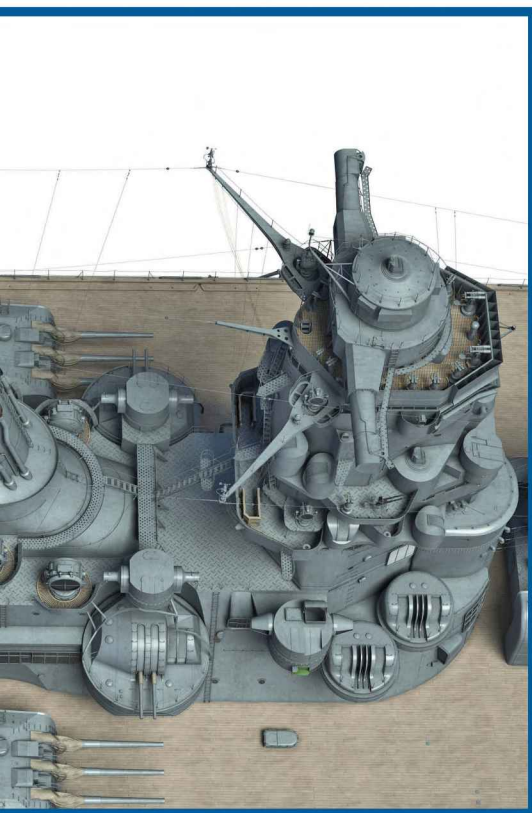
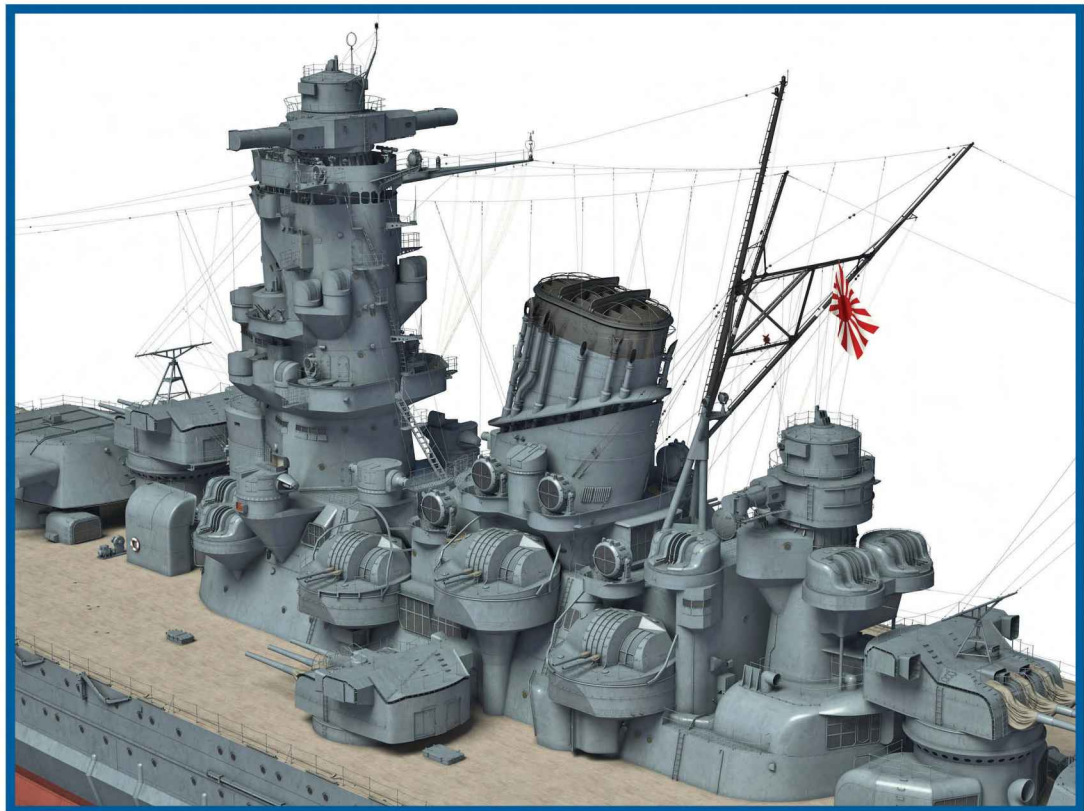
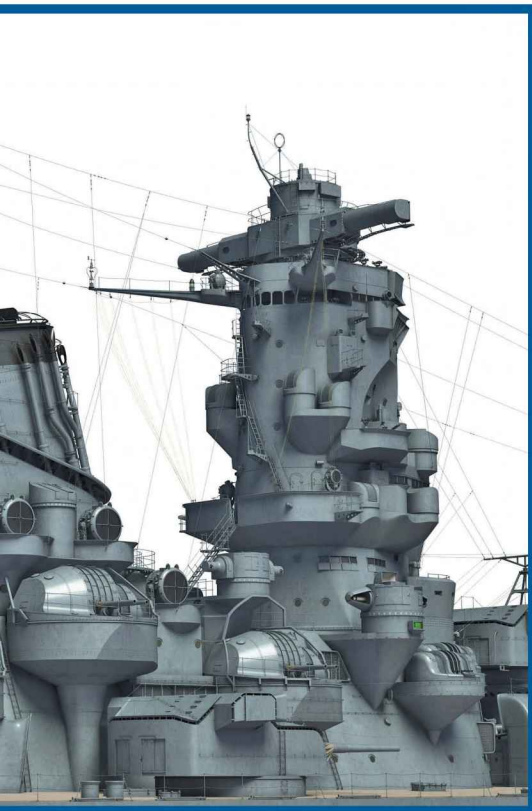


C1/6

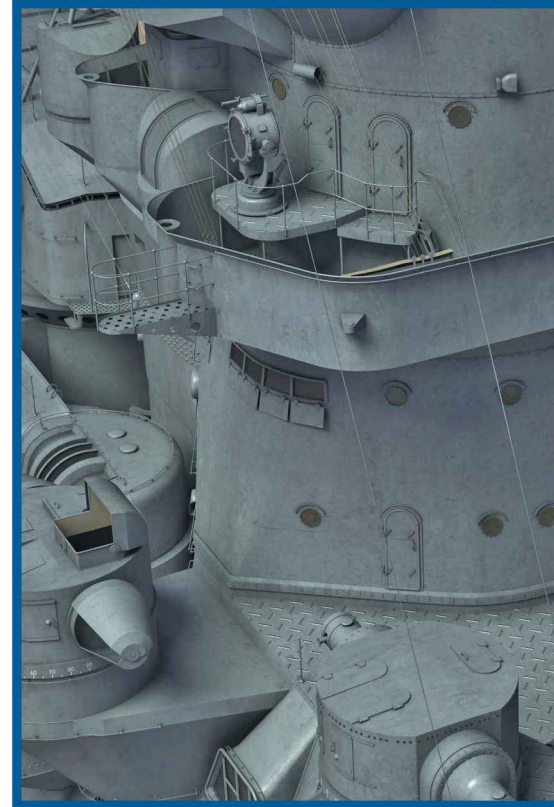
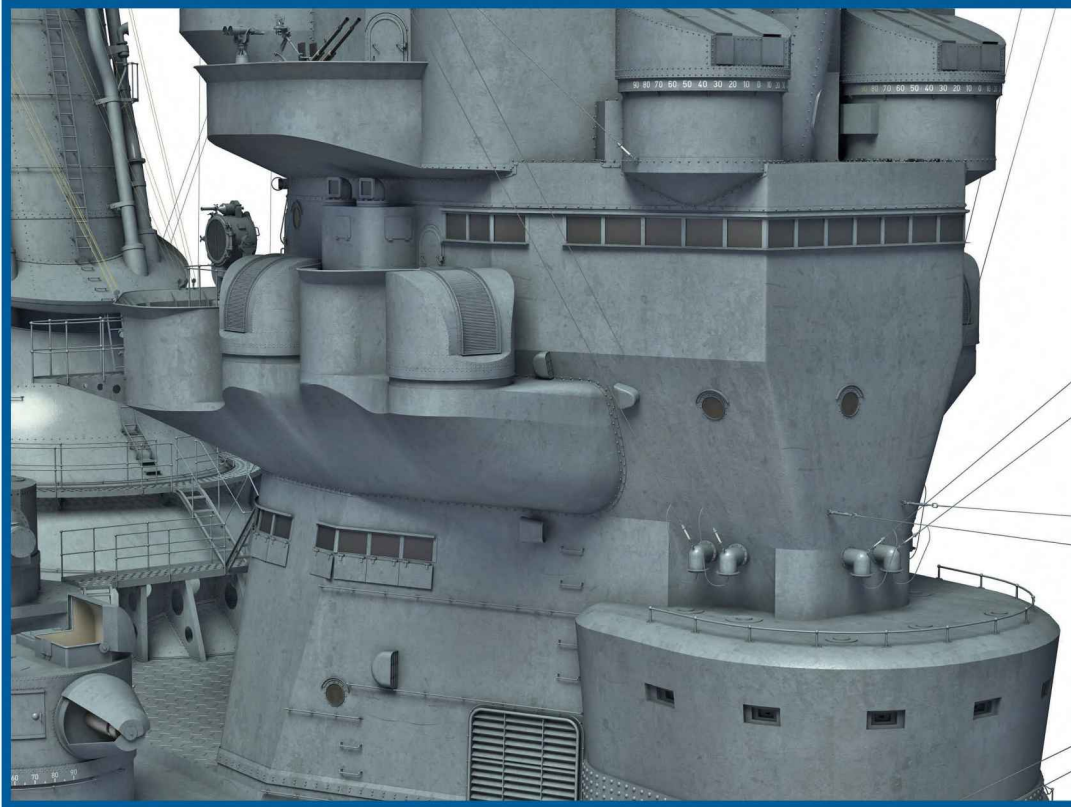
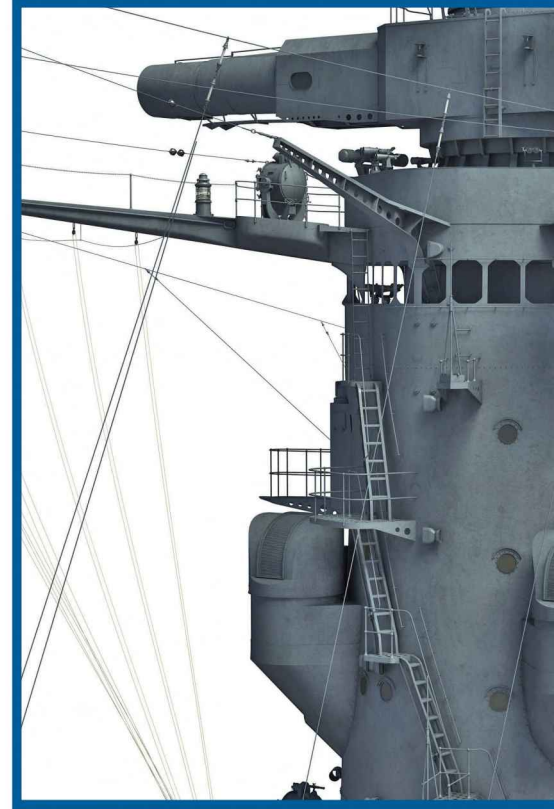
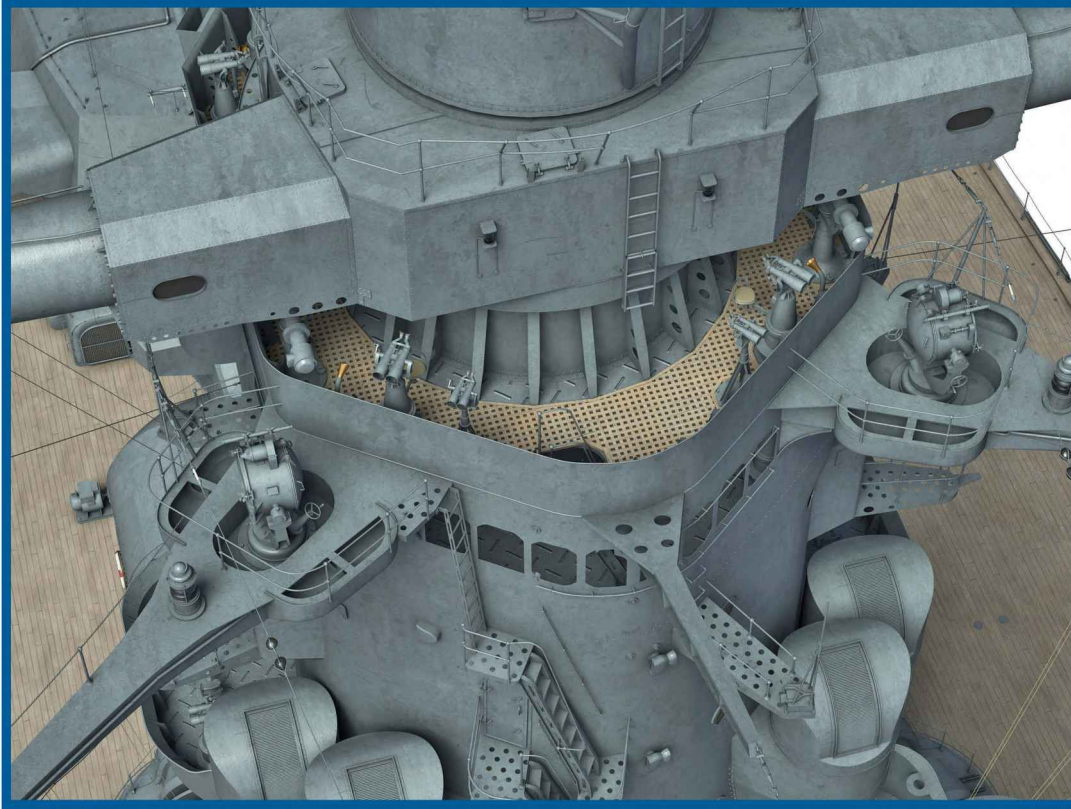


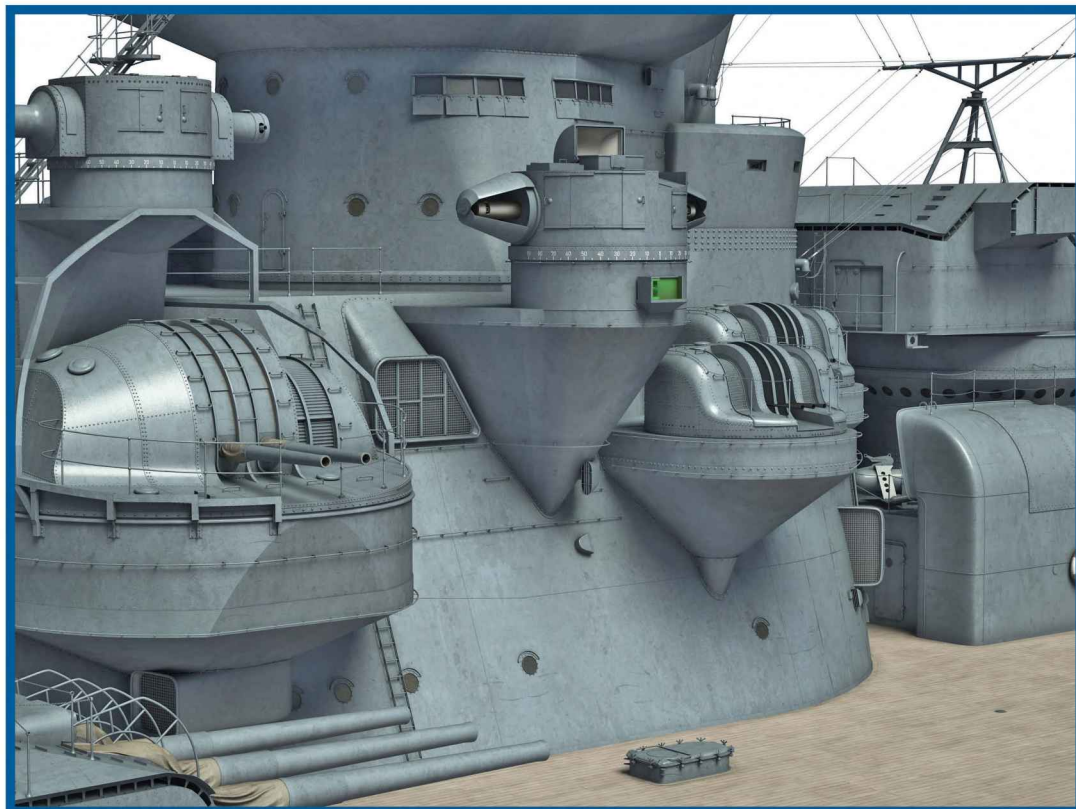
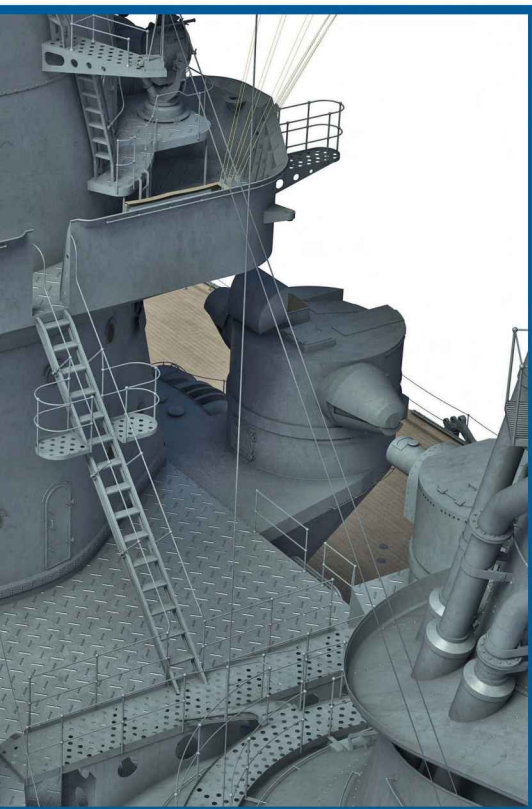
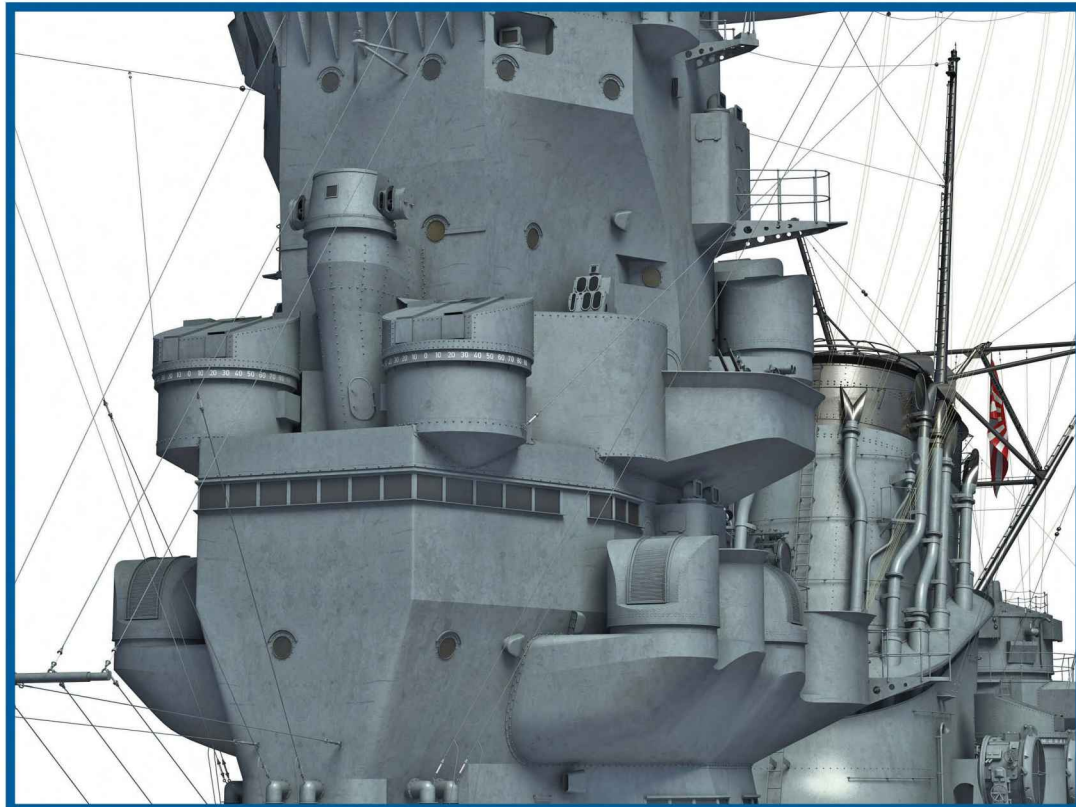
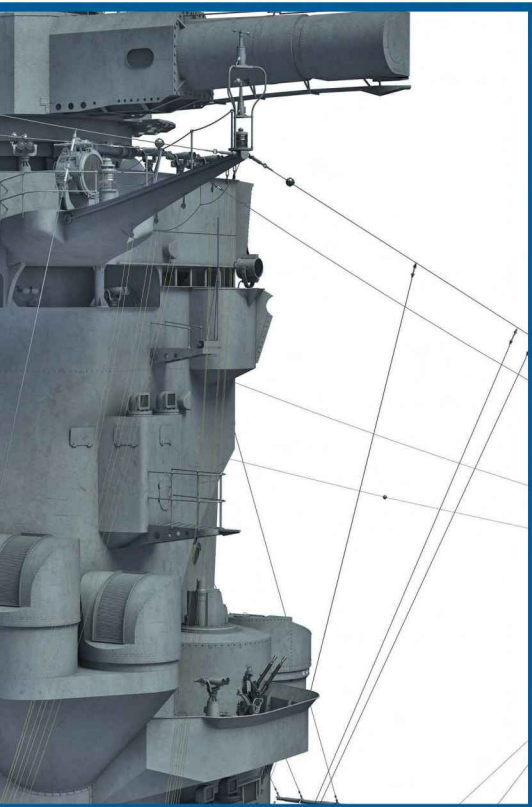
C Superstructure – Yamato 1941



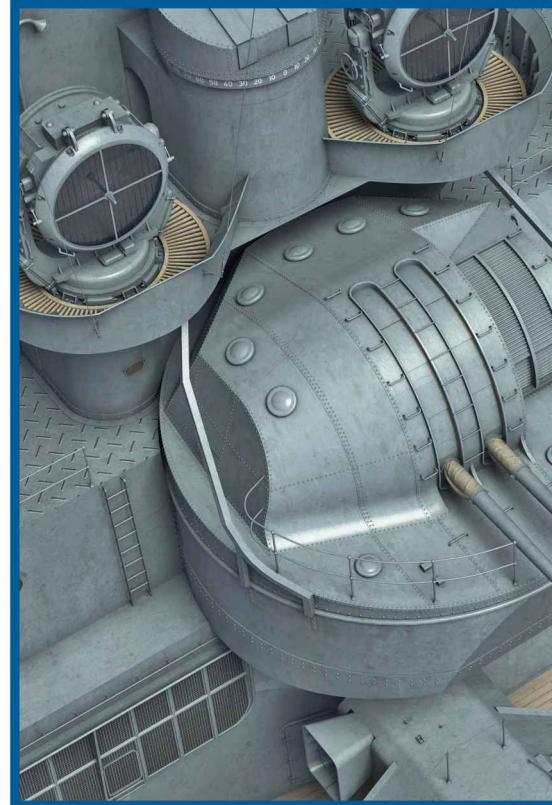
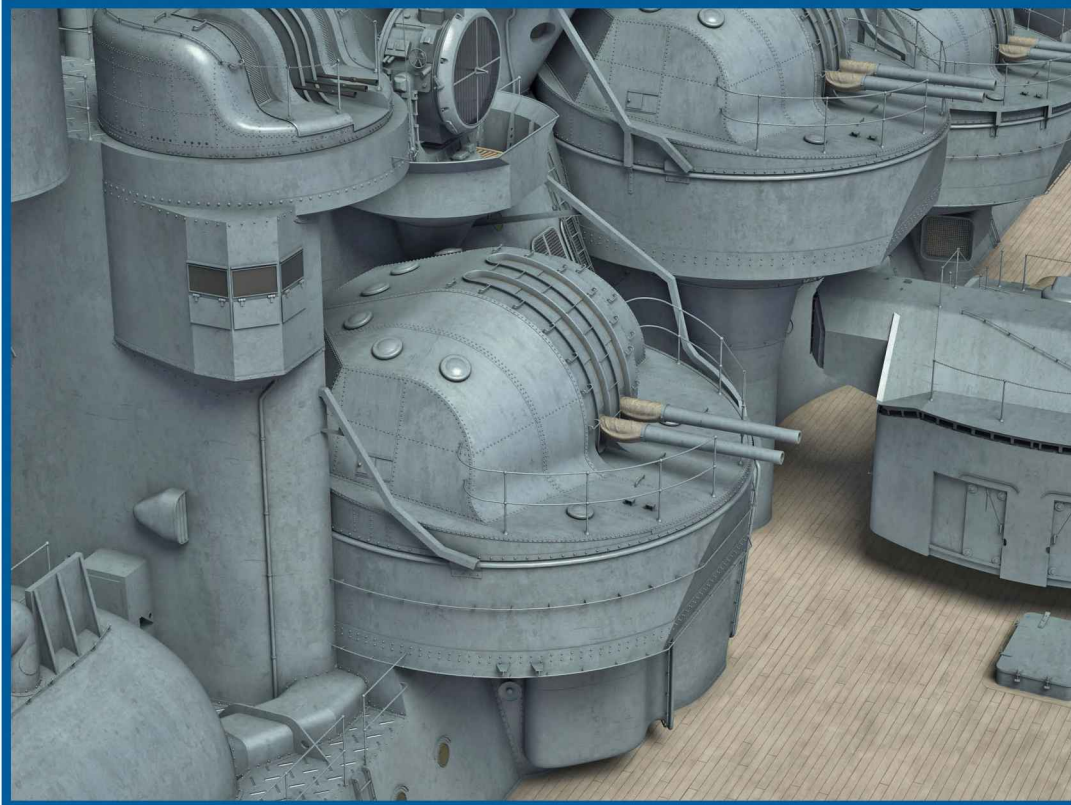
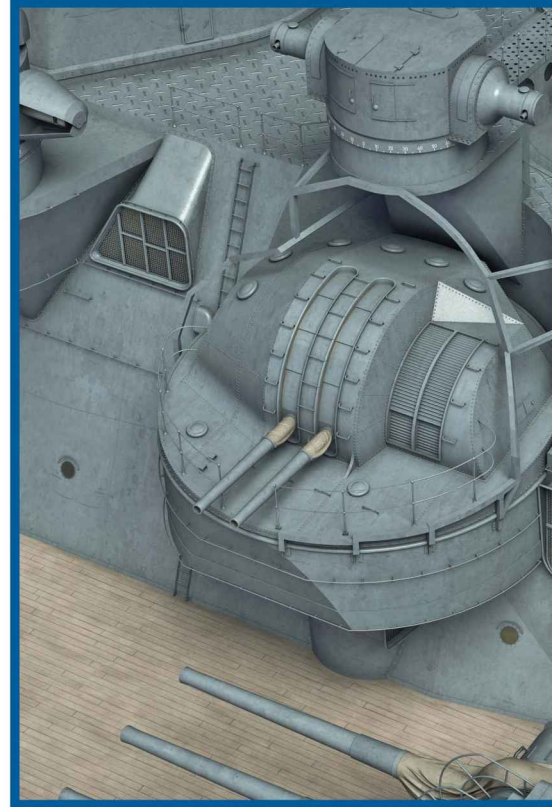
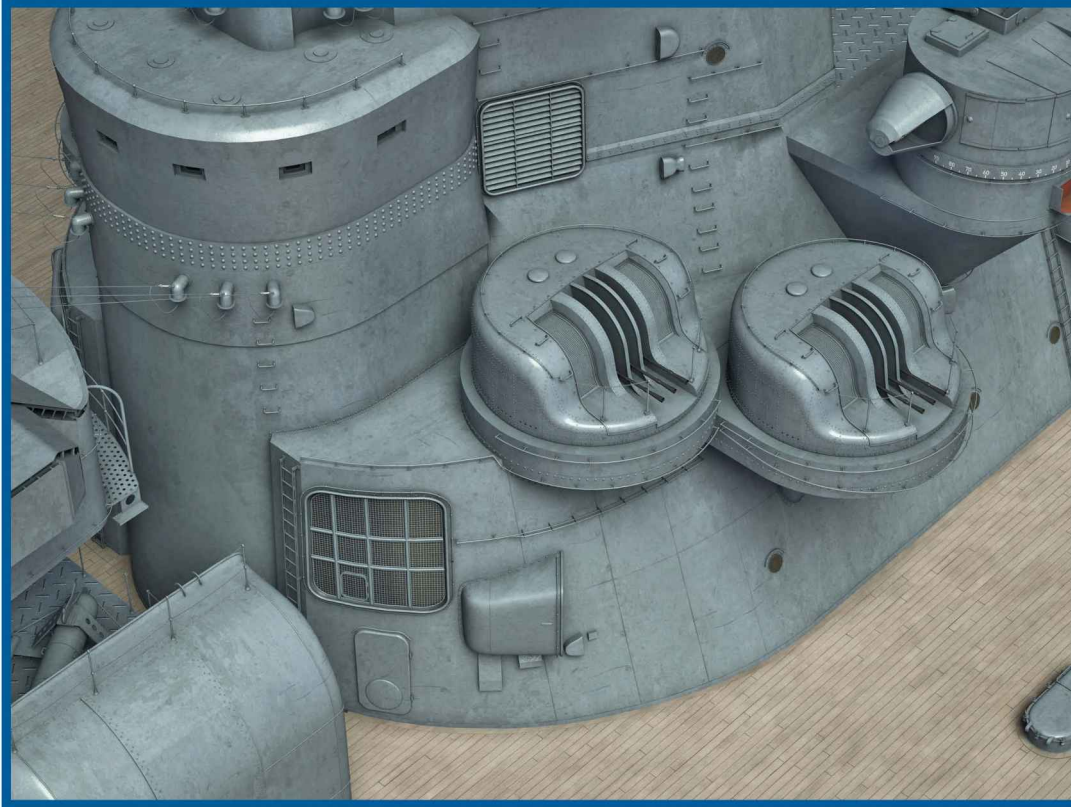


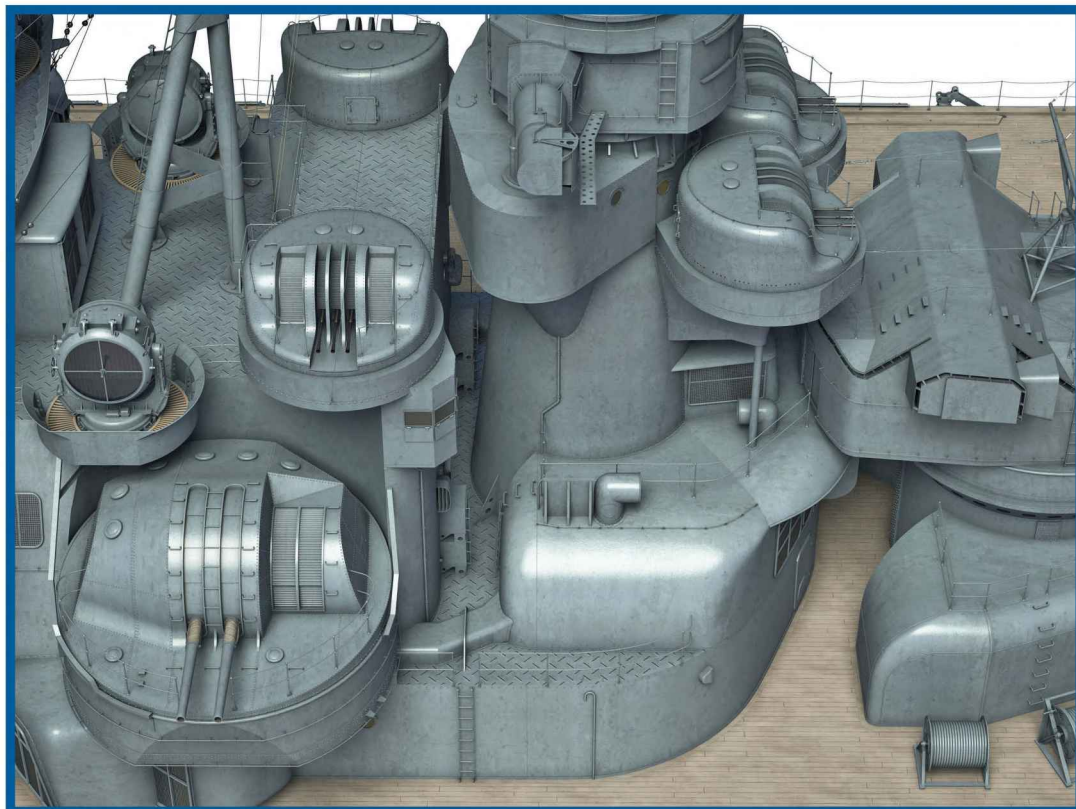
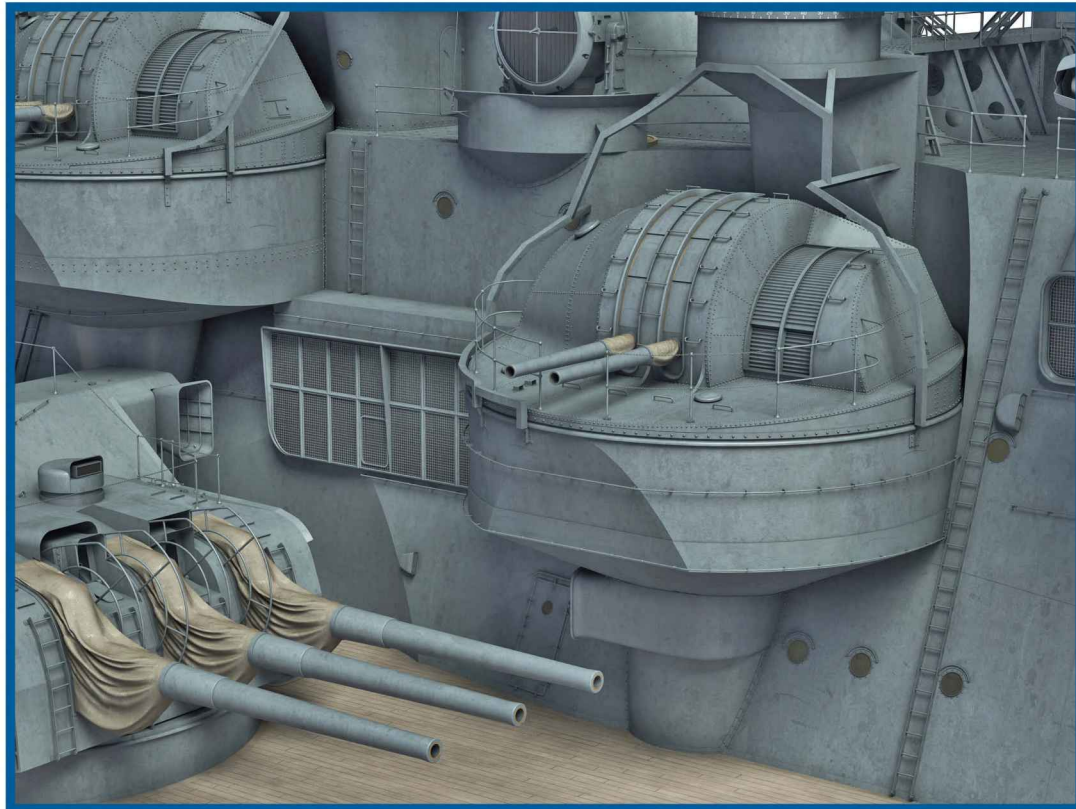
C Superstructure – Yamato 1941





C Superstructure – Yamato 1941

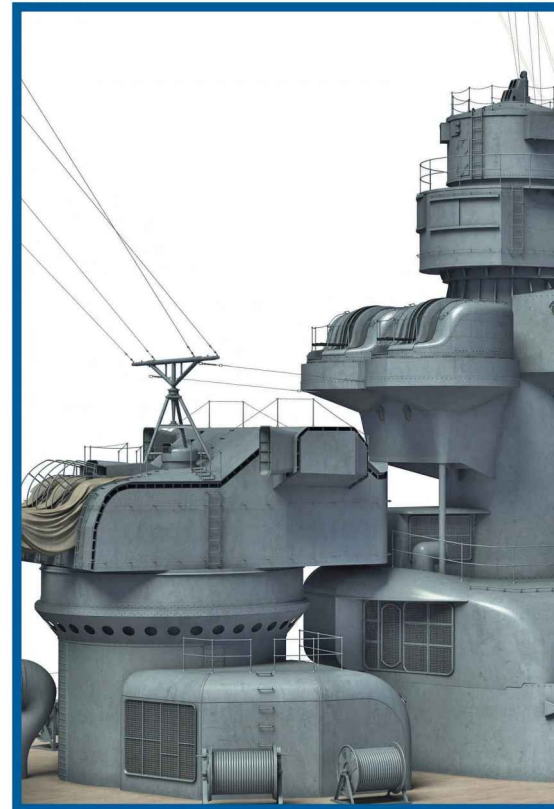
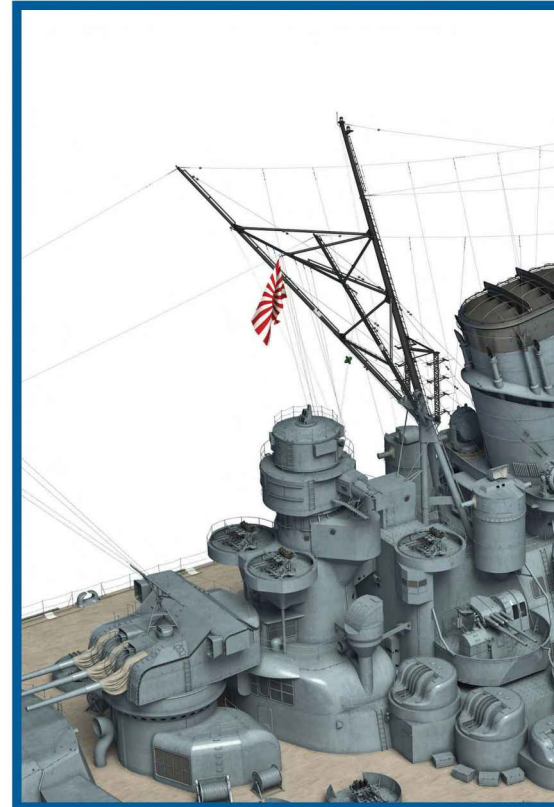
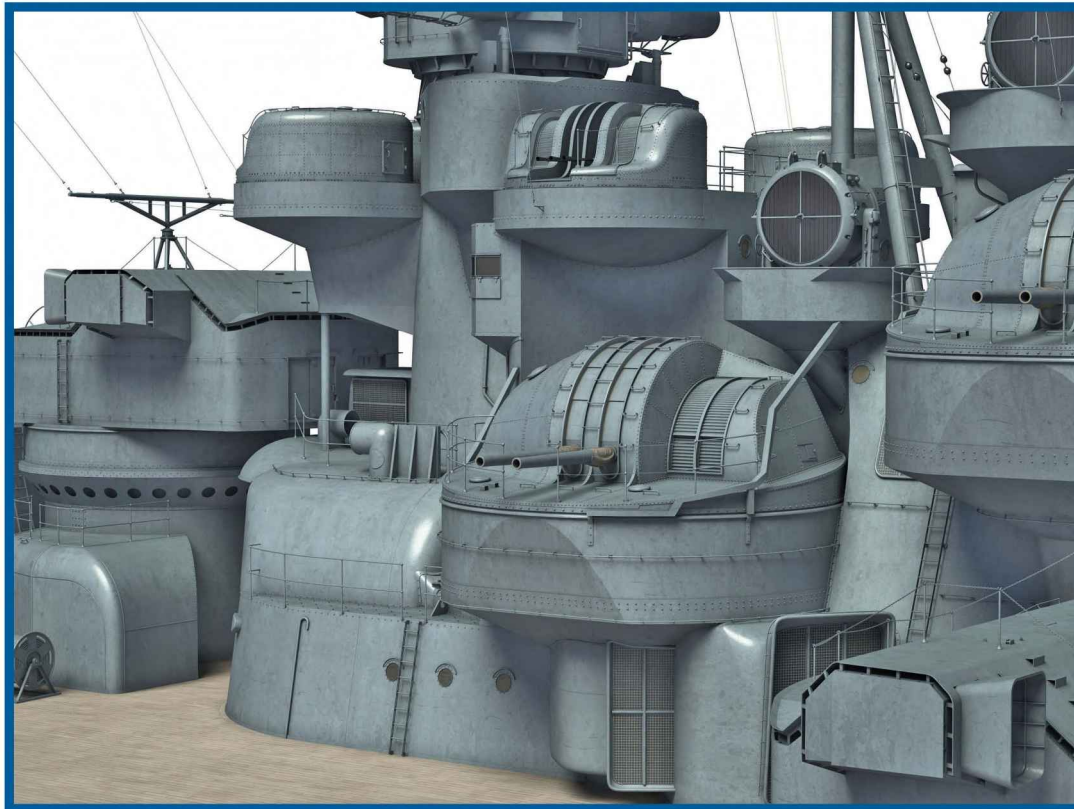


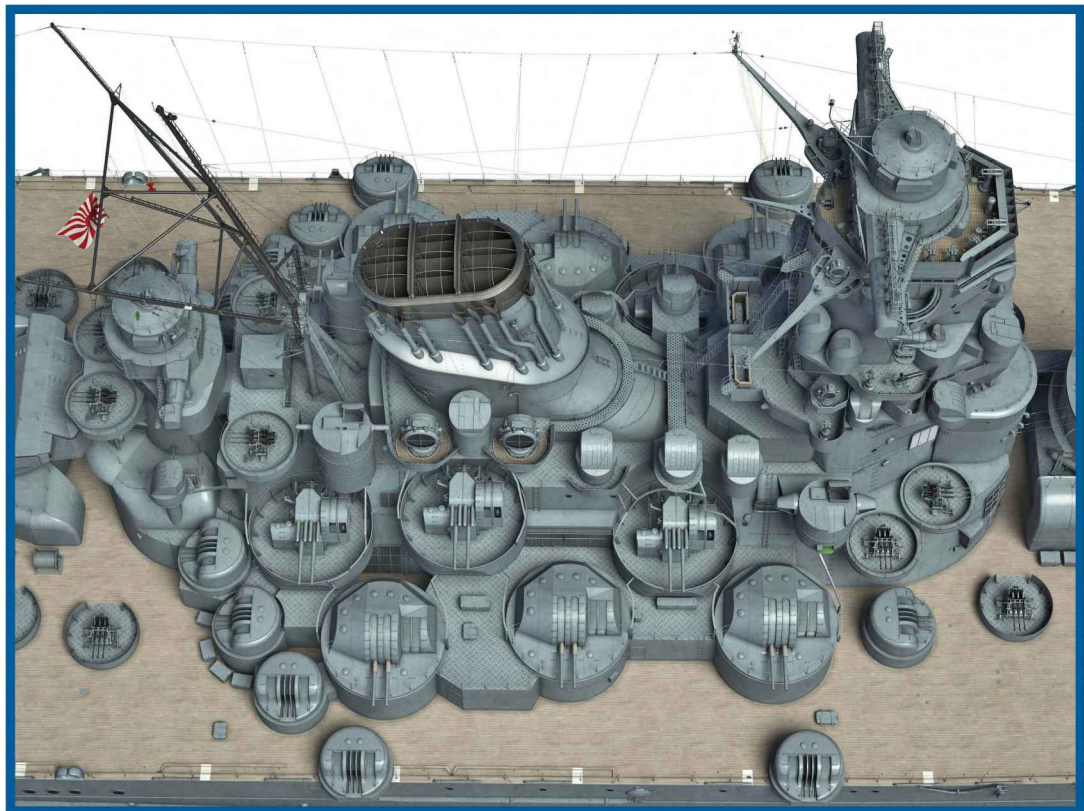
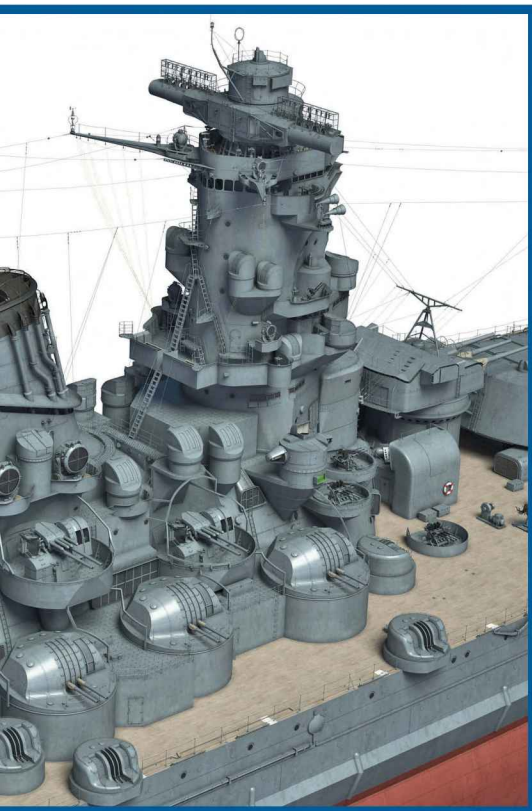
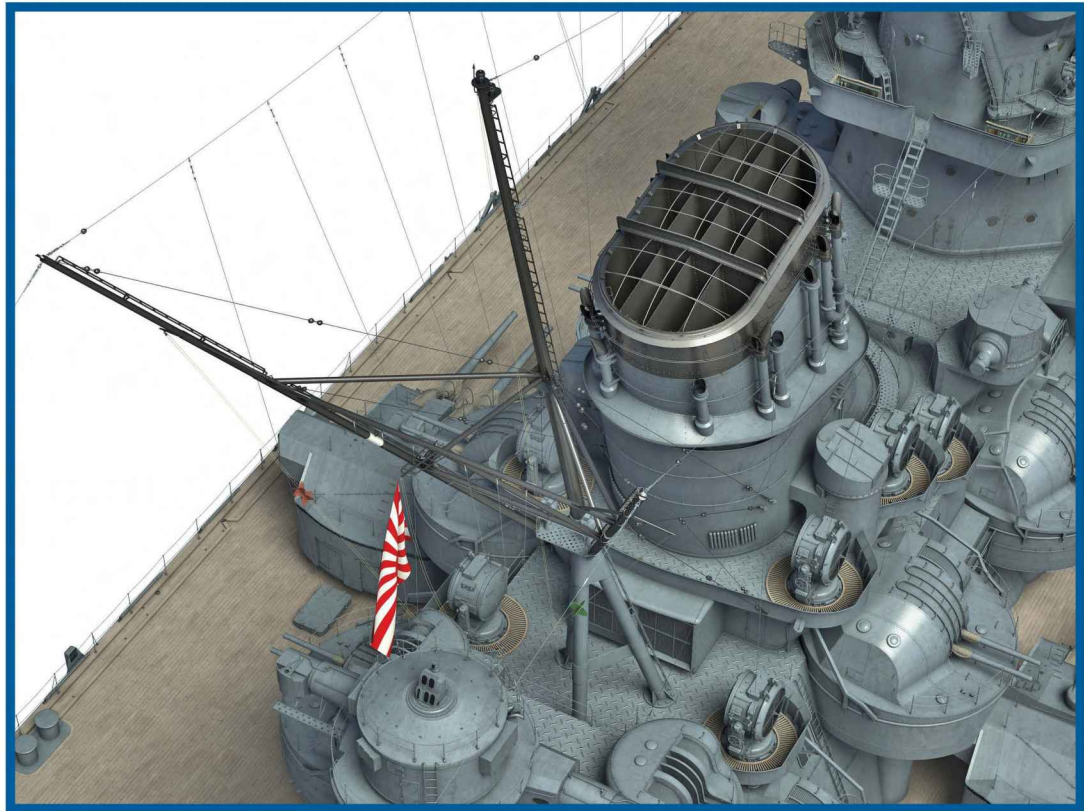


C Superstructure – Yamato 1944



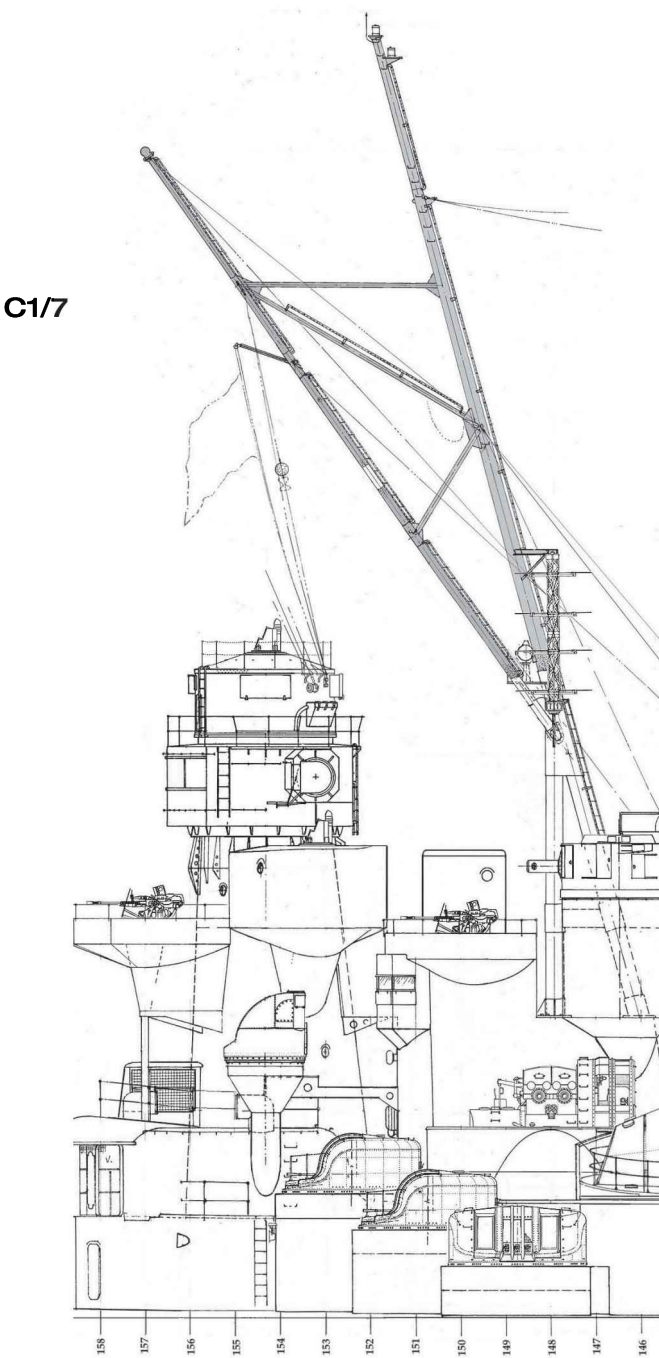
– Yamato 1941

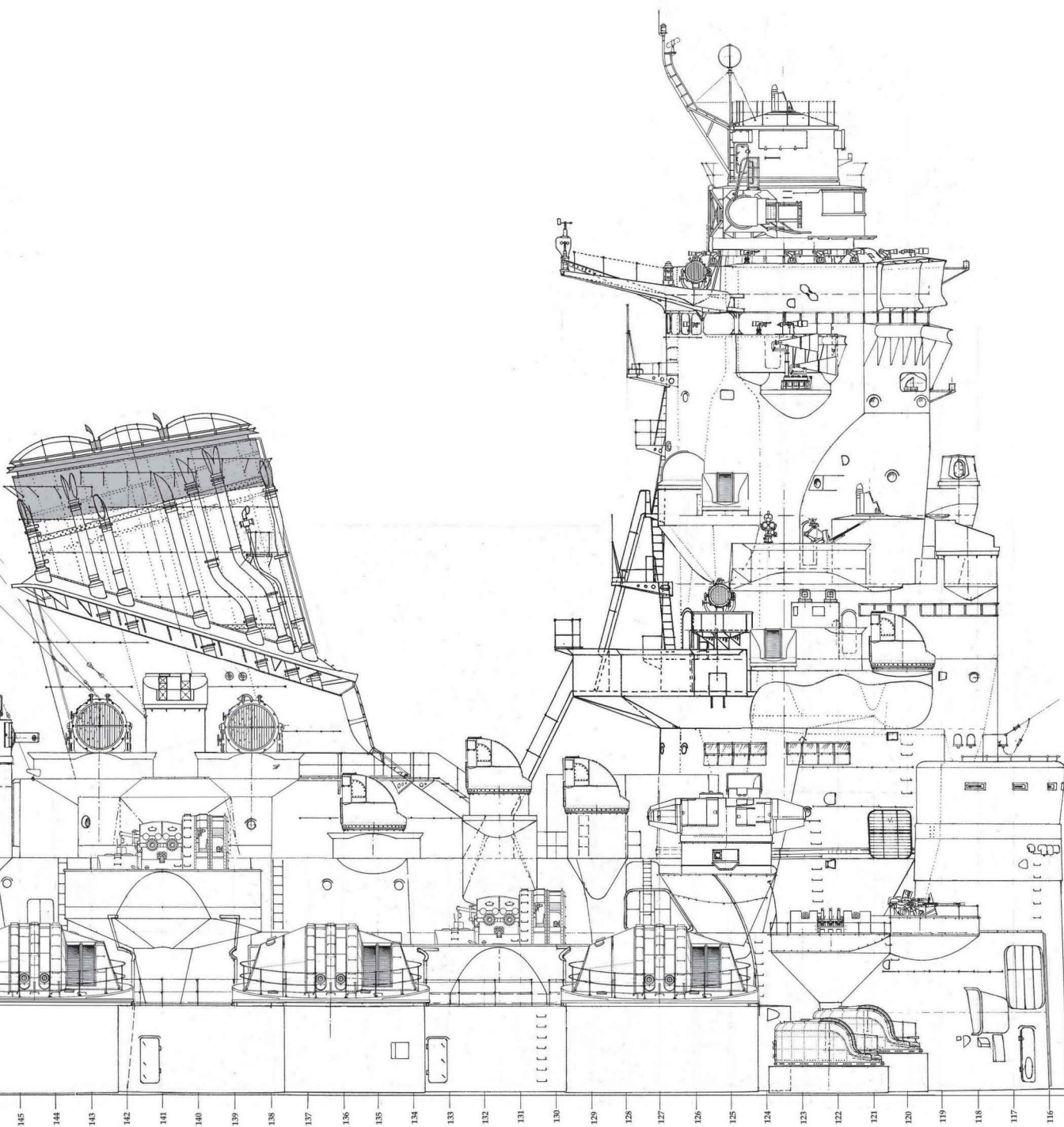




C Superstructure

C1/7 Yamato 1945 starboard elevation (1/200 scale)

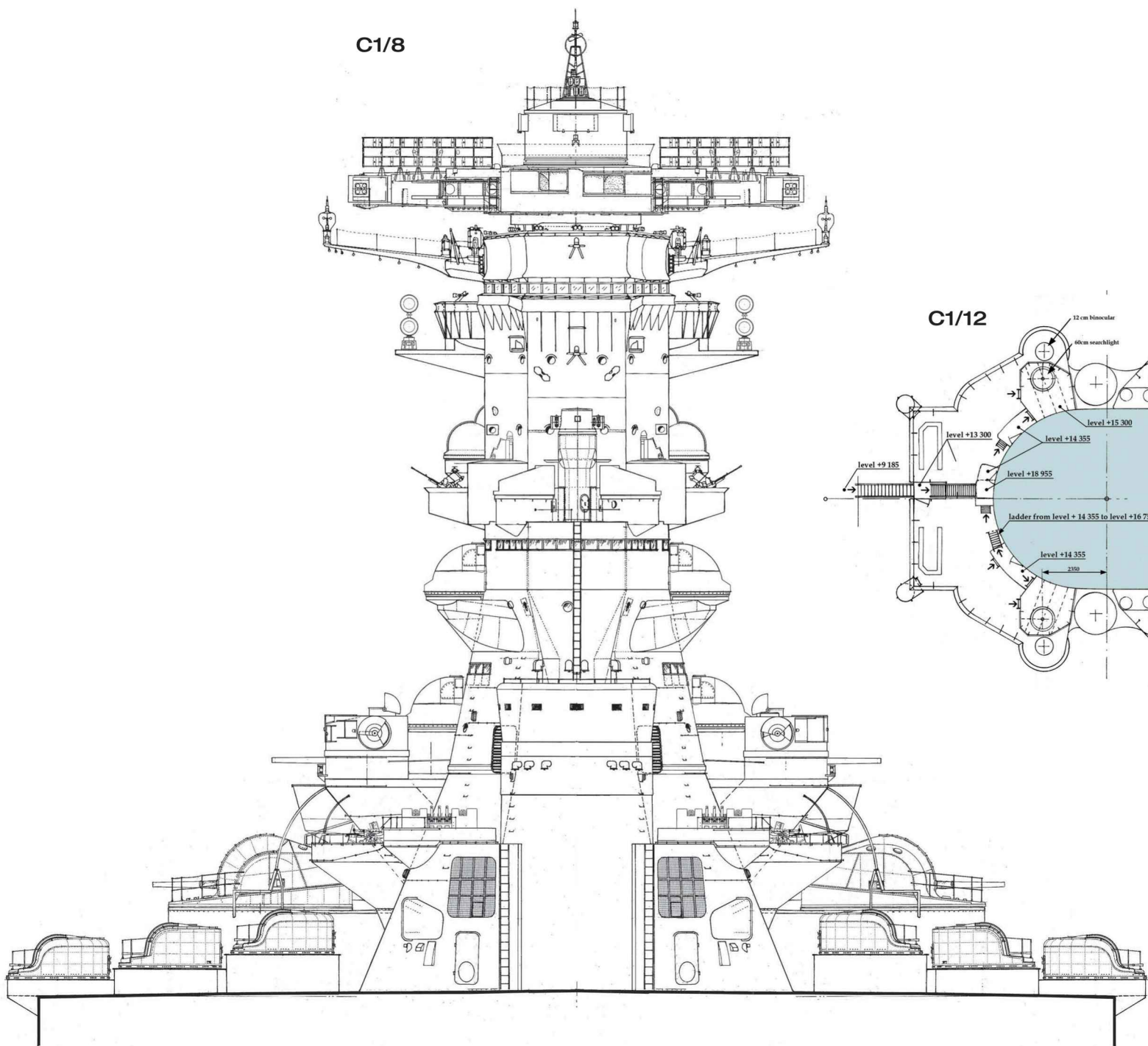




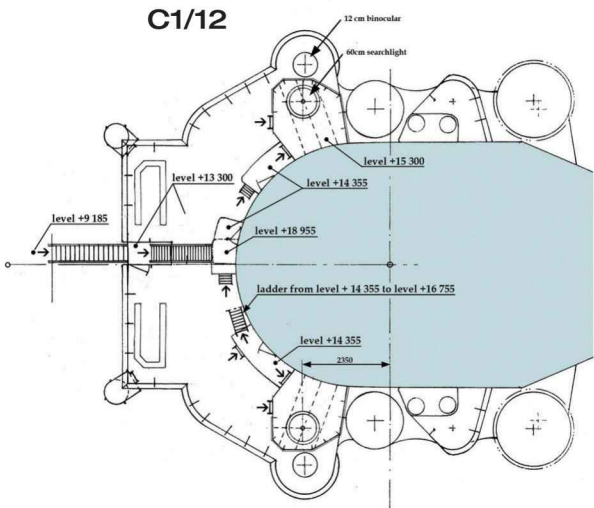
C Superstructure

C1/8 Yamato 1945 front view of superstructure (1/200 scale)

C1/8



C1/12



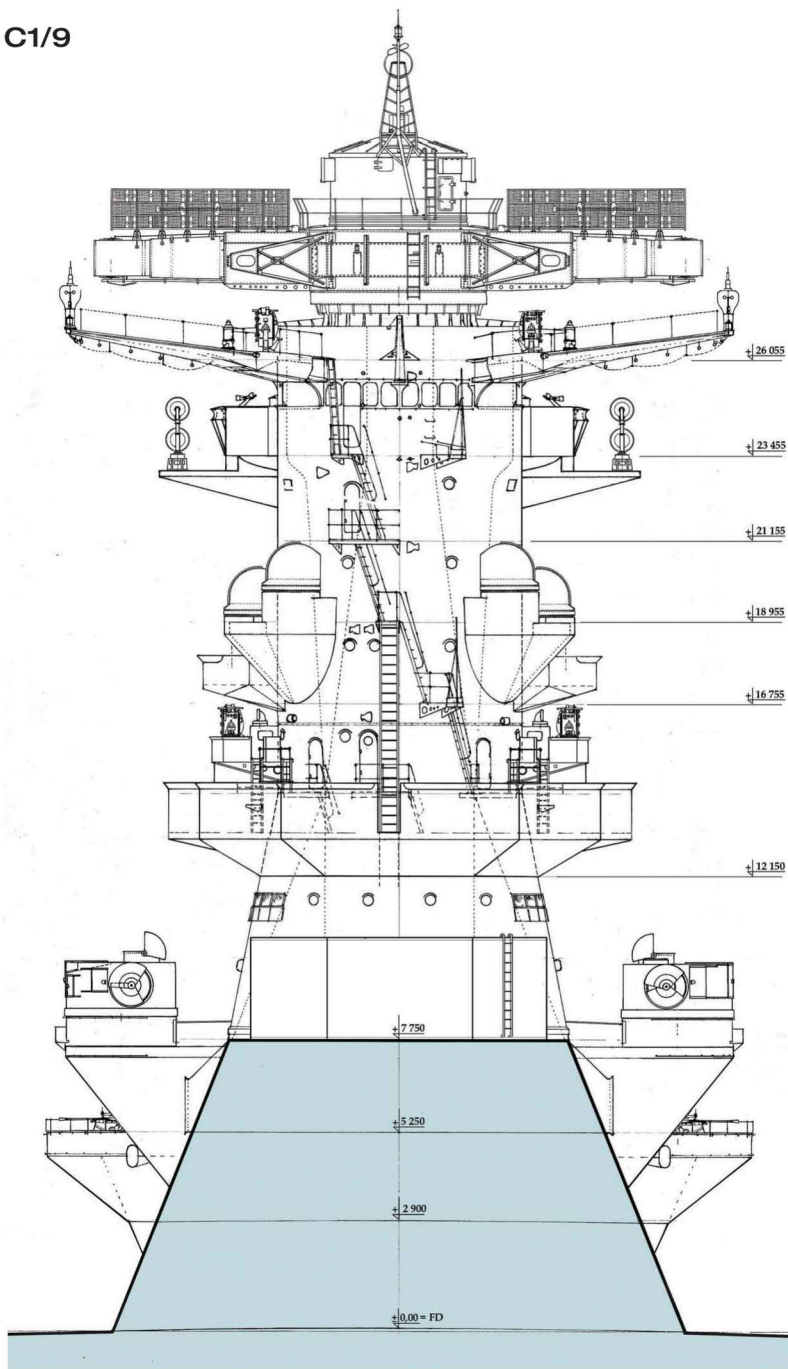
C1/9 Yamato 1945 rear view of tower bridge

C1/10 Yamato 1945 side view of tower bridge

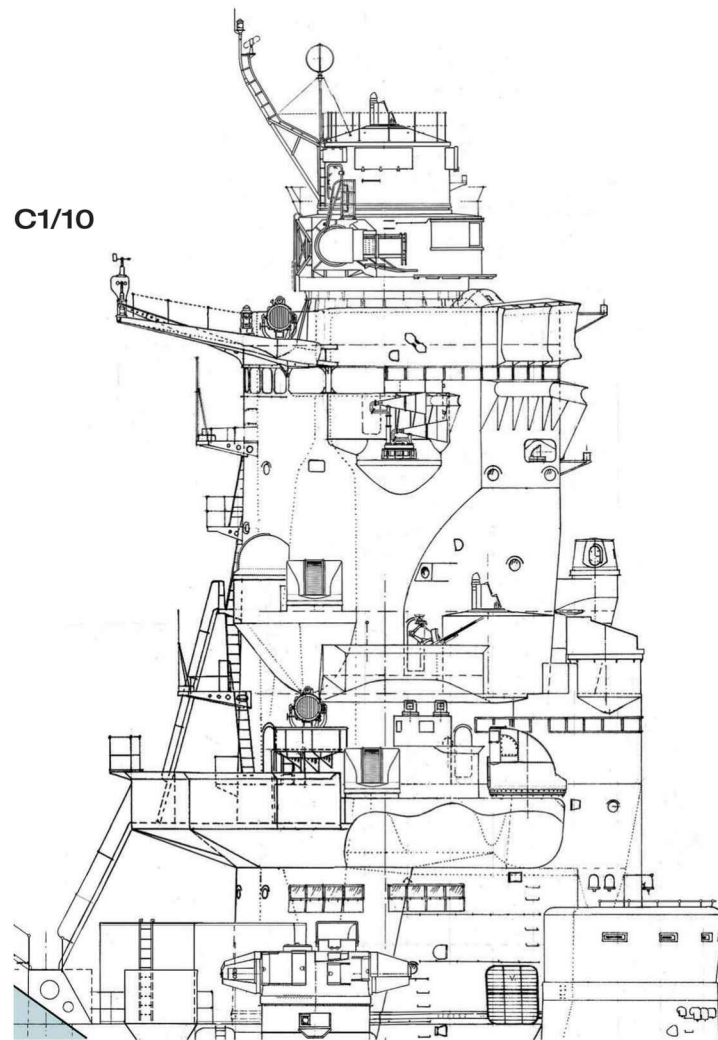
C1/11 Details of tower Yamato 1943-45

C1/12 Yamato 1945 plan of signal platform

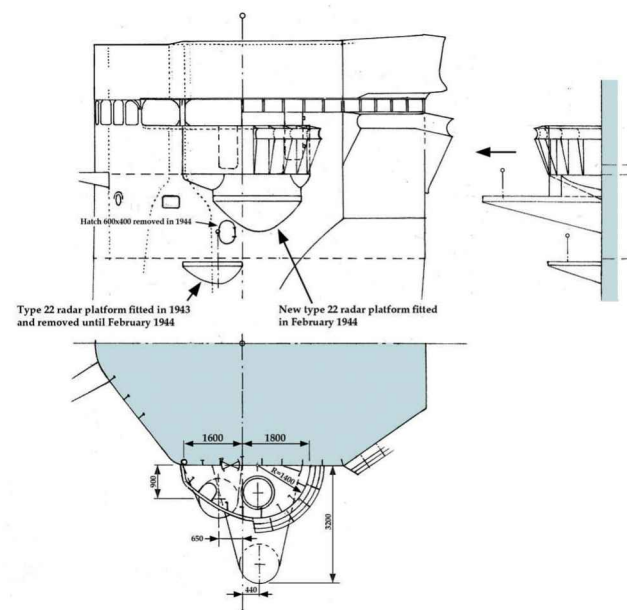
C1/9



C1/10



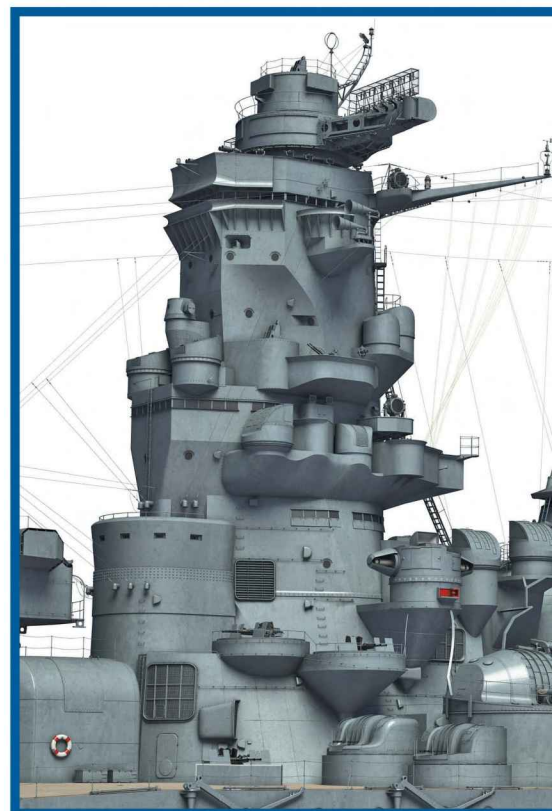
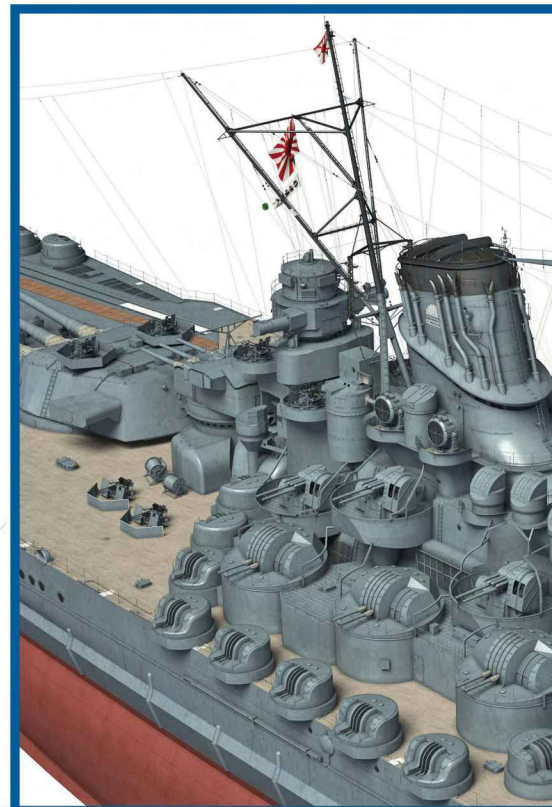
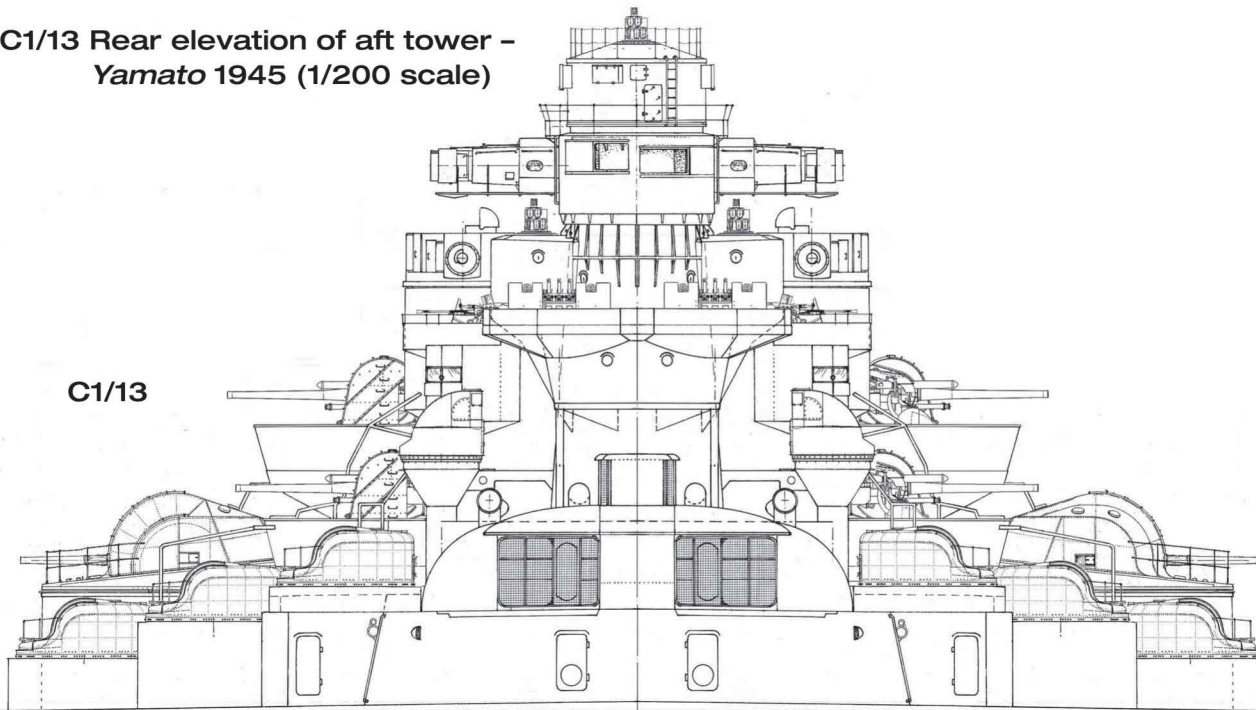
C1/11

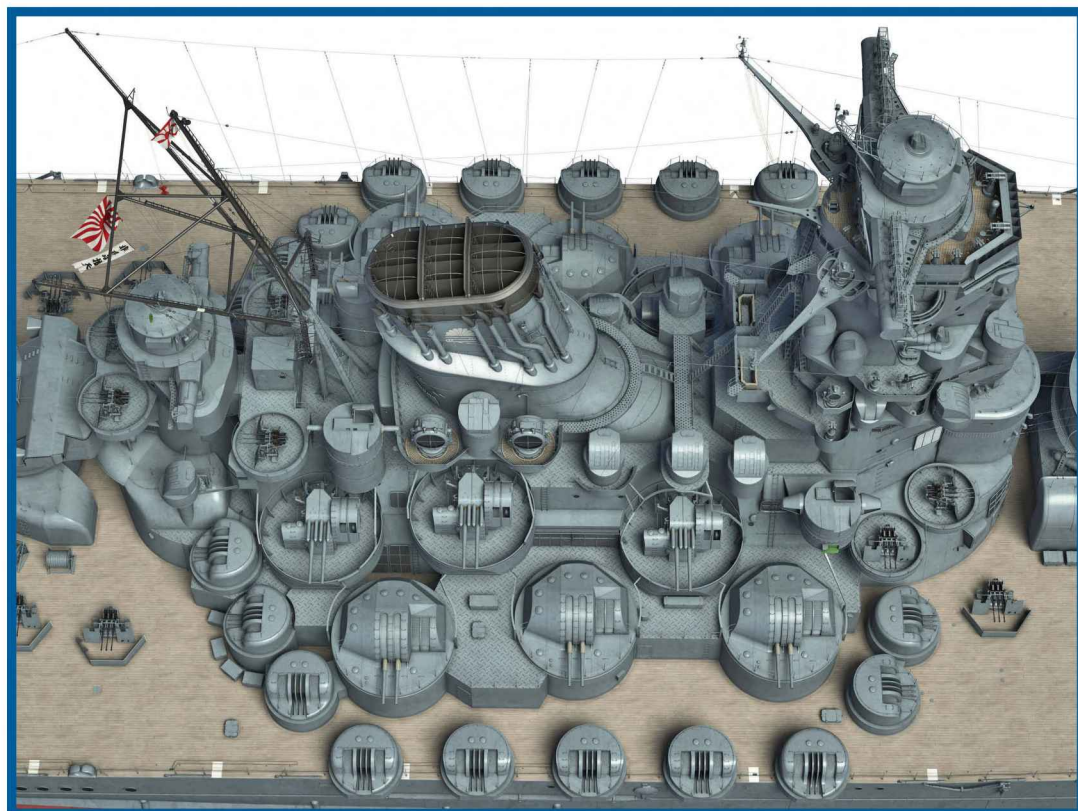
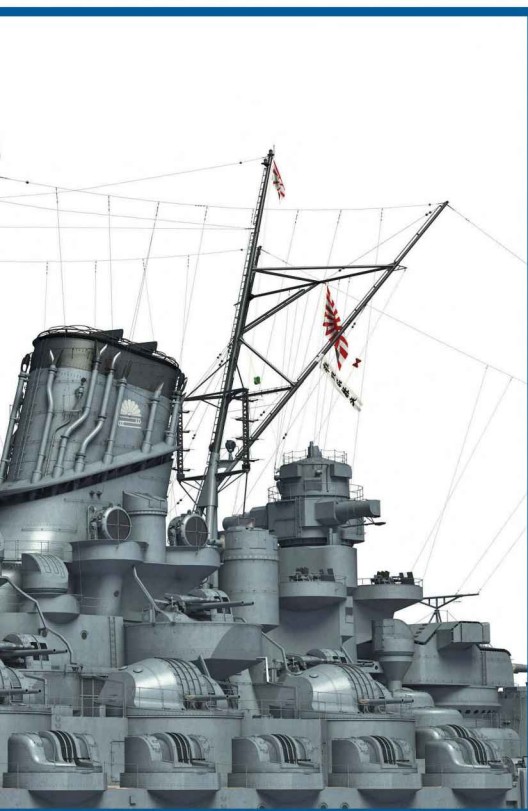
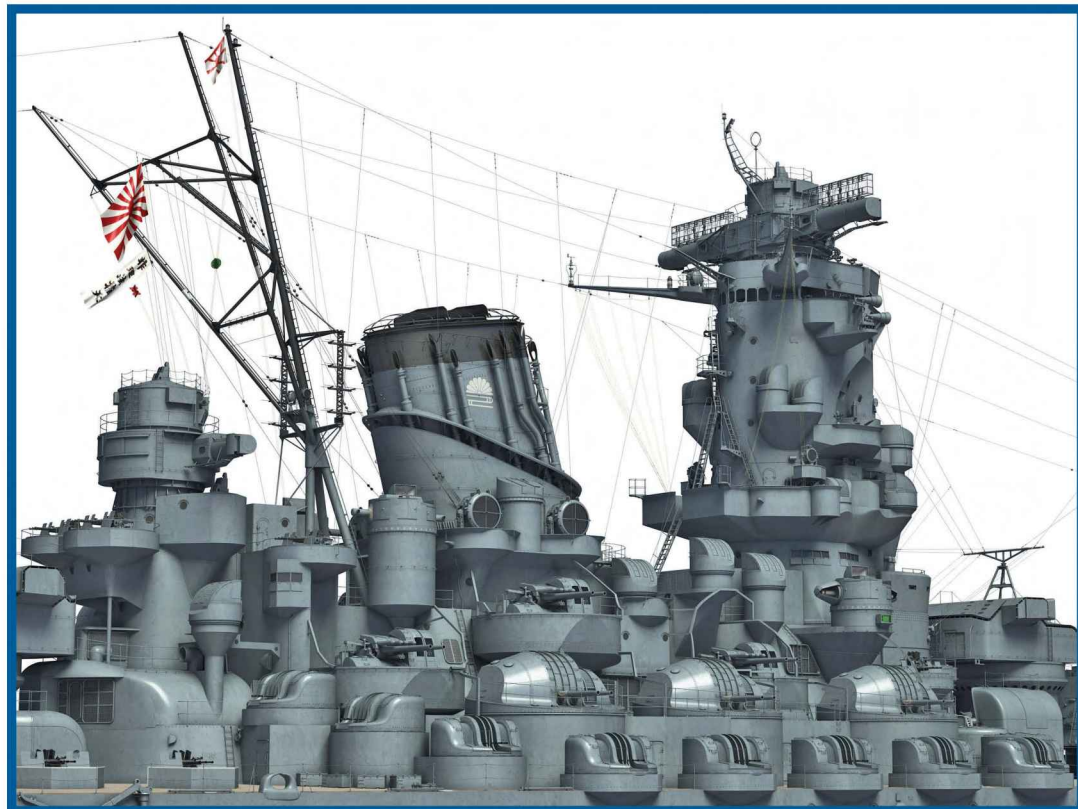
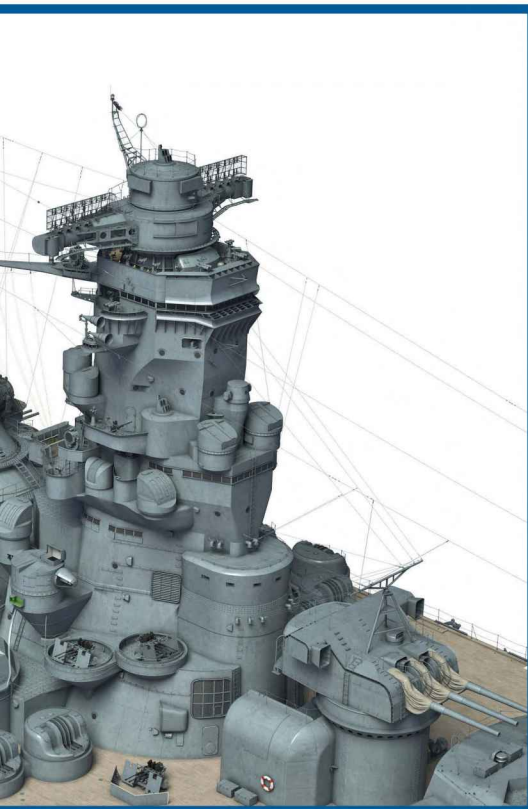


C Superstructure – *Yamato* 1945

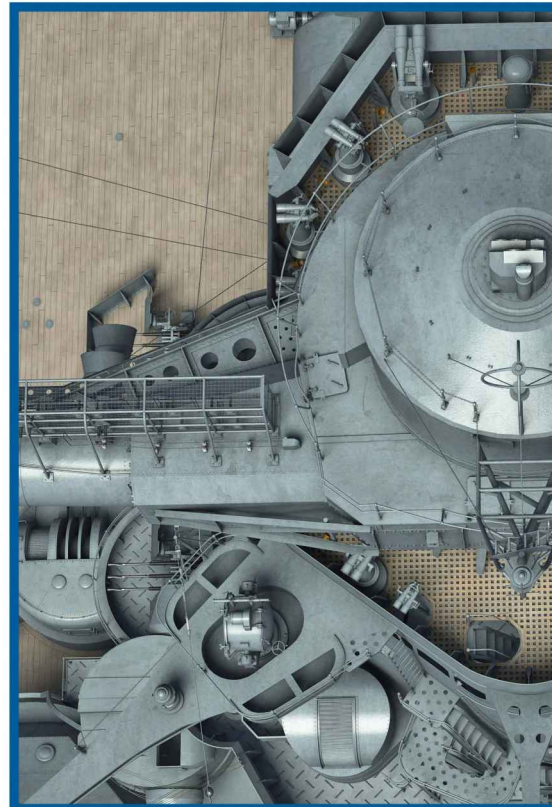
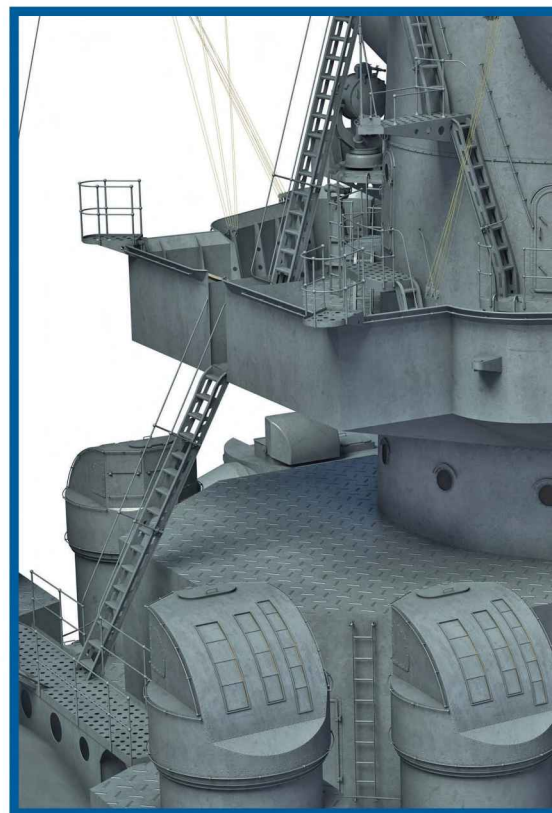
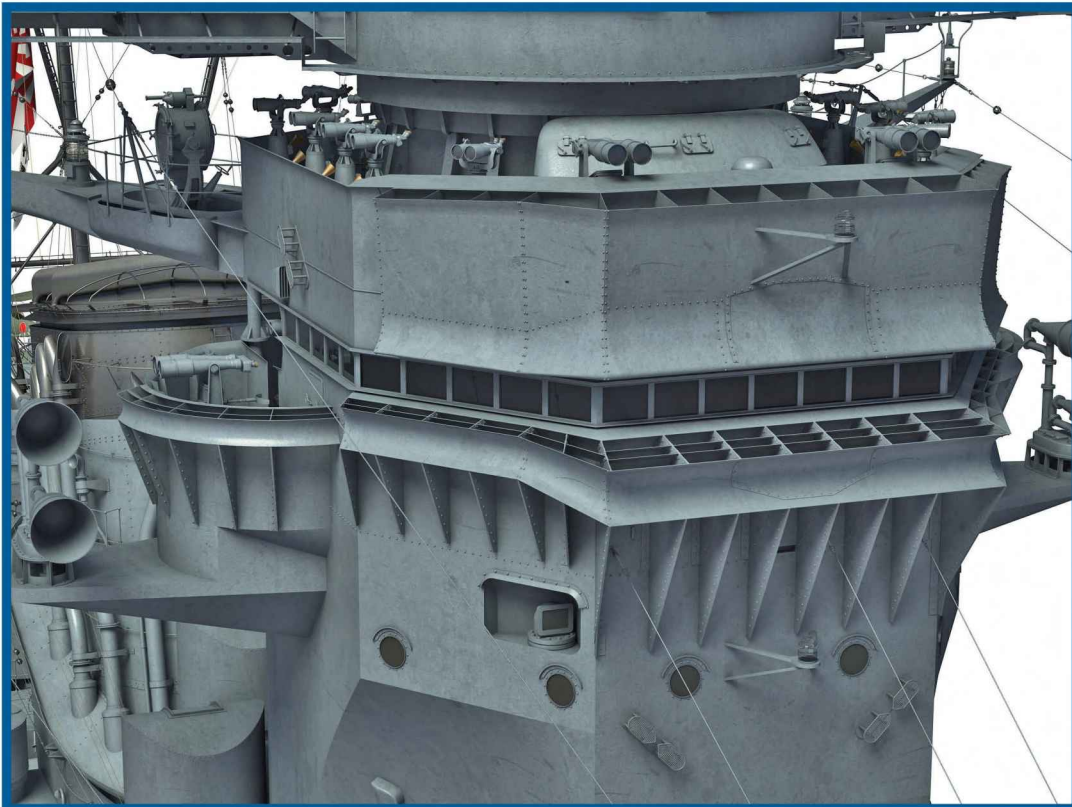
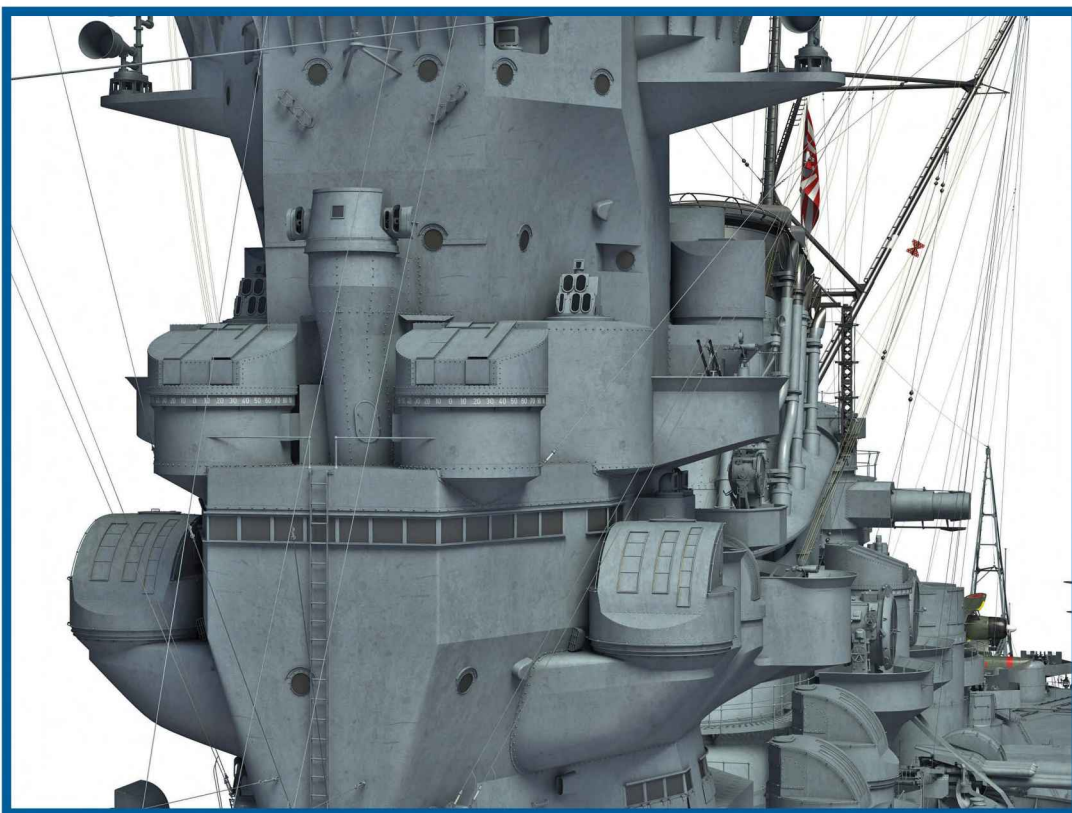
C1/13 Rear elevation of aft tower –
Yamato 1945 (1/200 scale)

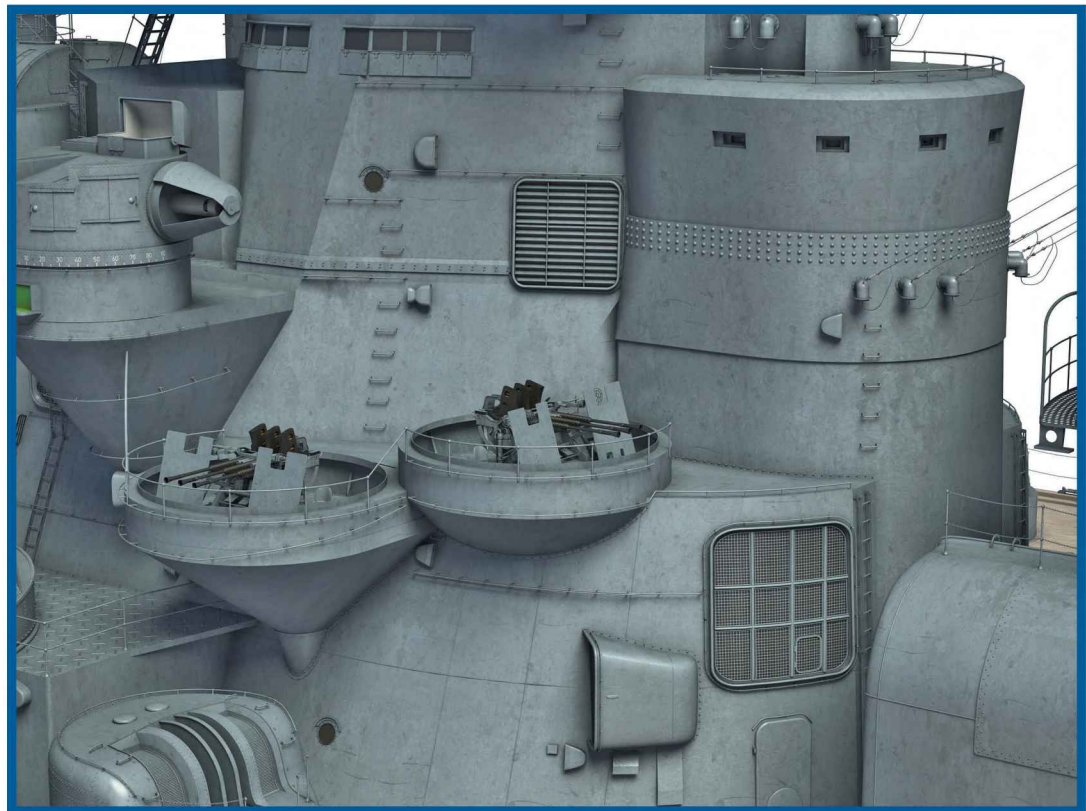
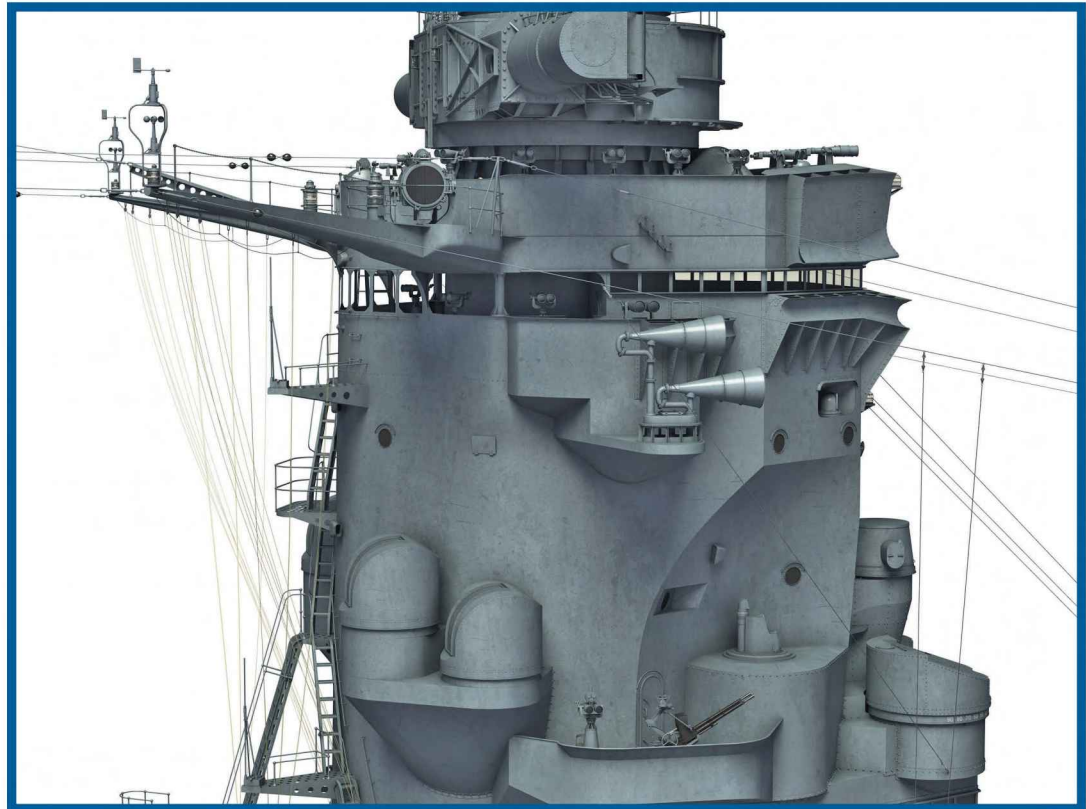
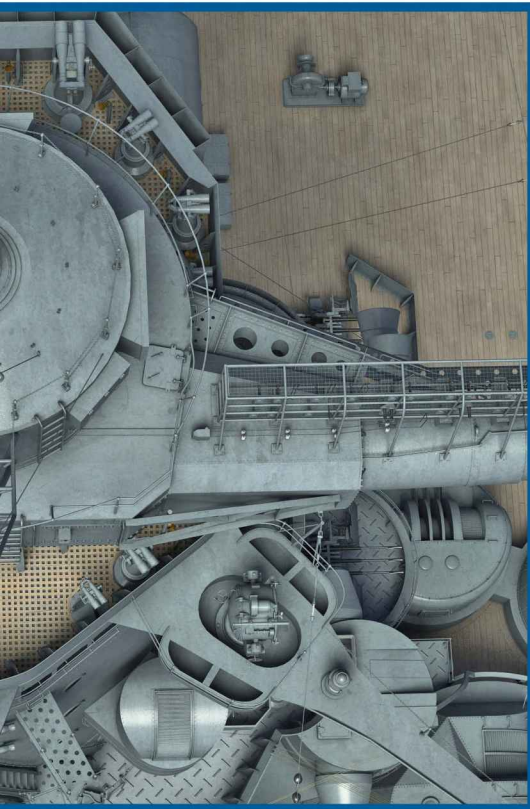
C1/13



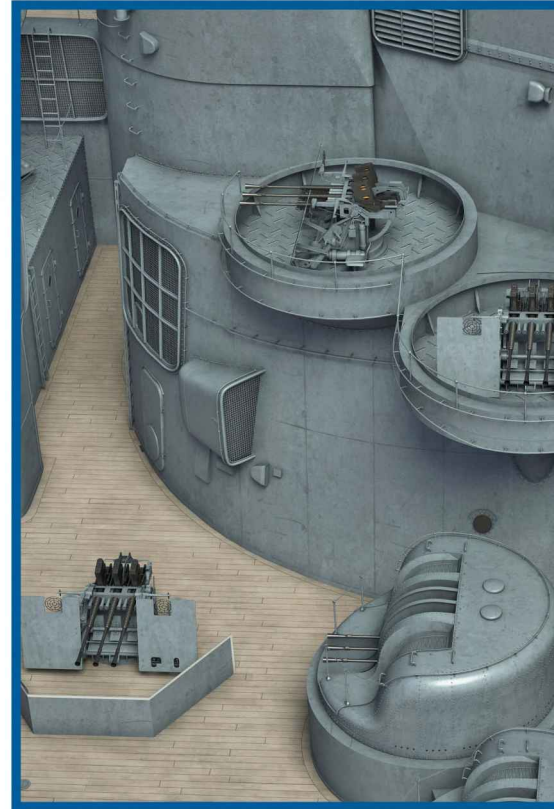
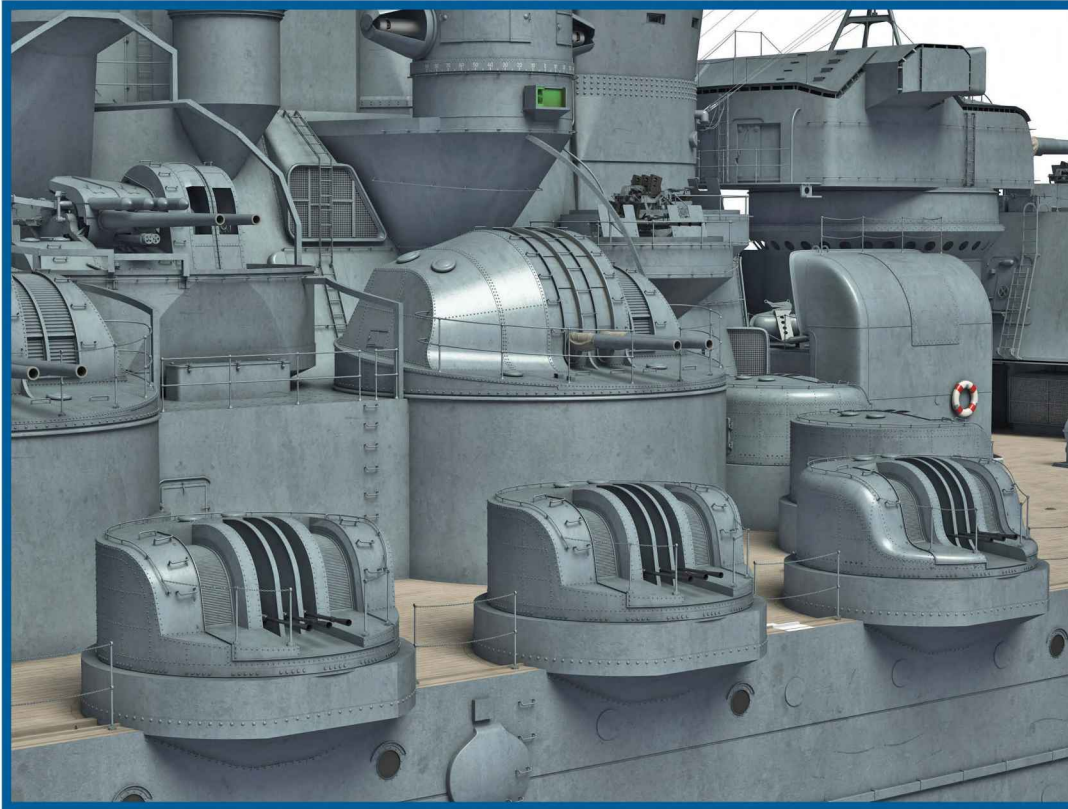


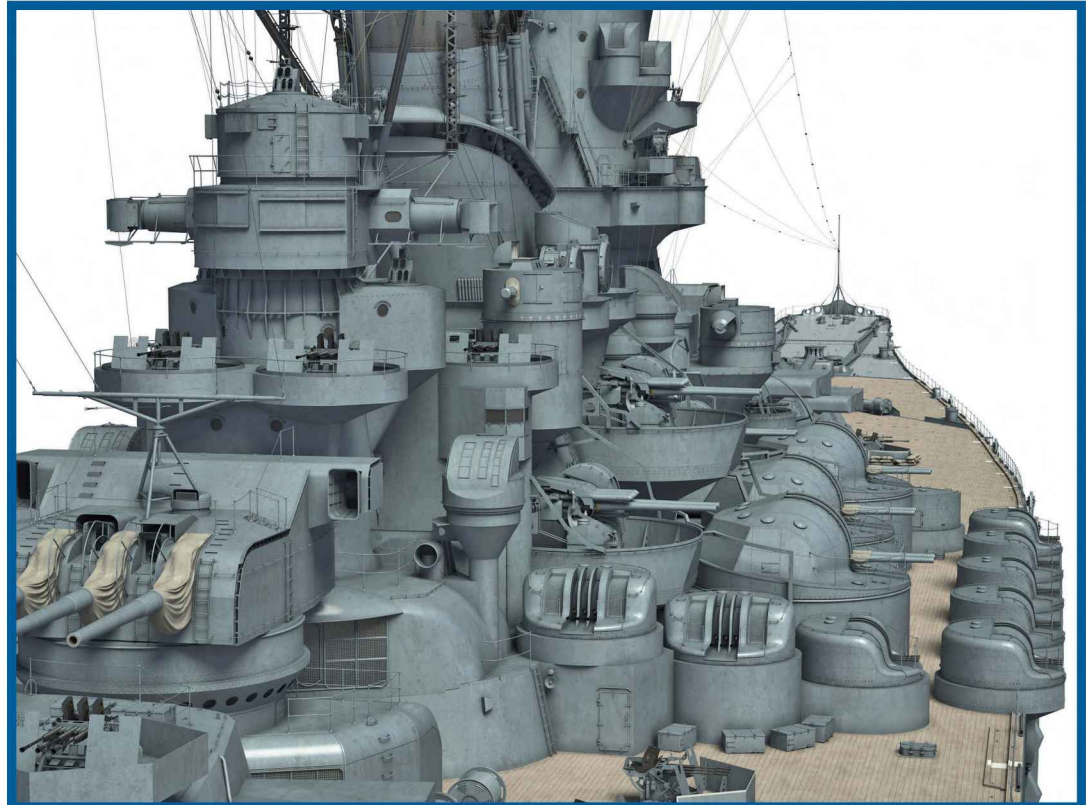
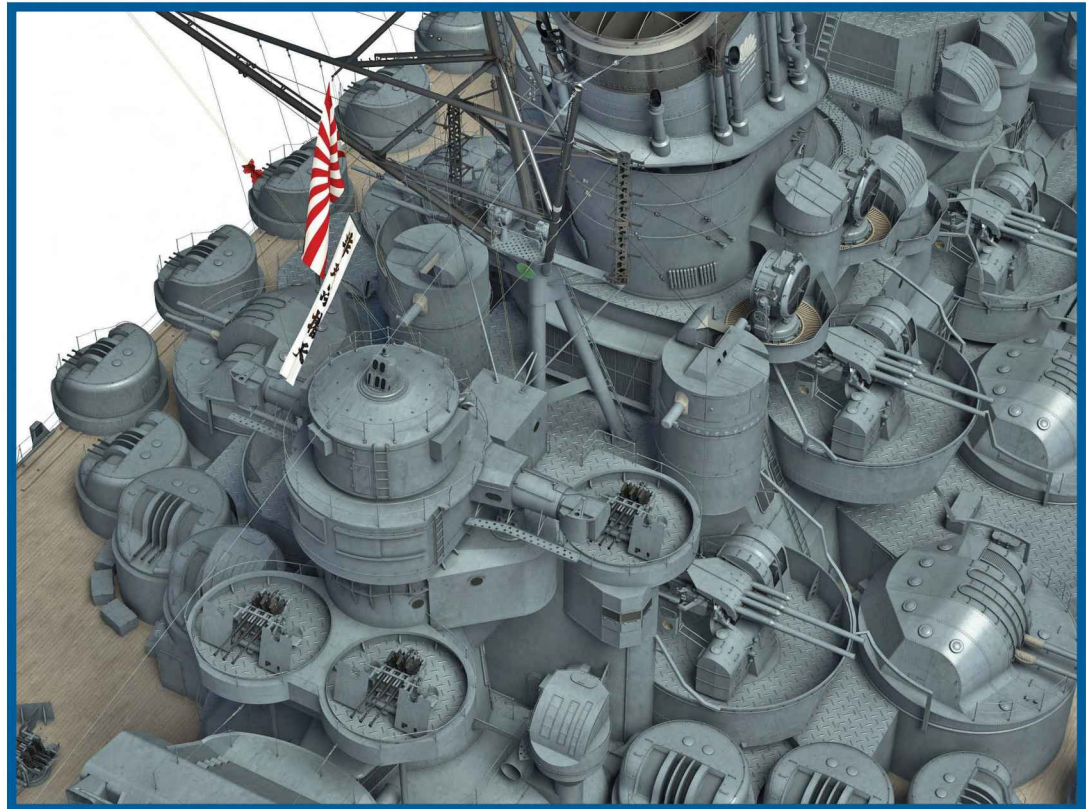
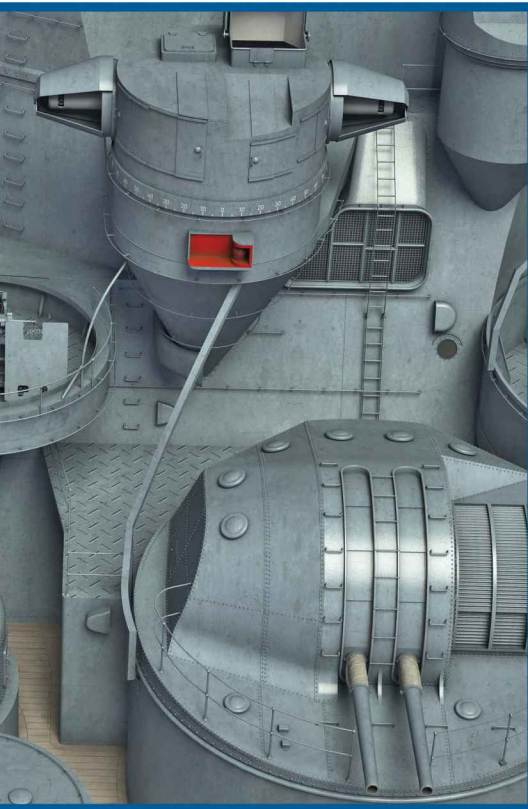
C Superstructure – Yamato 1945





C Superstructure – Yamato 1945

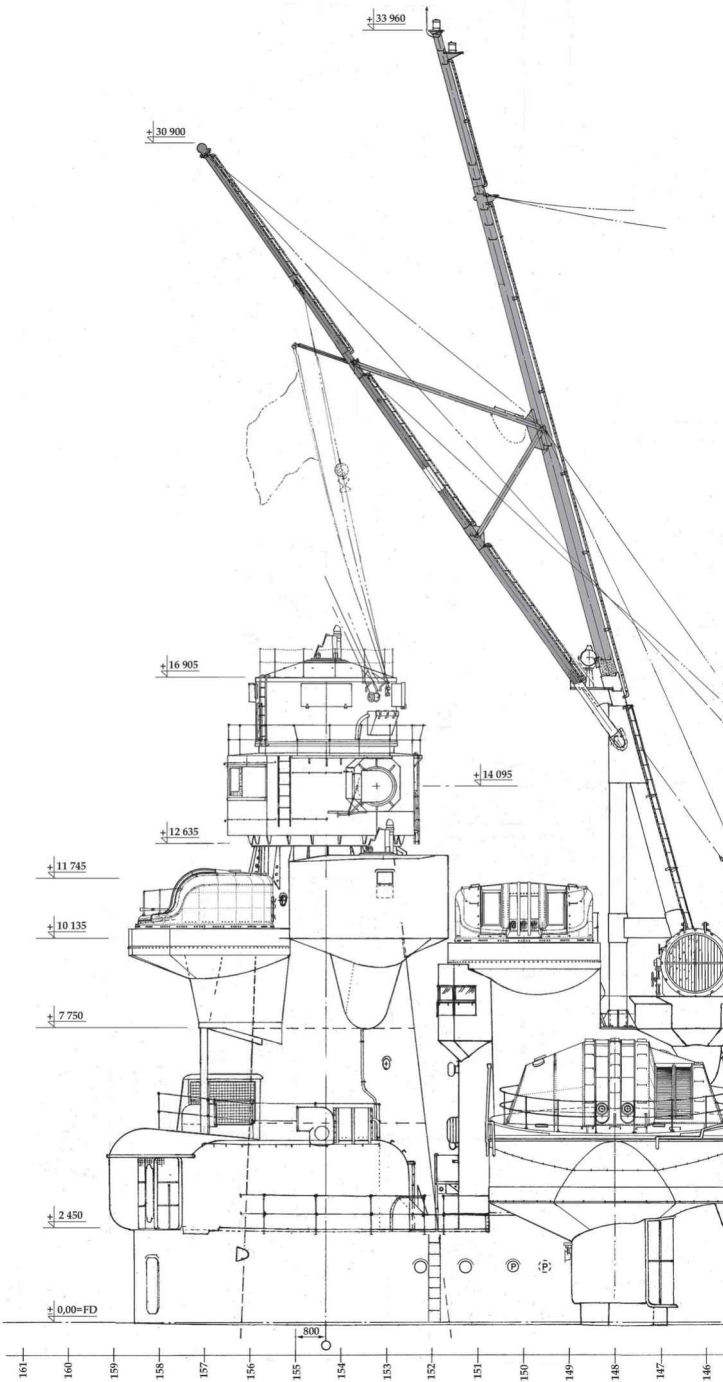


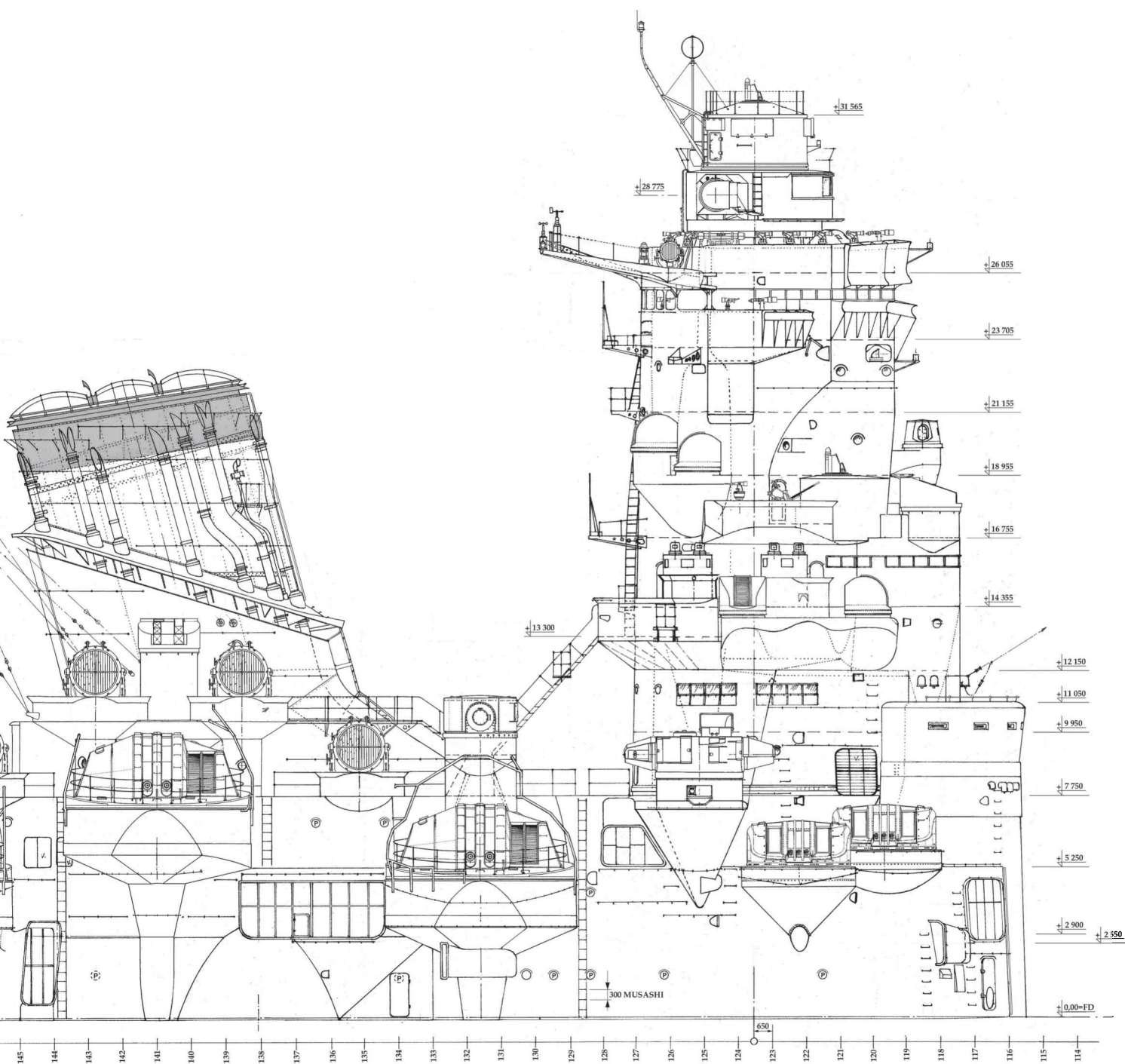


C Superstructure

C1/14 *Musashi* 1942 starboard elevation of
superstructure (levels as on drawing C1/1)
(1/200 scale)

C1/14





Scuttles ○ only starboard ⊗ both sides ⊖ only port side

C Superstructure

Details of *Musashi* tower bridge in 1942 (1/200 scale)

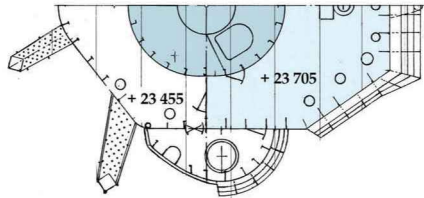
C1/15 Platform Level +23 455/+23 705

C1/16 Profile

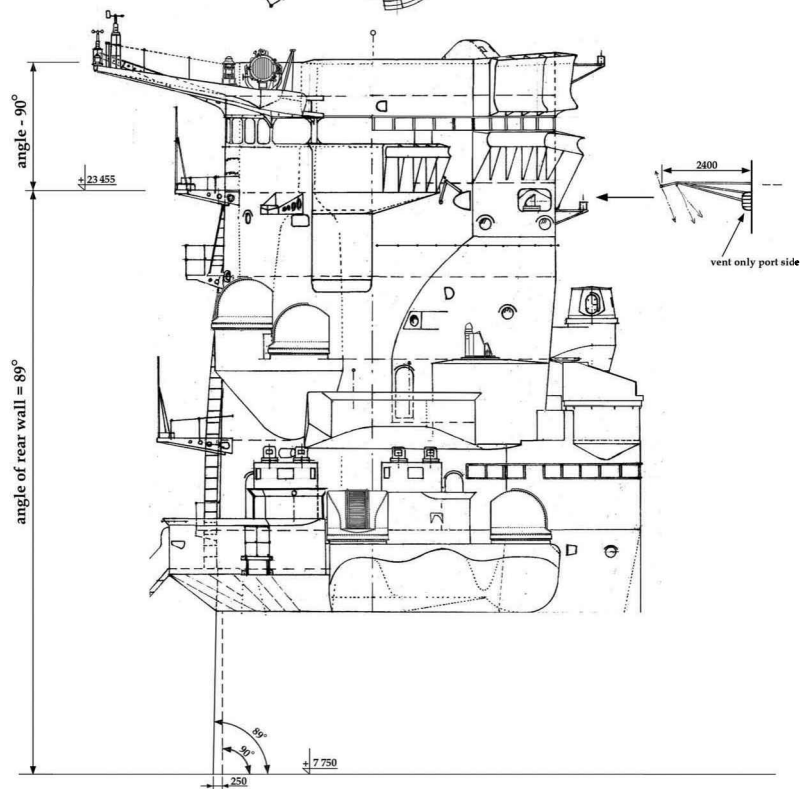
C1/17 Rear view of tower bridge

C1/18 *Musashi* 1942 view of rear tower from frame 159 to bow direction

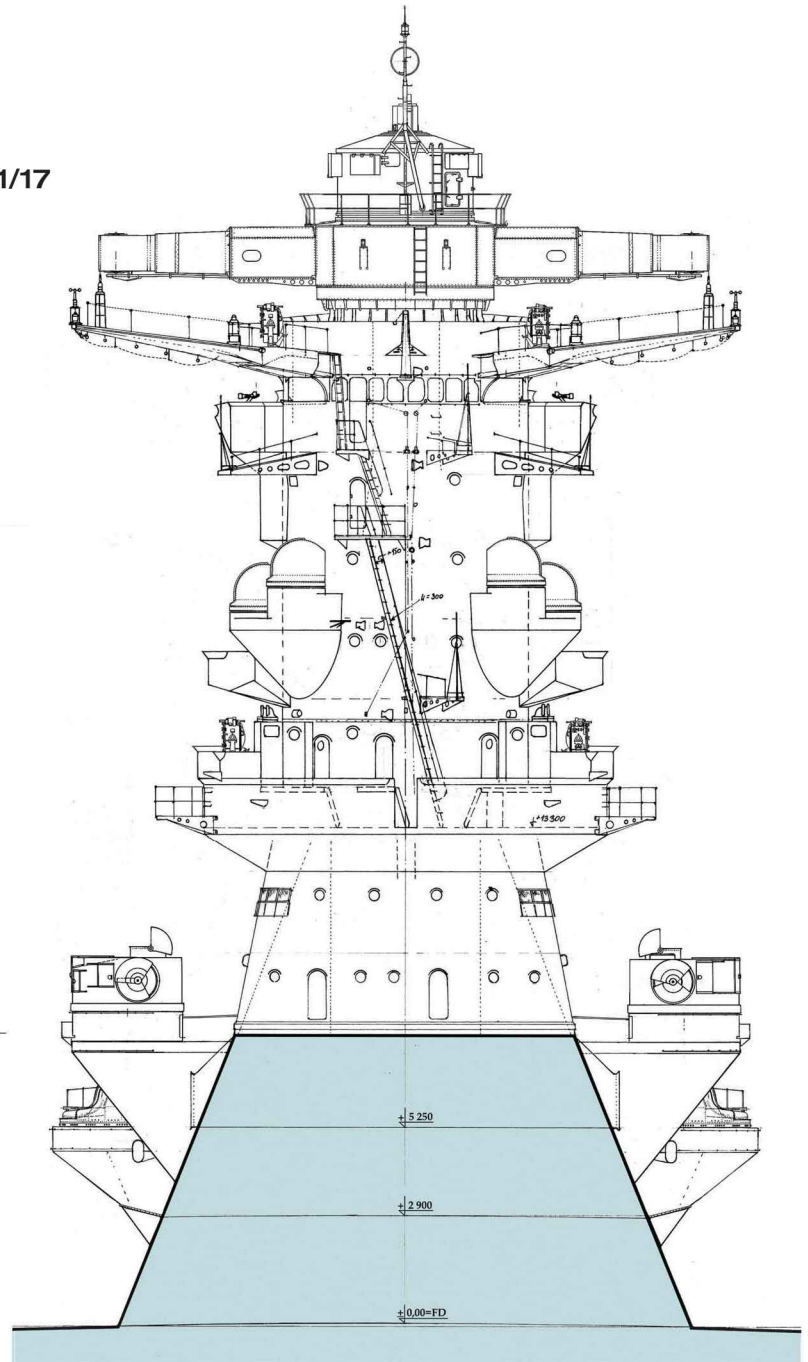
C1/15

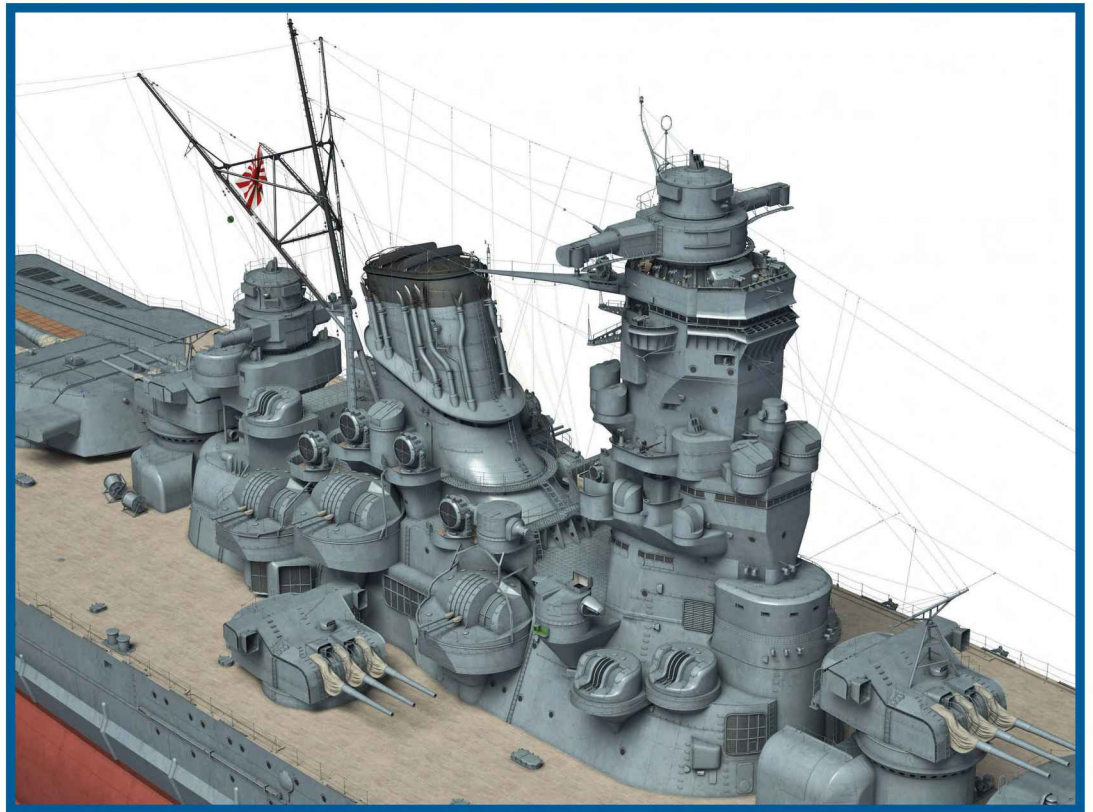


C1/16

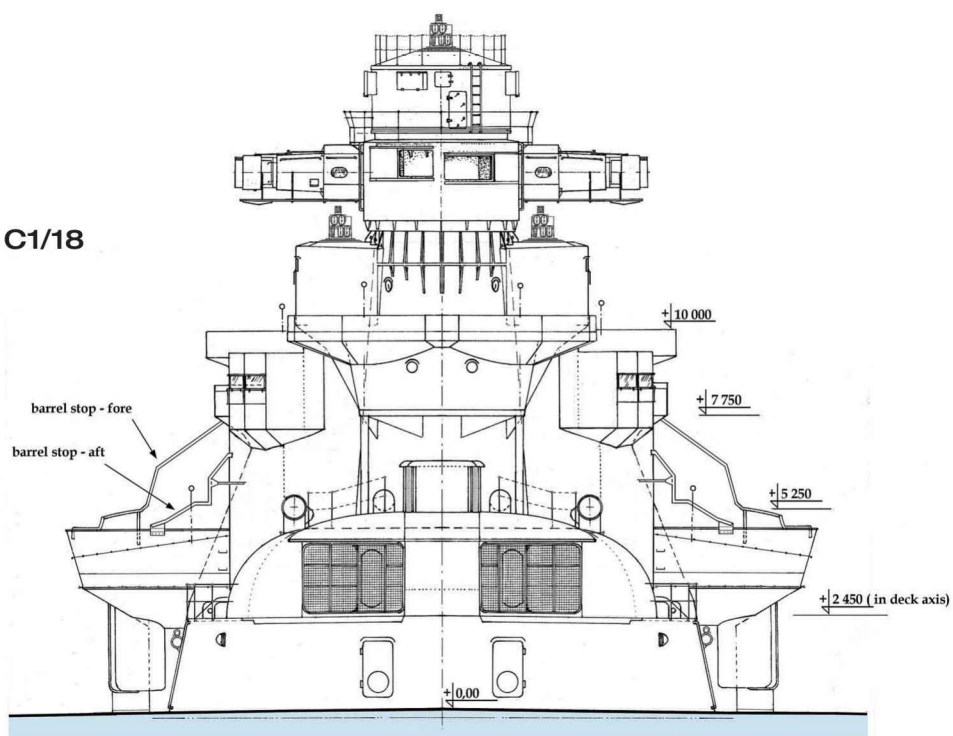


C1/17

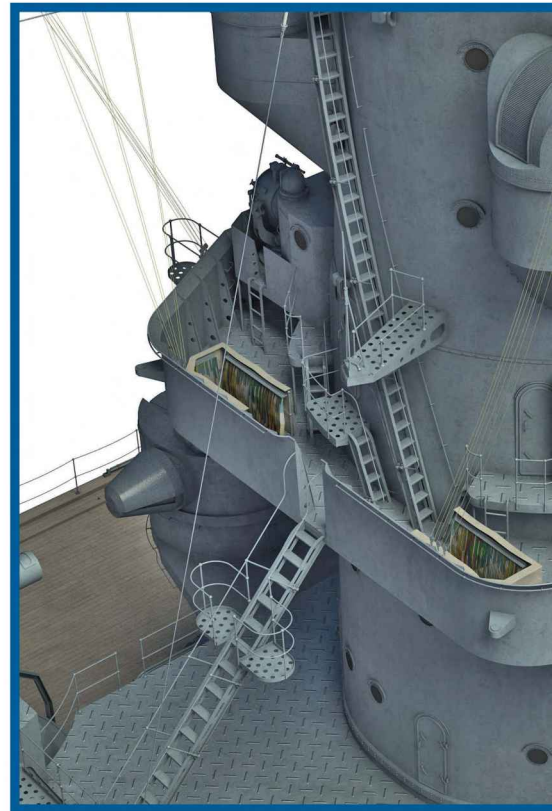
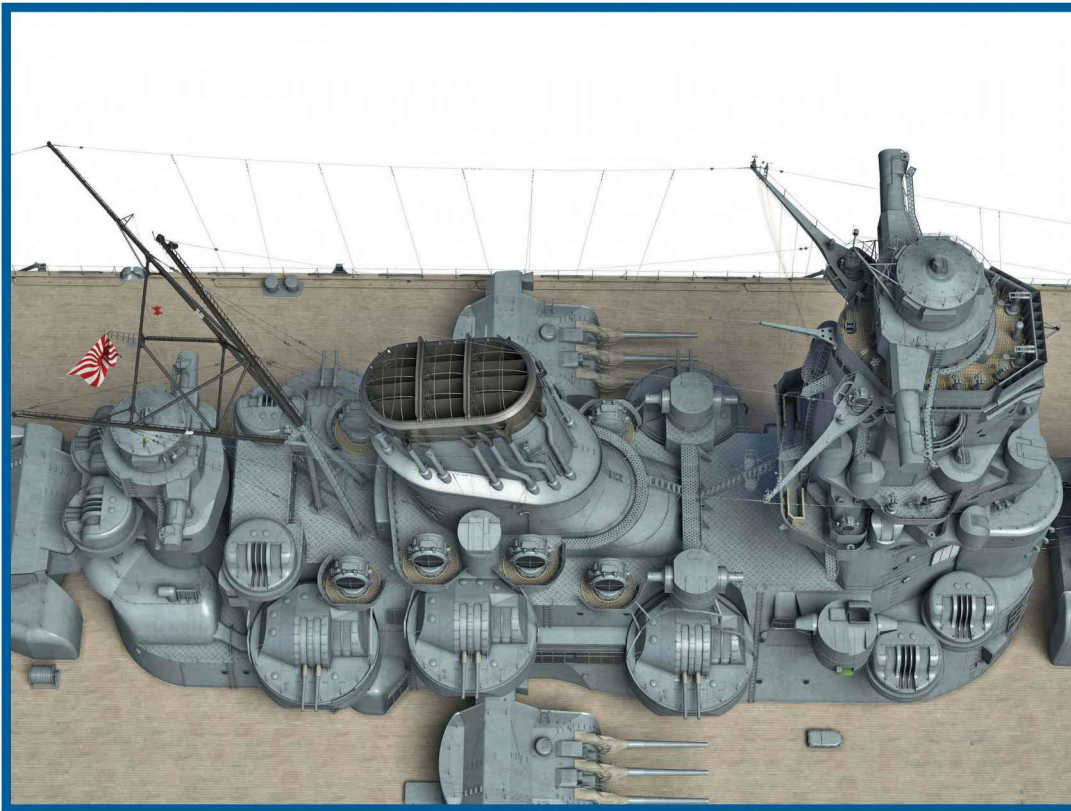


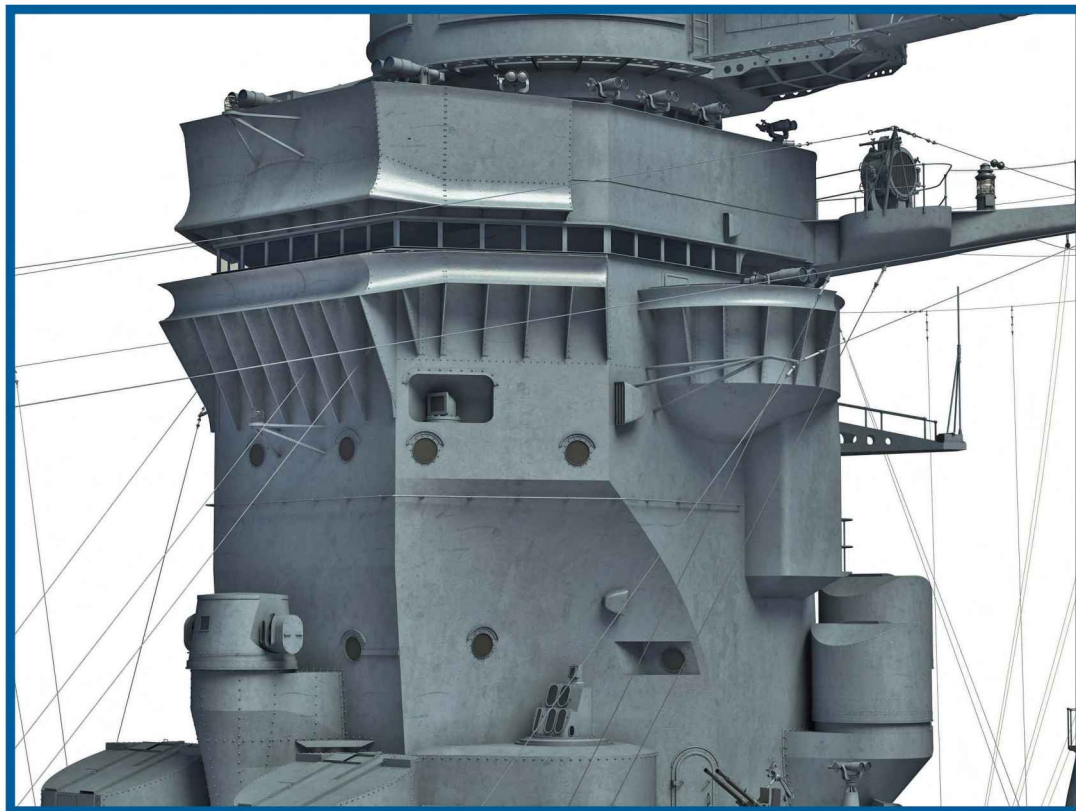
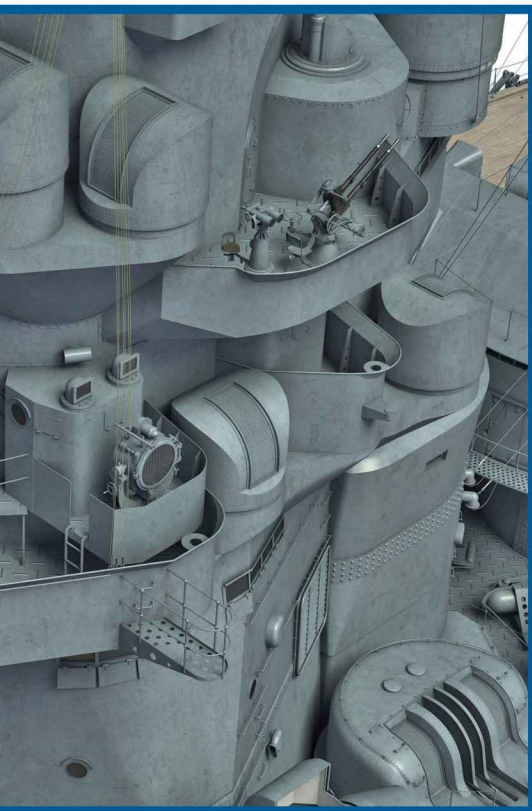
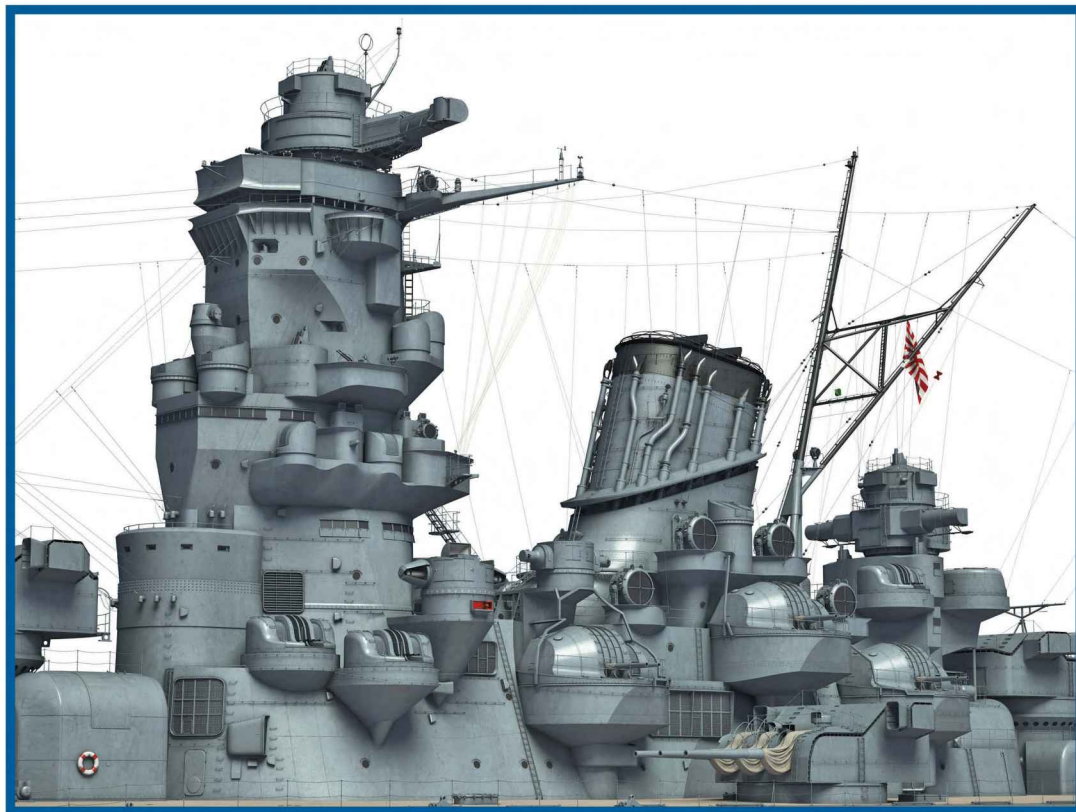
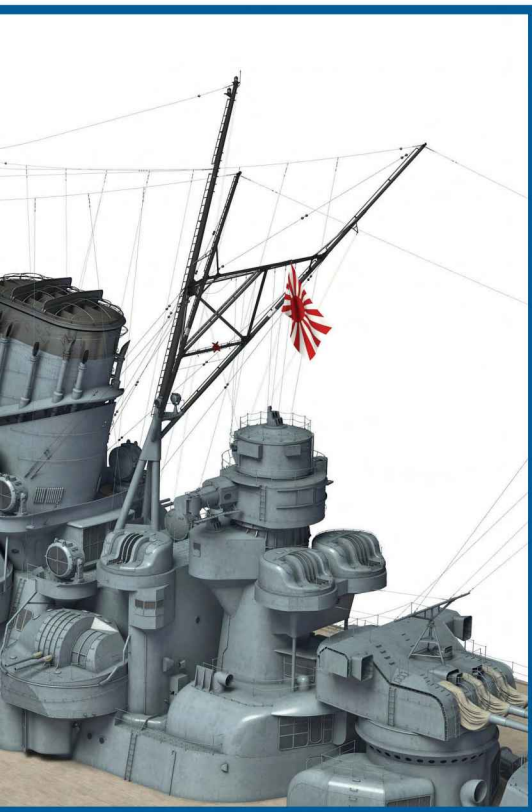


C1/18



C Superstructure – Musashi 1942

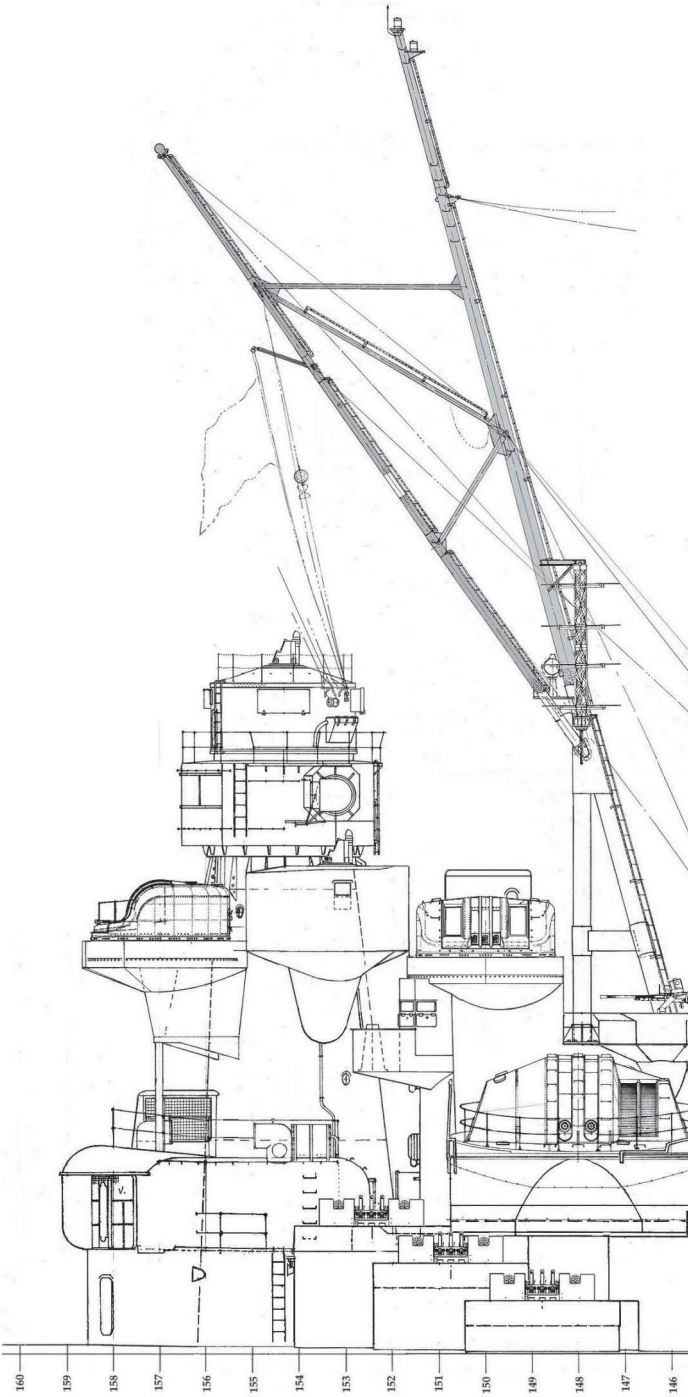


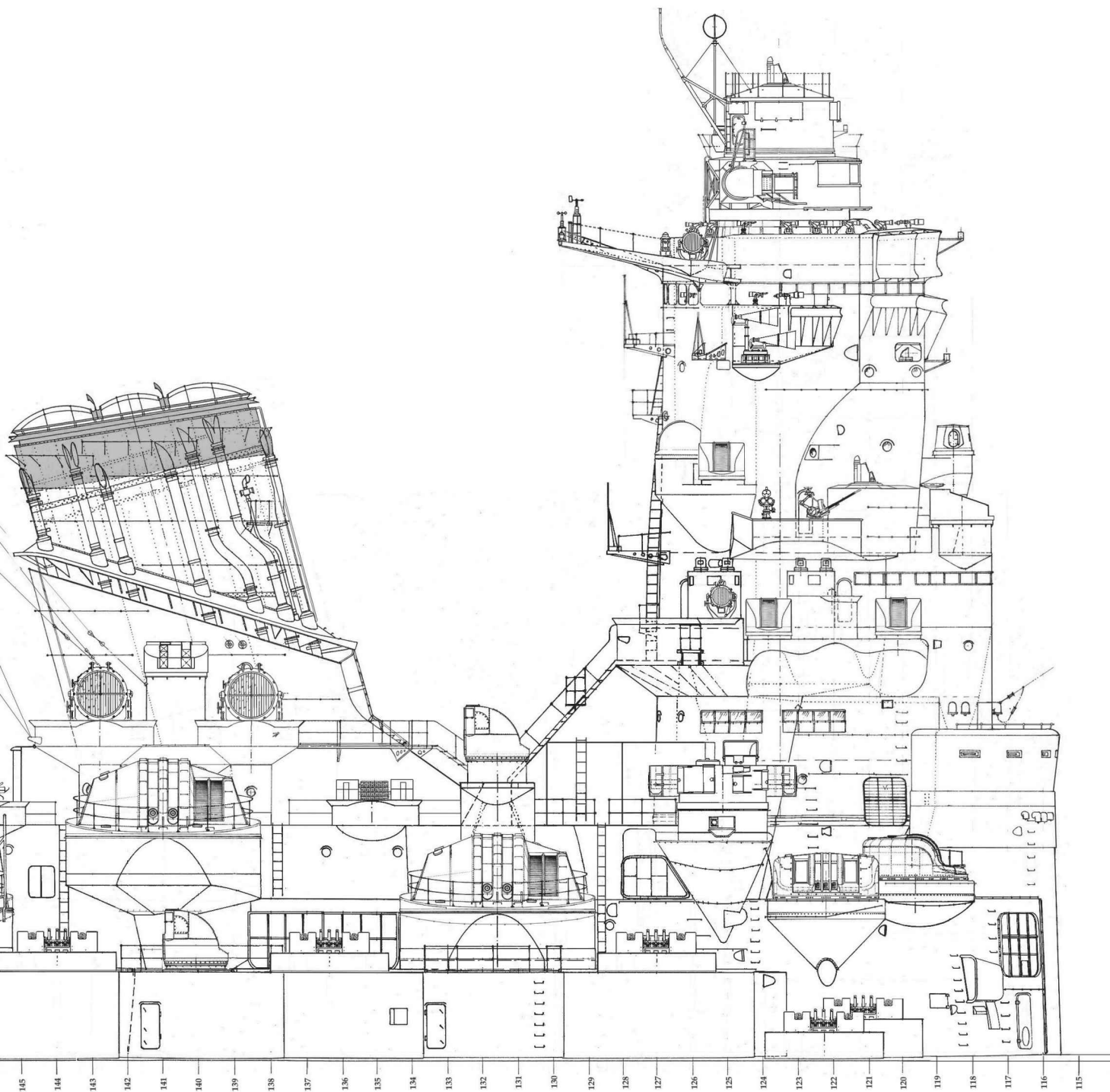


C Superstructure

C1/19 *Musashi* 1944 starboard elevation of superstructure (1/200 scale)

C1/19





C Superstructure

C1/20 Front elevation of *Musashi* tower bridge in 1944
(1/200 scale)

C1/21 Rear view of tower bridge

C1/22 Side view of tower bridge

C1/23 Signal deck (+13 300 over FD) 1942

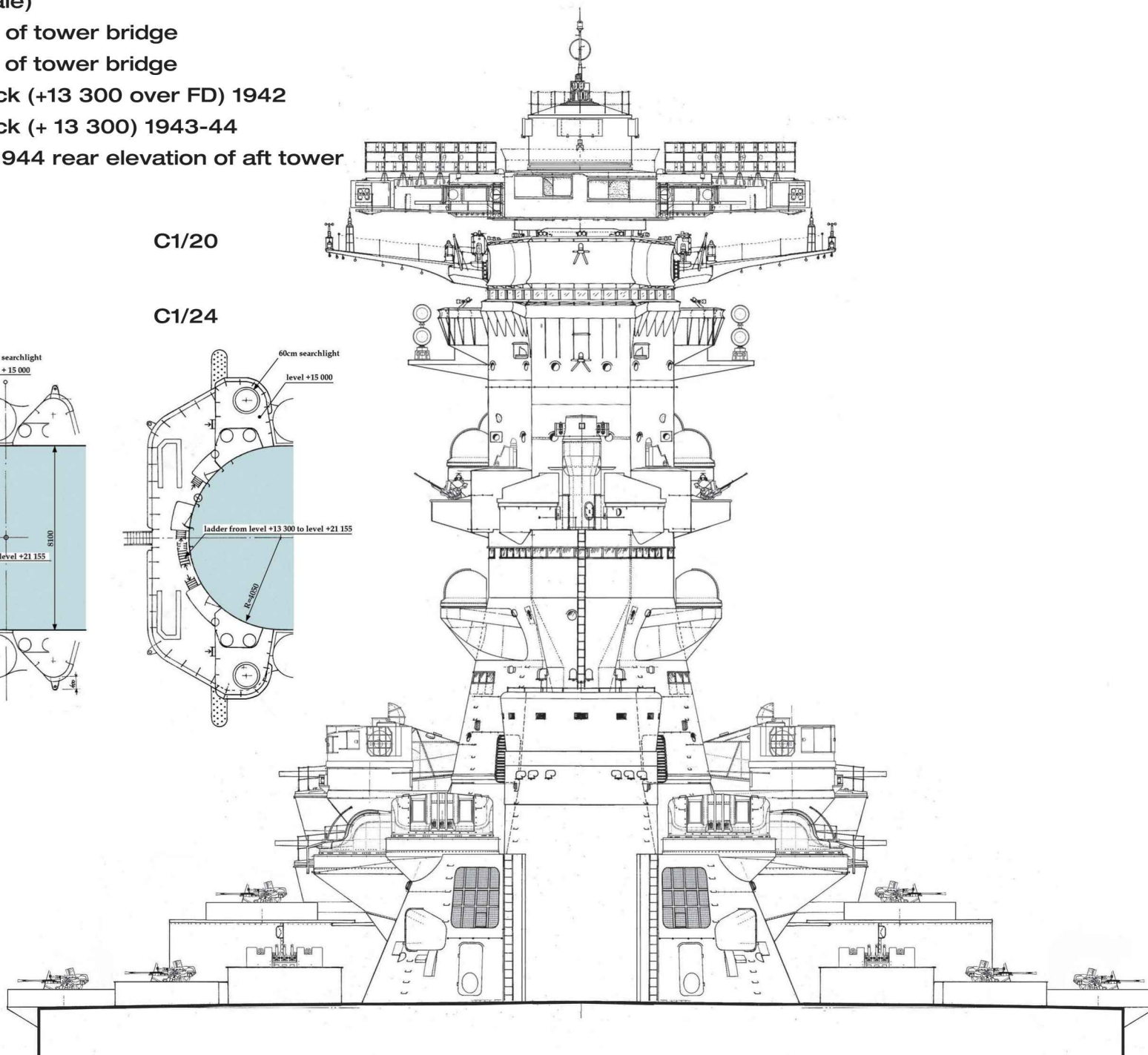
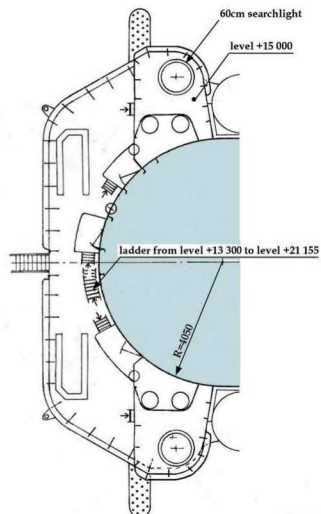
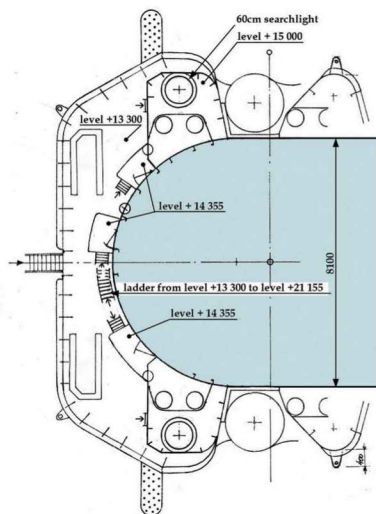
C1/24 Signal deck (+ 13 300) 1943-44

C1/25 *Musashi* 1944 rear elevation of aft tower

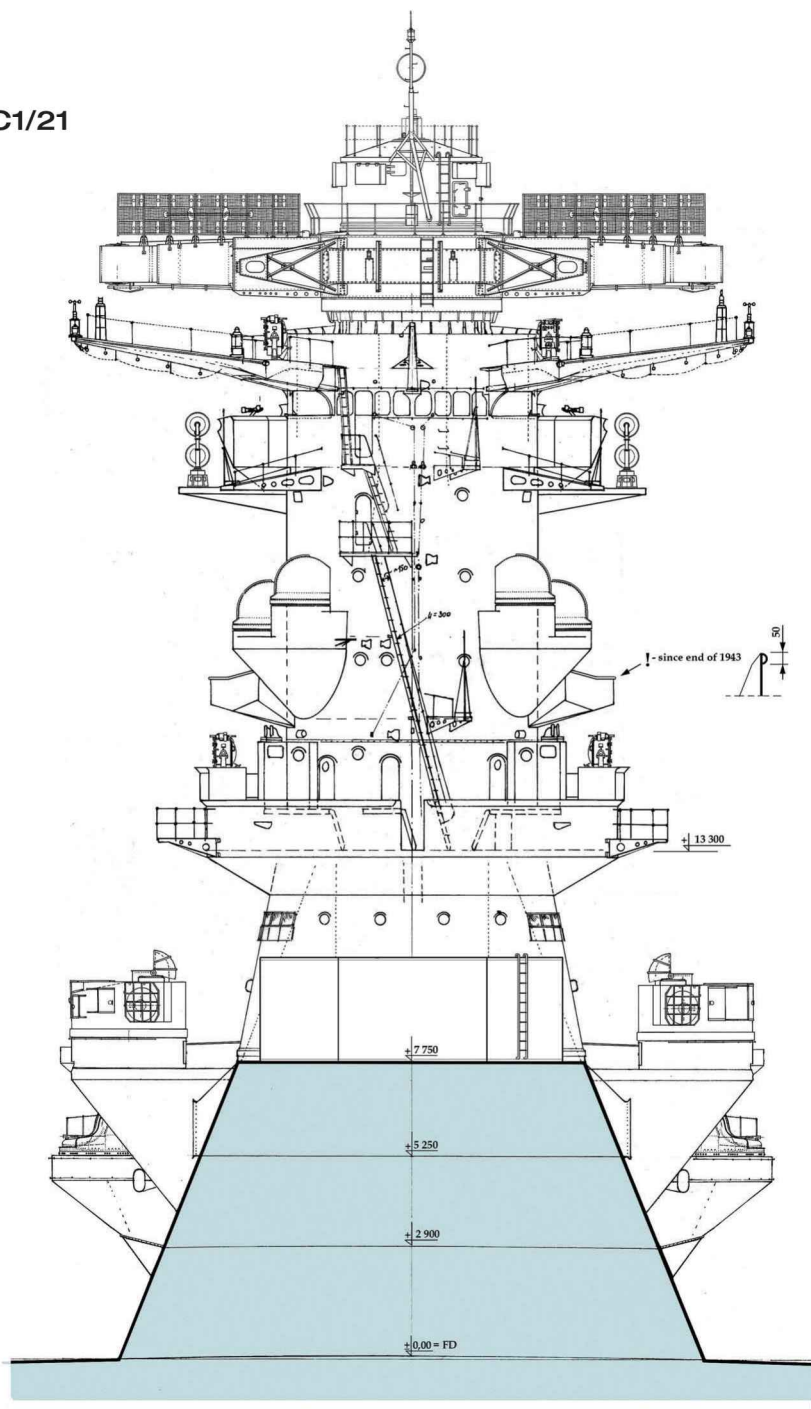
C1/20

C1/24

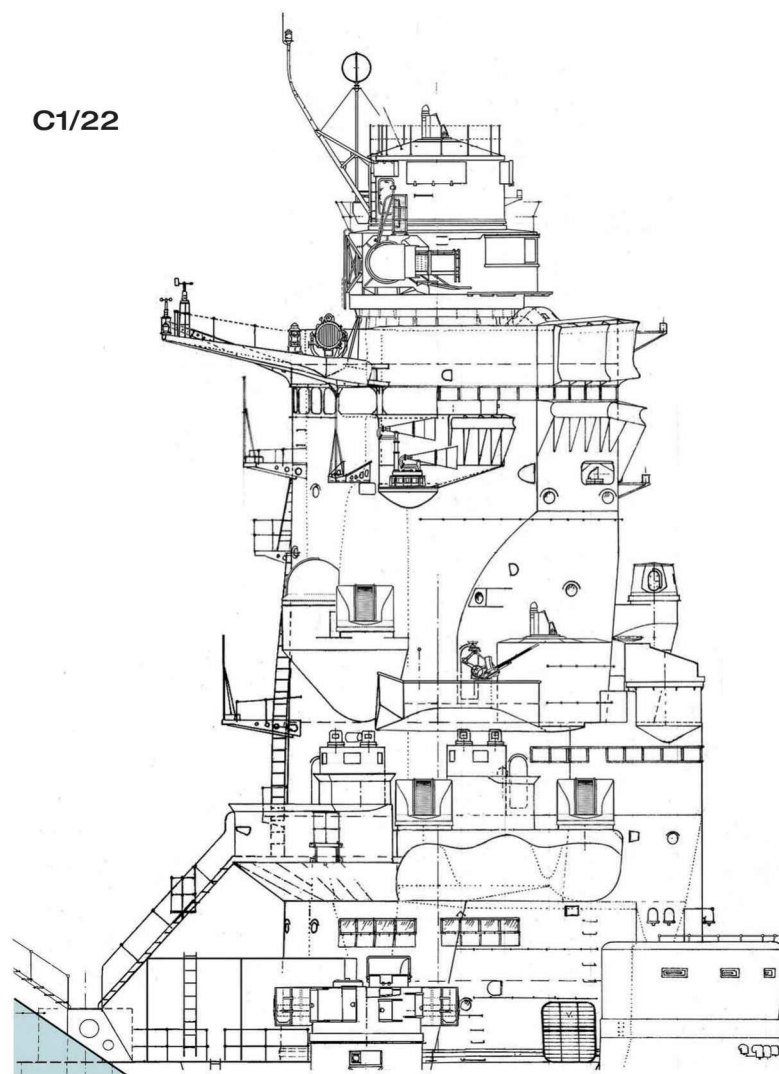
C1/23



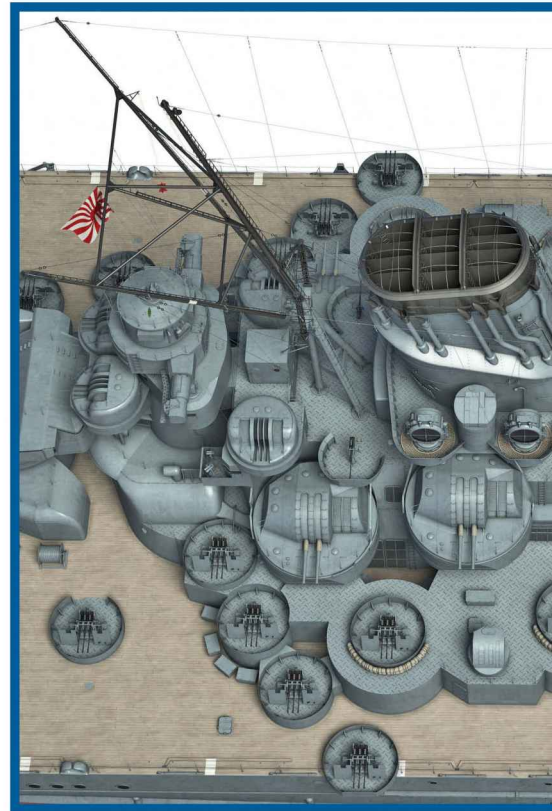
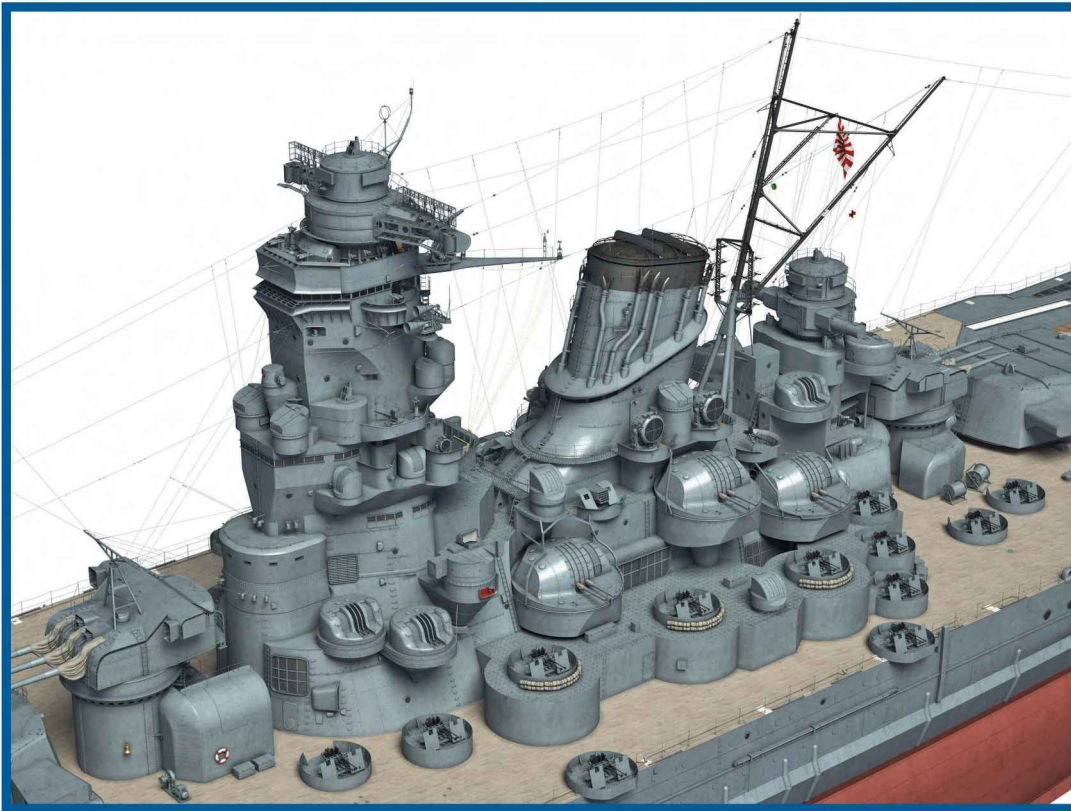
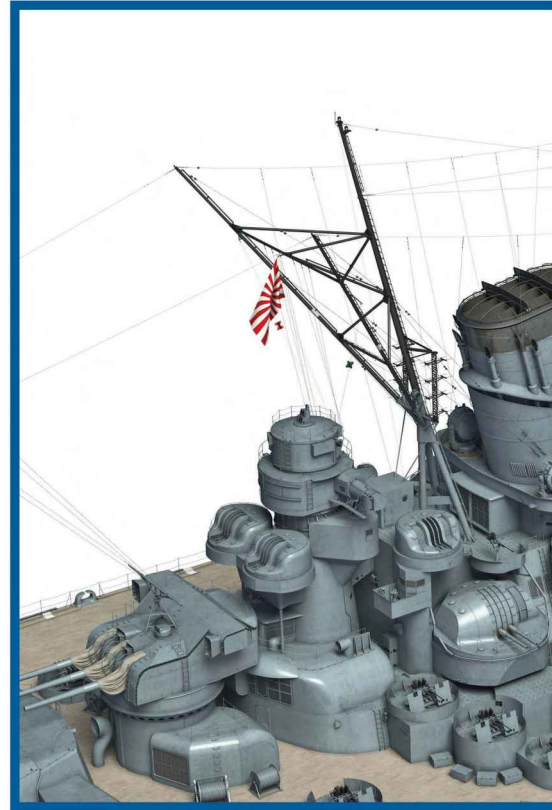
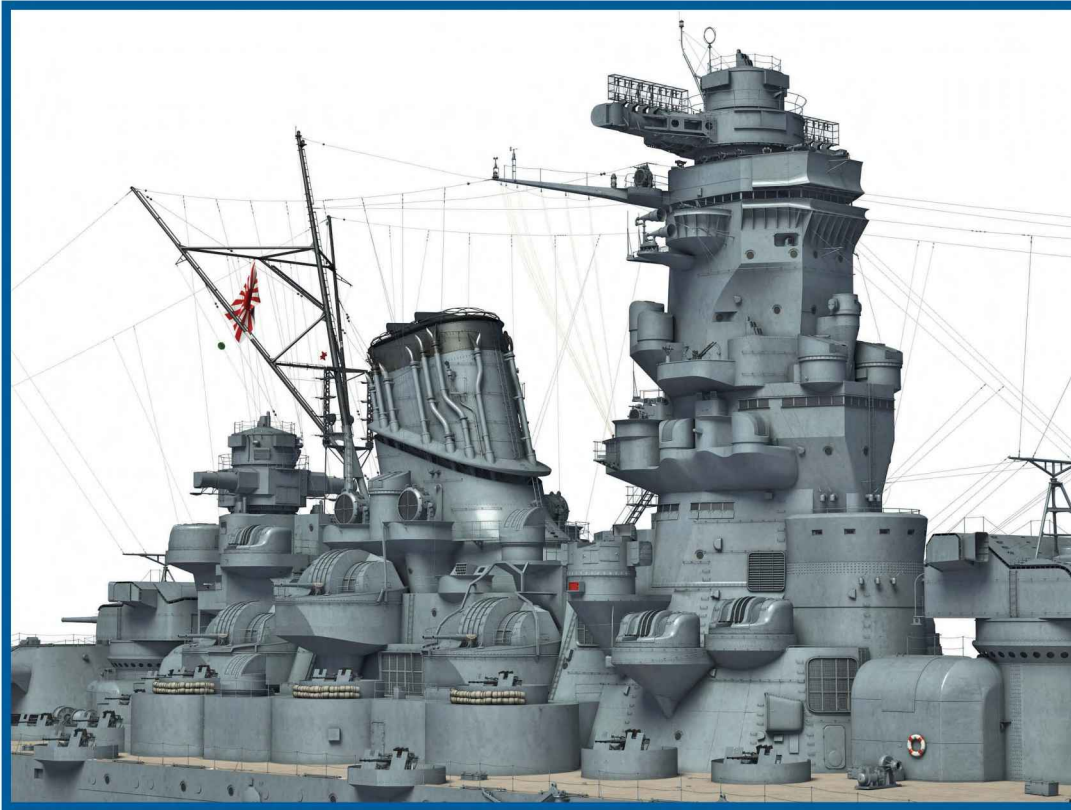
C1/21

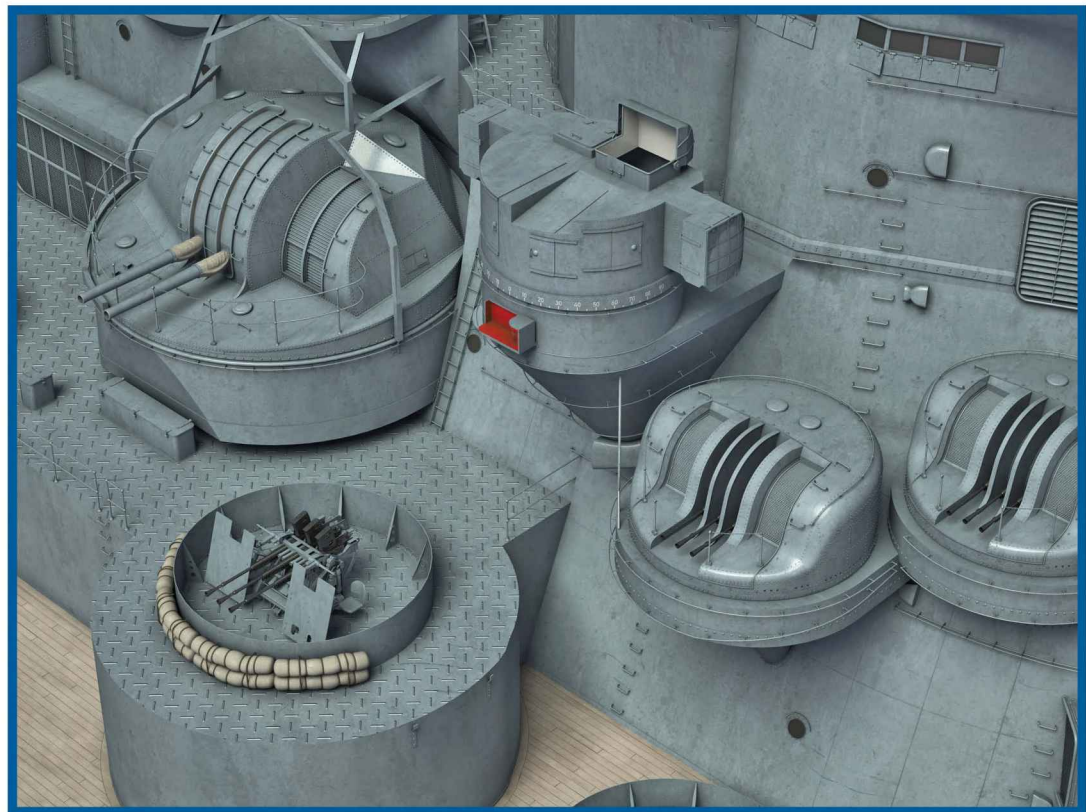
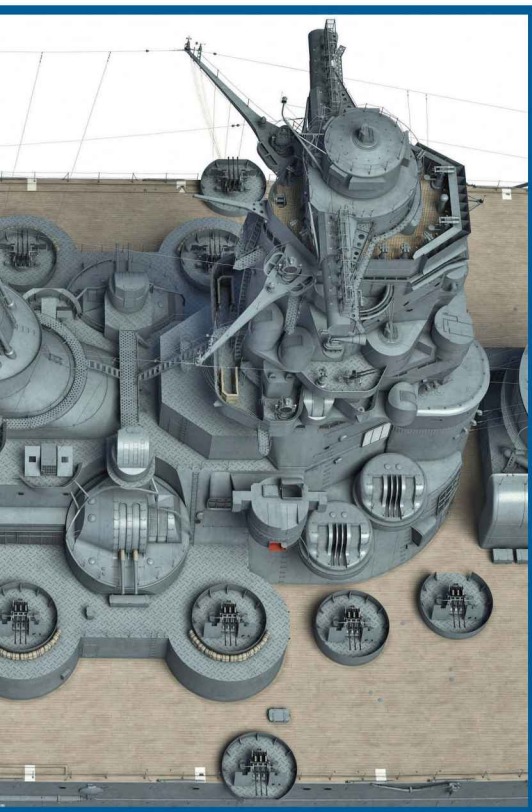
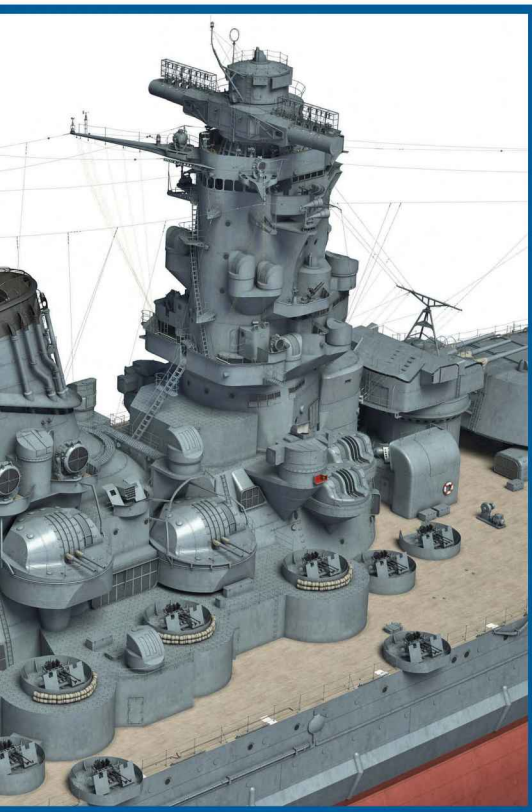


C1/22



C Superstructure – Musashi1944

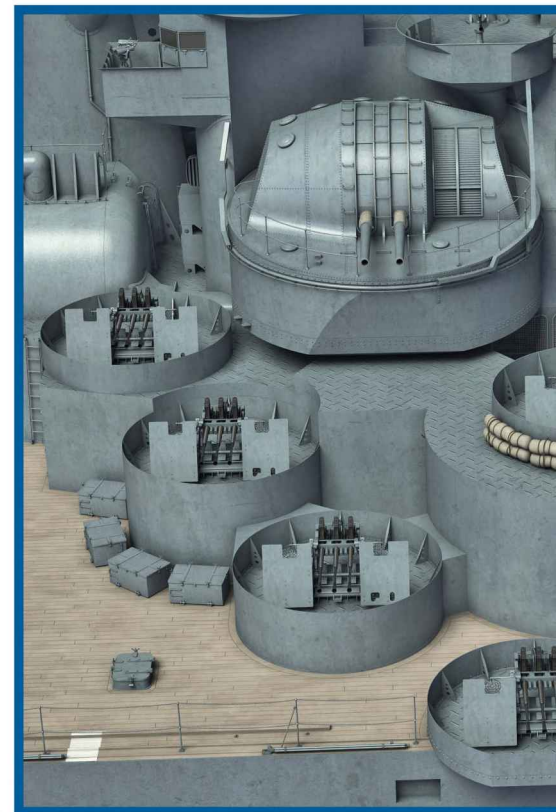
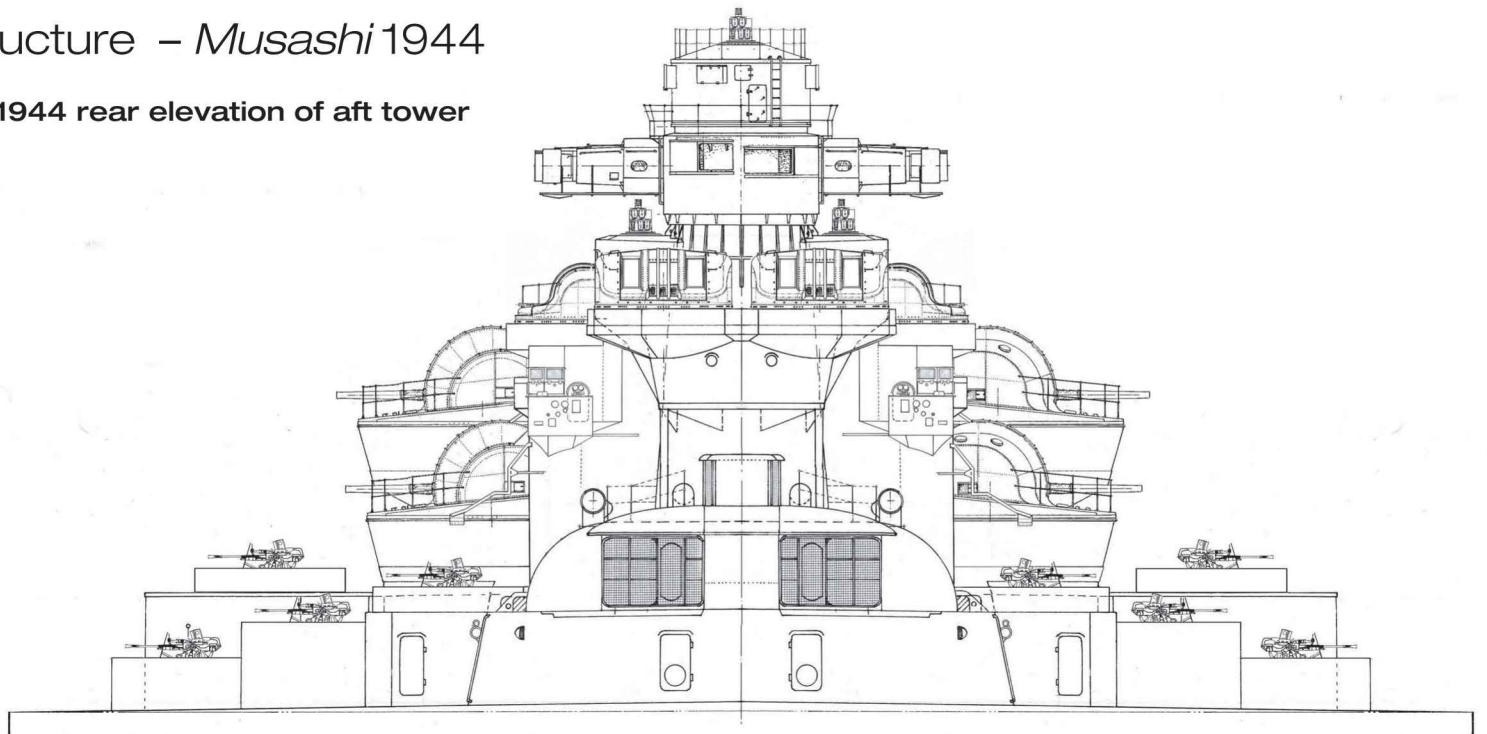


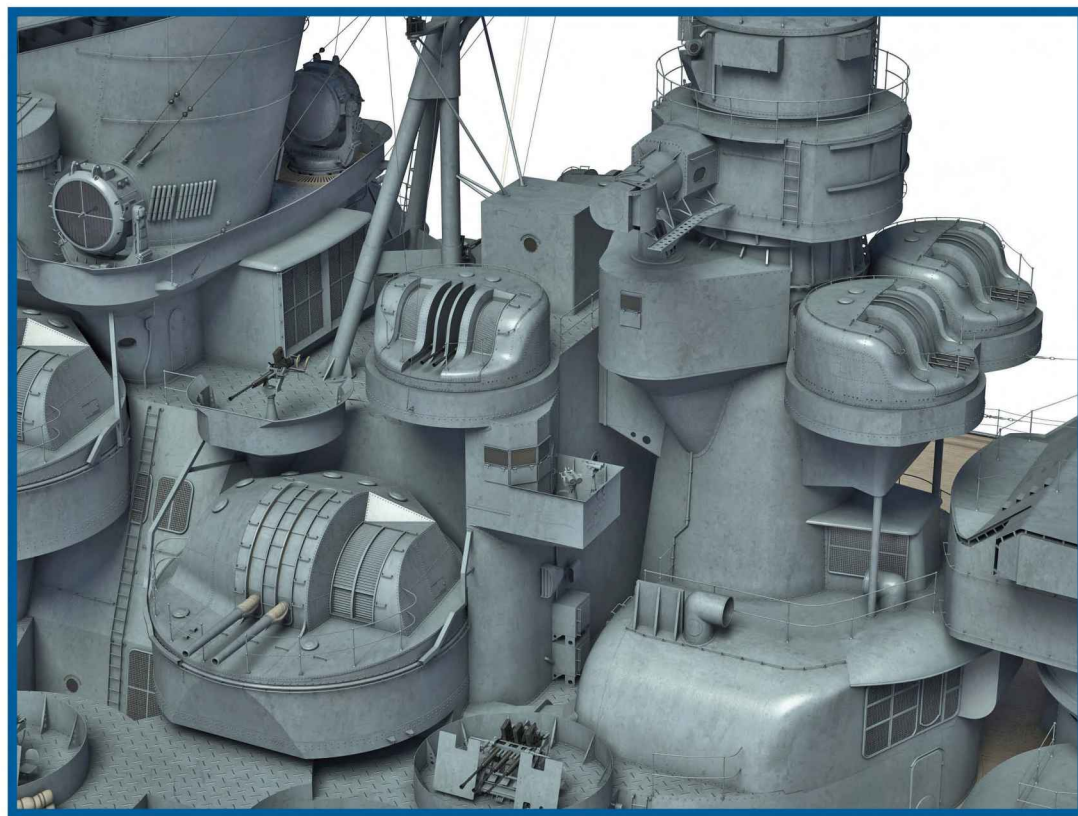
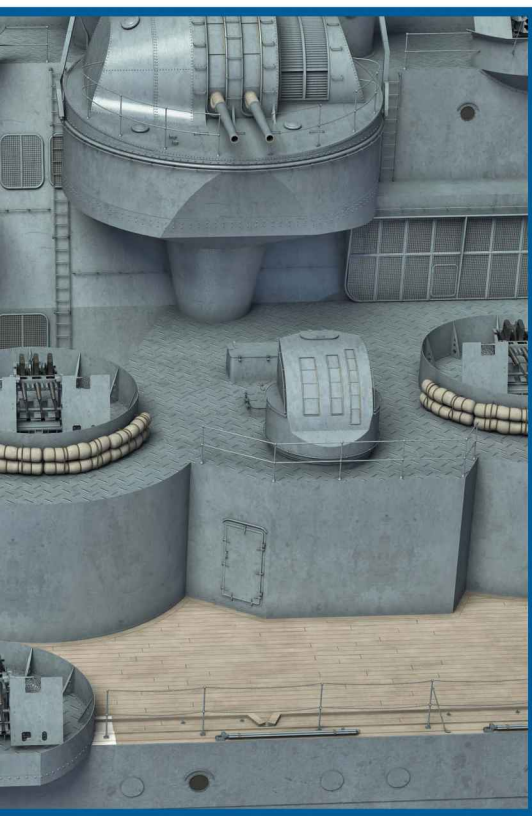


C Superstructure – *Musashi* 1944

C1/25 *Musashi* 1944 rear elevation of aft tower

C1/25





C Superstructure

Rear tower (1/200 scale)

C1/26 Side view – *Yamato*

C1/27 Horizontal body lines of rear tower

C1/28 Detail of *Musashi*

Yamato 1941

C1/29 View from frame 152 to bow direction

Yamato superstructure details after middle of 1943 with fitted radar cabin and passage between superstructure and rear tower:

C1/30 Profile

C1/31 View to stern direction

C1/32 View to bow direction

C1/33 Plan

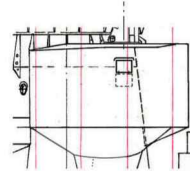
Musashi 1944

C1/34 Profile

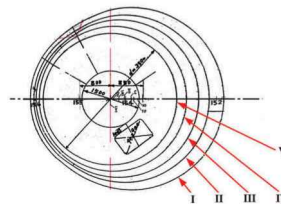
C1/35 View from frame 152 to bow direction

C1/36 Plan

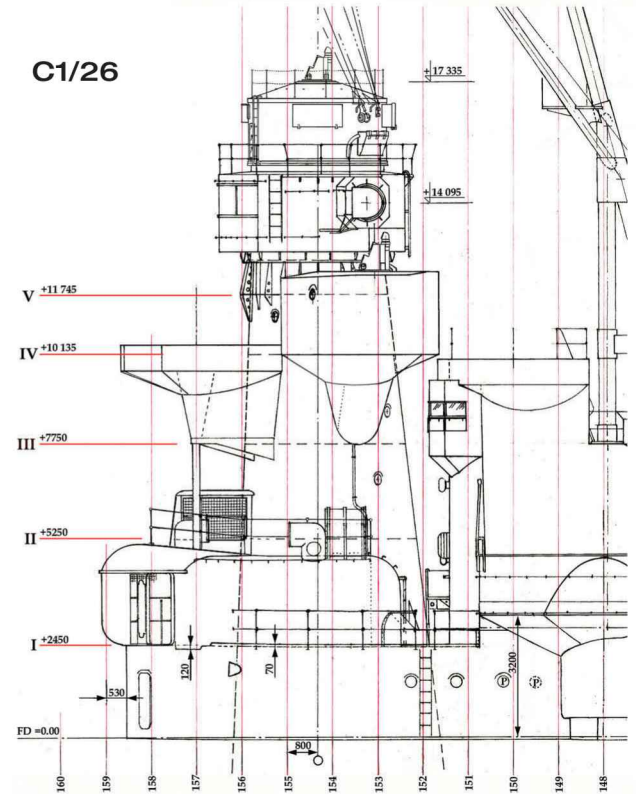
C1/28



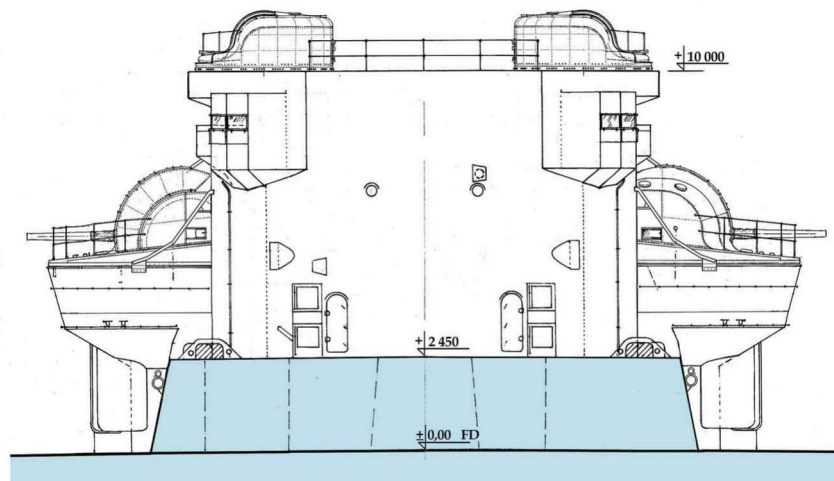
C1/27



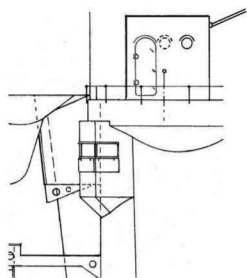
C1/26



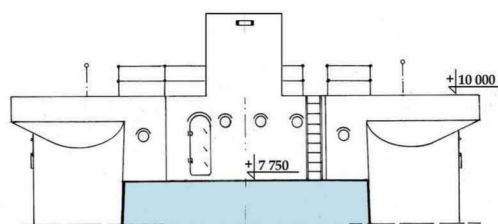
C1/29



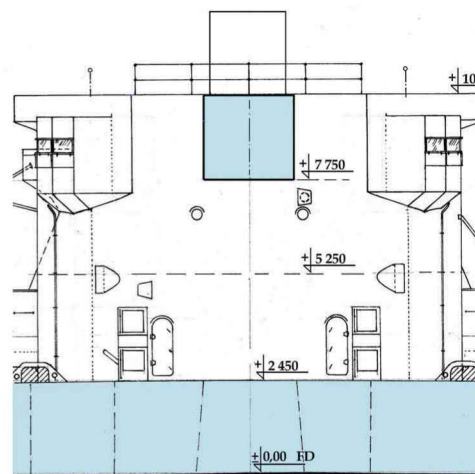
C1/30



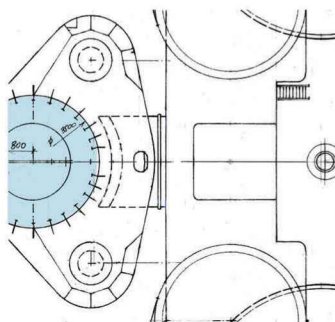
C1/31



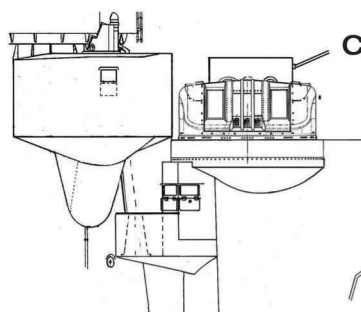
C1/32



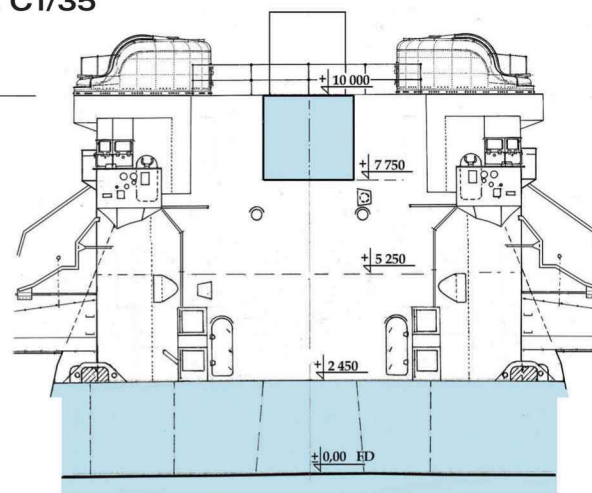
C1/33



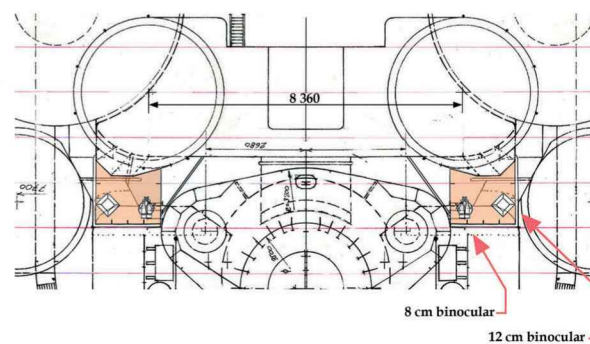
C1/34



C1/35



C1/36



C Superstructure

Views from frame 148 to bow direction

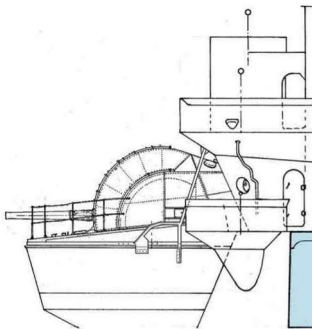
C1/37 *Musashi*

C1/38 *Yamato*

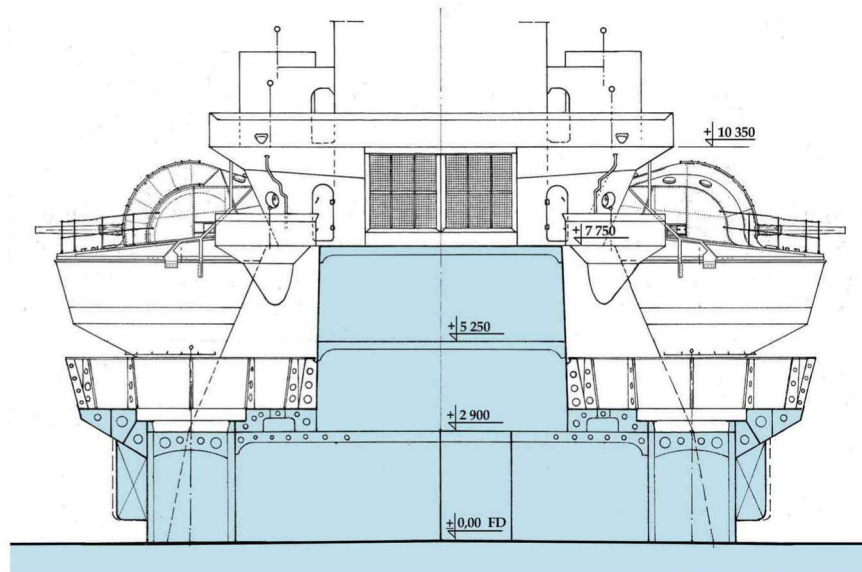
C1/39, C1/40 *Musashi* 1942 view from frame 138 to stern direction

C1/41 *Yamato* 1945 view from frame 138 to stern direction

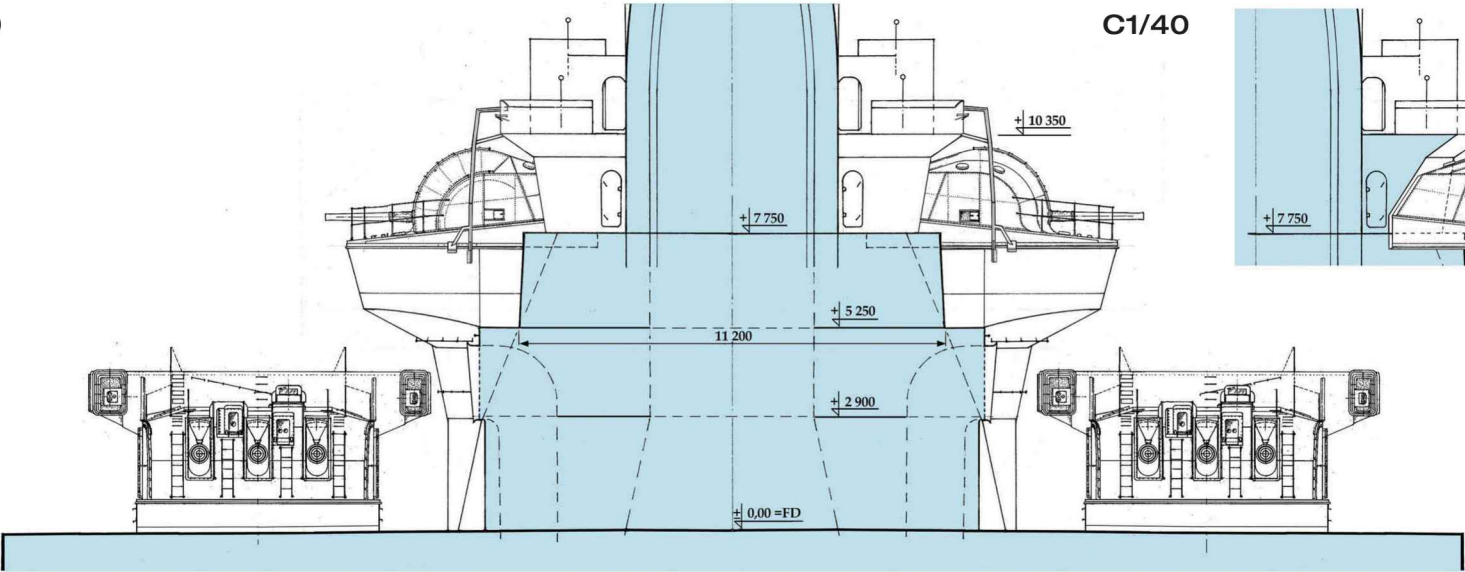
C1/37



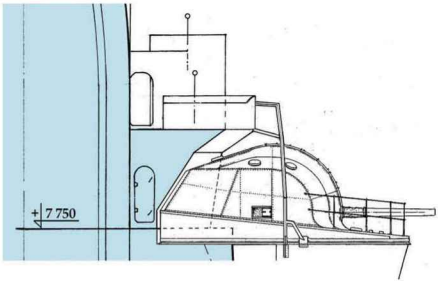
C1/38



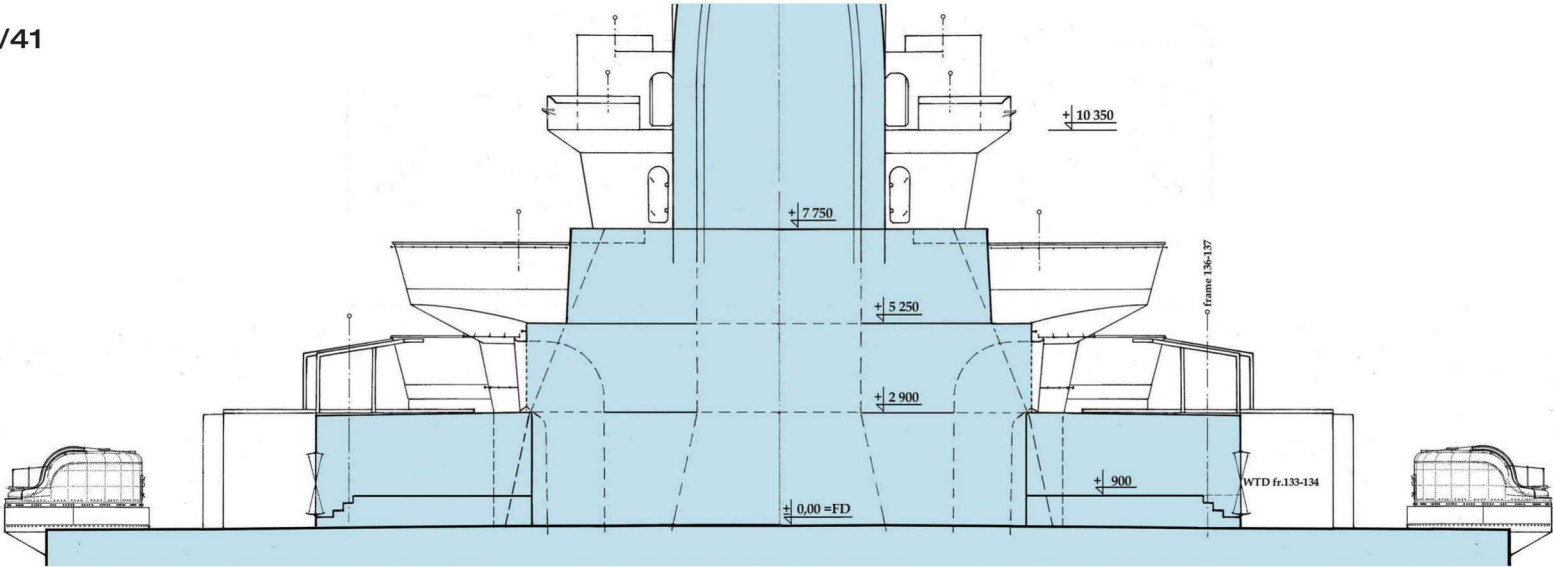
C1/39



C1/40



C1/41

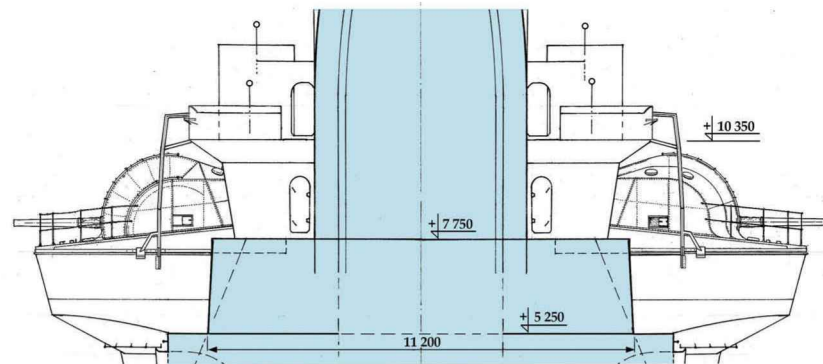


C Superstructure

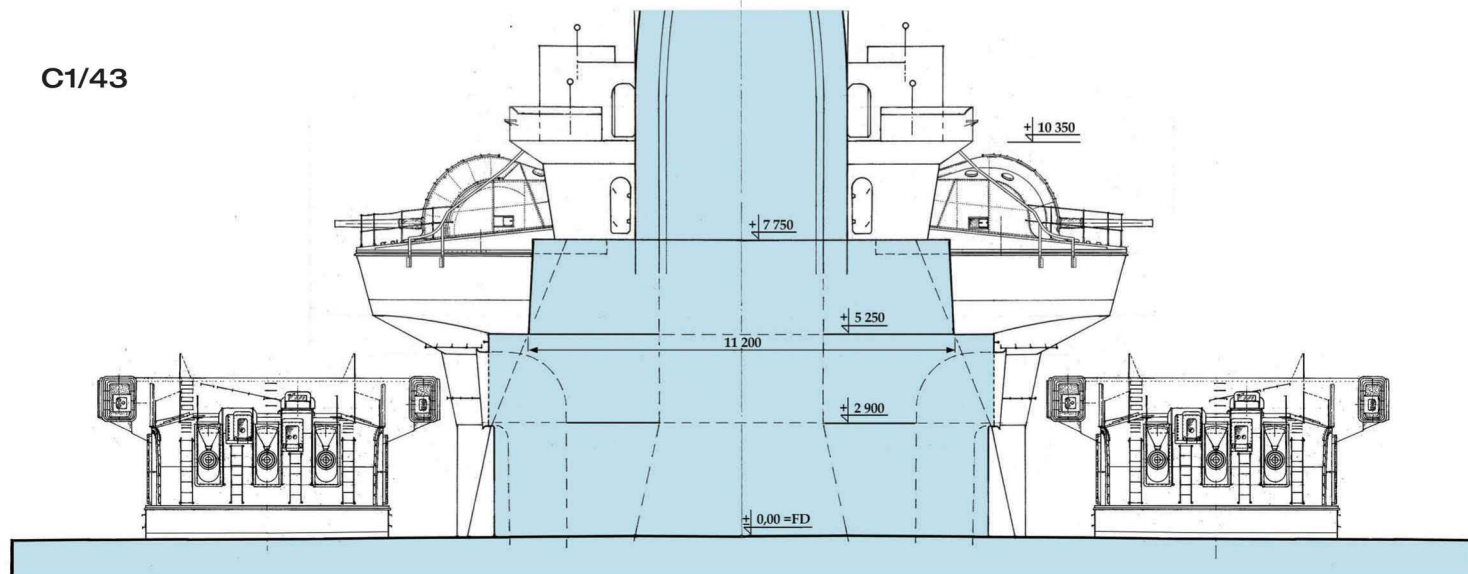
C1/42 *Musashi* 1942 view from frame 138 to stern direction

C1/43 *Yamato* 1941 view from frame 138 to stern direction

C1/42

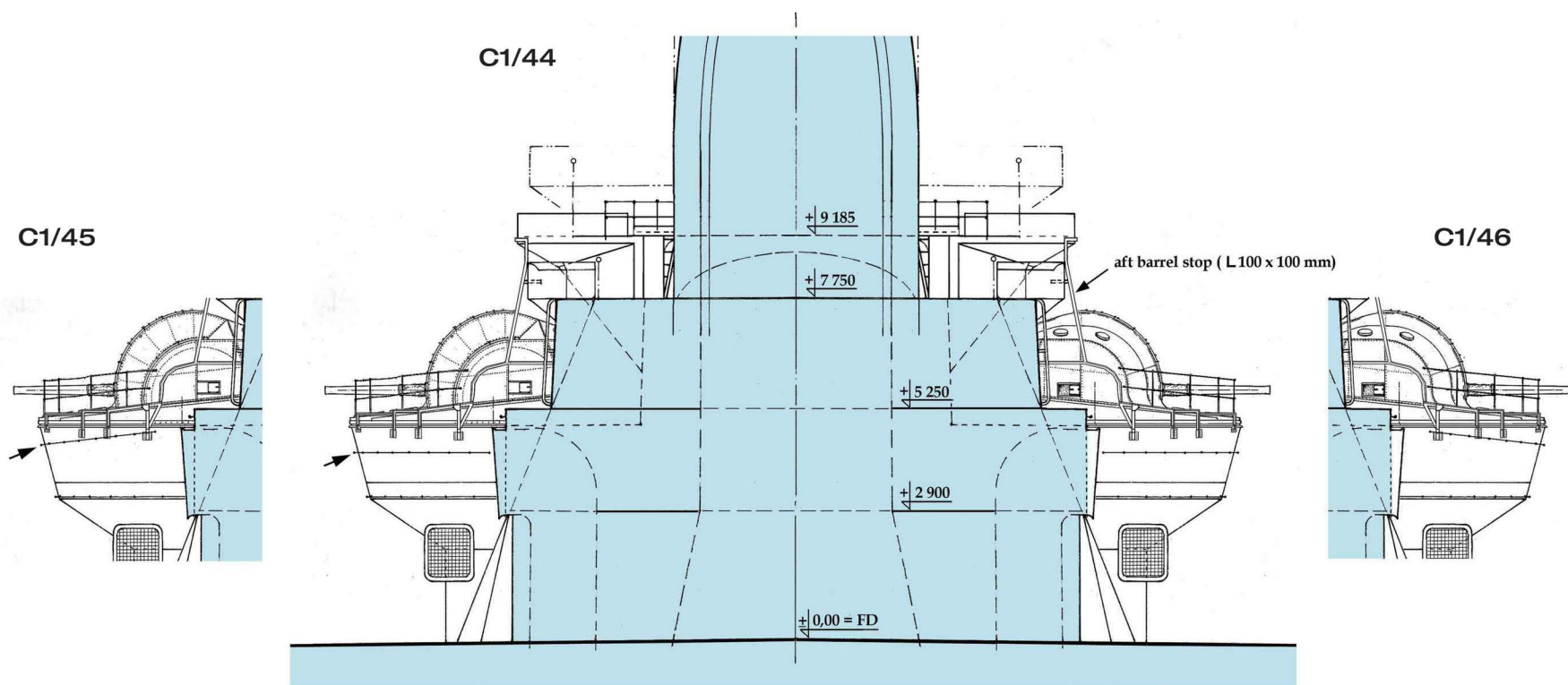


C1/43



C1/44 *Yamato* 1941 view from frame 138 to bow direction

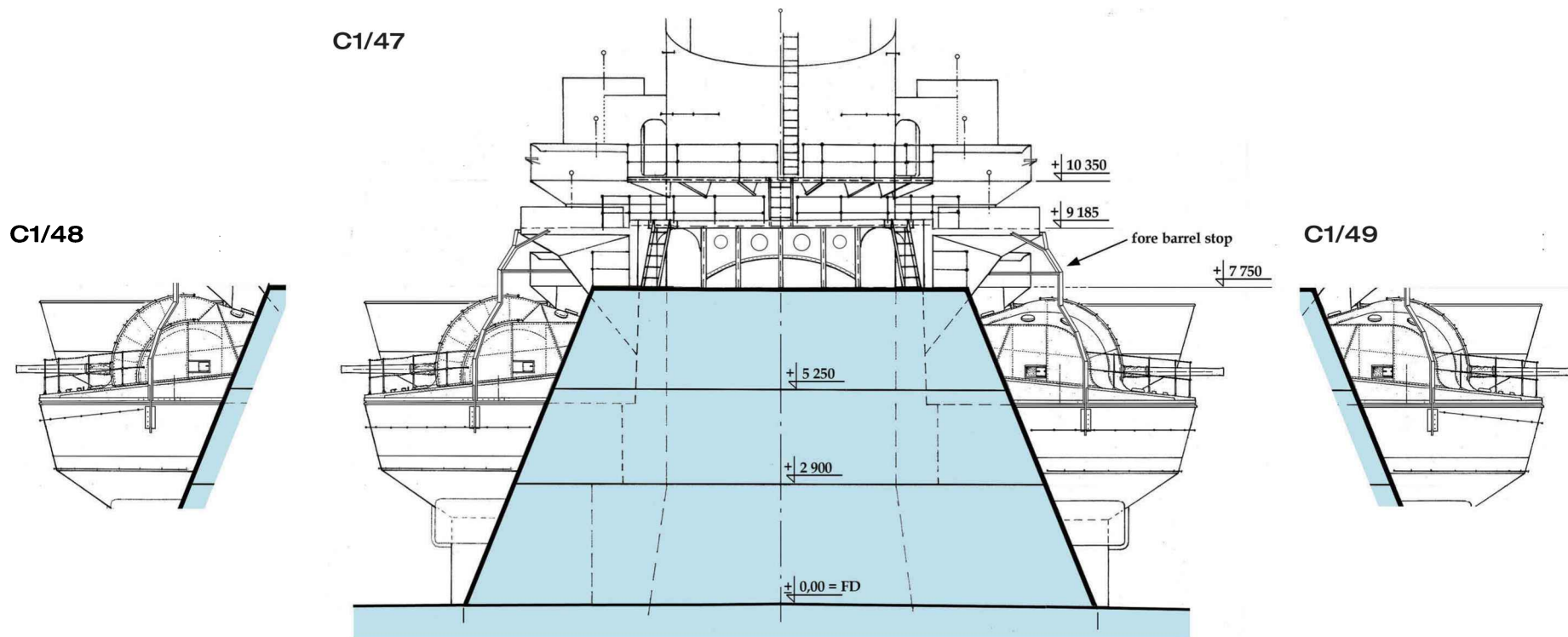
C1/45, C1/46 *Musashi* 1942 frame 138 to bow (showing differences)



C Superstructure

C1/47 *Yamato* 1941 view from frame 128 to stern
direction

C1/48, C1/49 *Musashi* 1942 view from frame 128 to stern
direction (showing differences)



12.7cm HA gun tower bases

C1/50 *Yamato* turrets no.1, no.2, no.5, no.6

C1/51 *Yamato* turrets no.3, no.4

C1/52 *Musashi* turrets no.1, no.2

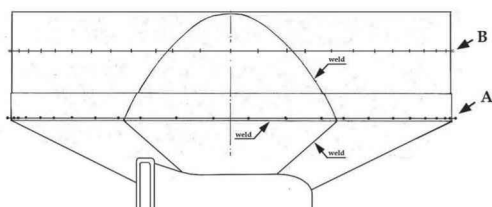
C1/53 *Musashi* turrets no.5, no.6

C1/54 *Musashi* turrets no.3, no.4

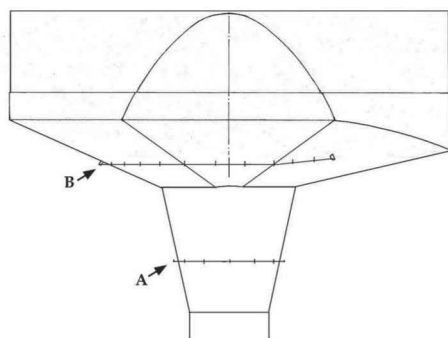
C1/55 *Musashi* turret no.2

C1/56 Handrail details

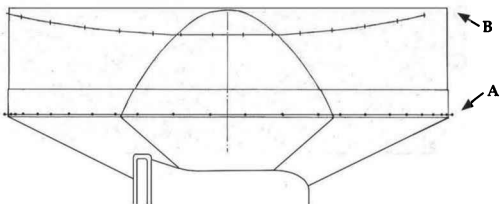
C1/50



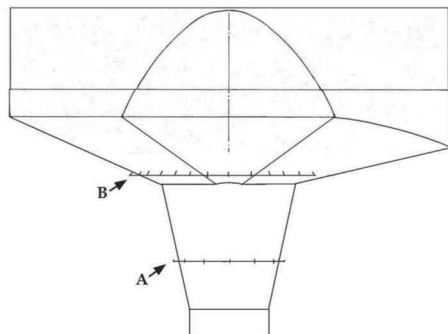
C1/51



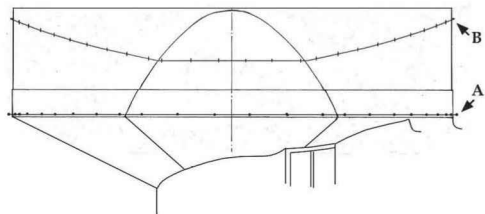
C1/52



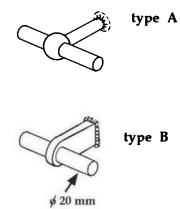
C1/54



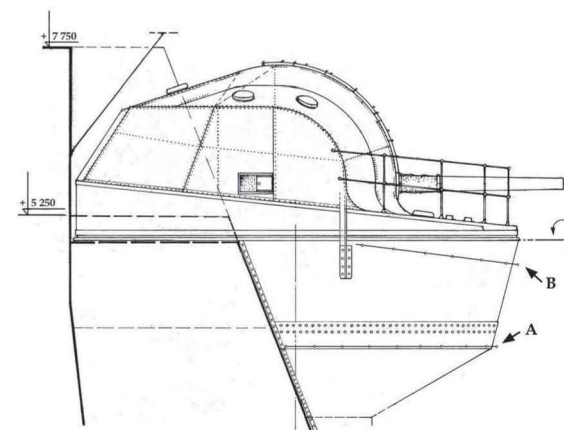
C1/53



C1/56



C1/55



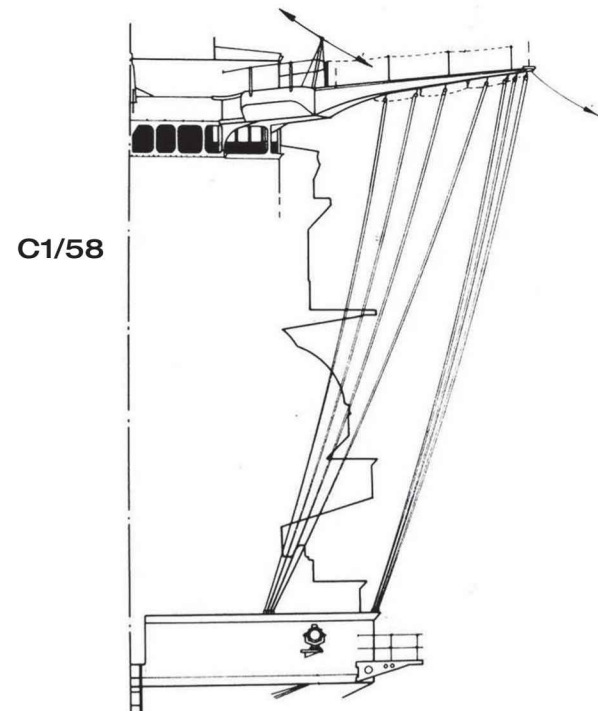
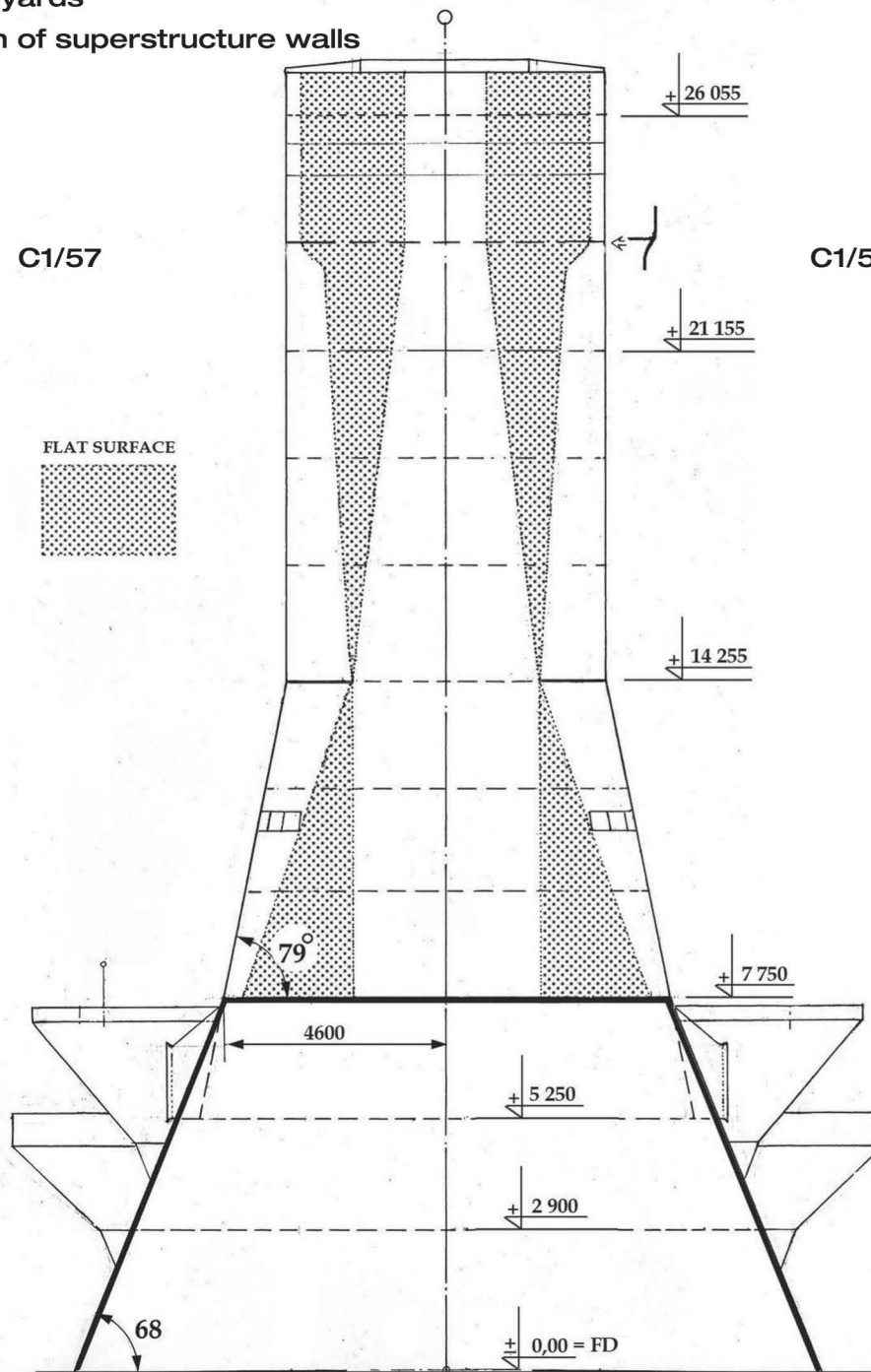
C Superstructure

Rear wall of tower bridge (scheme):

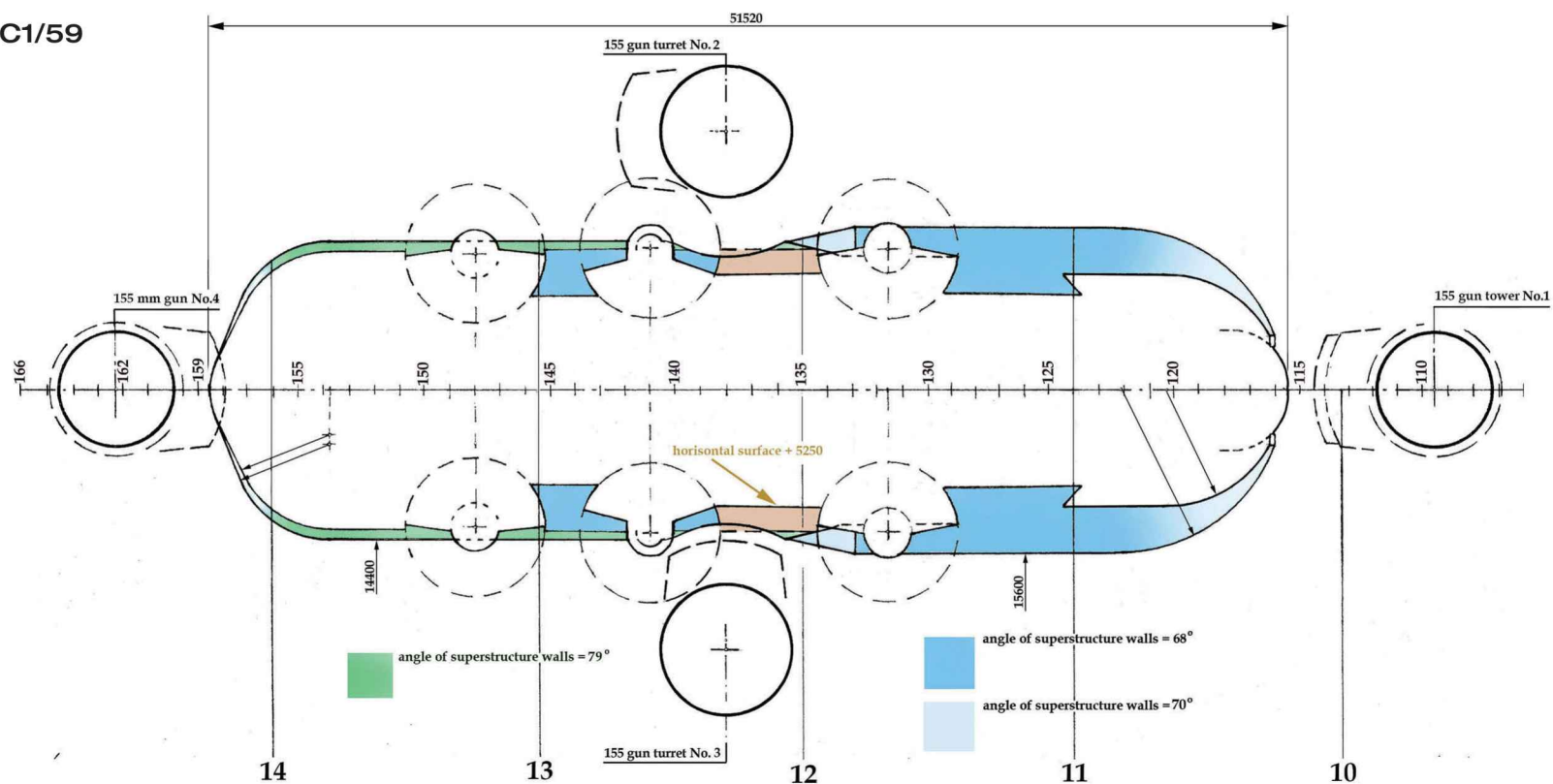
C1/57 Flat surfaces

C1/58 Signal halyards

C1/59 Inclination of superstructure walls



C1/59



C Superstructure

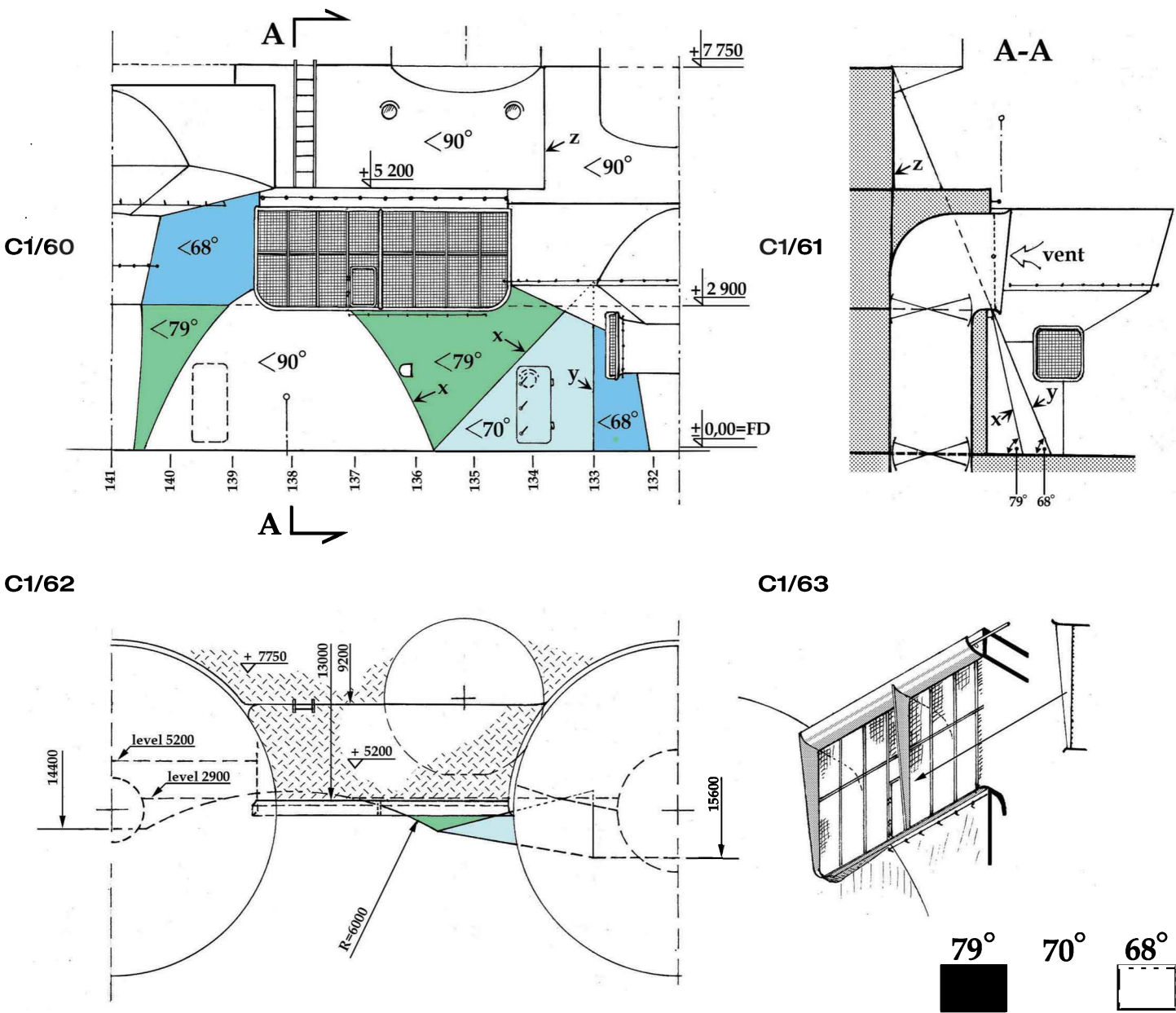
Inclination of superstructure walls

C1/60 Side view

C1/61 Section

C1/62 Plan

C1/63 Vent intake detail



Sponson of searchlight control towers

C1/64 Plan

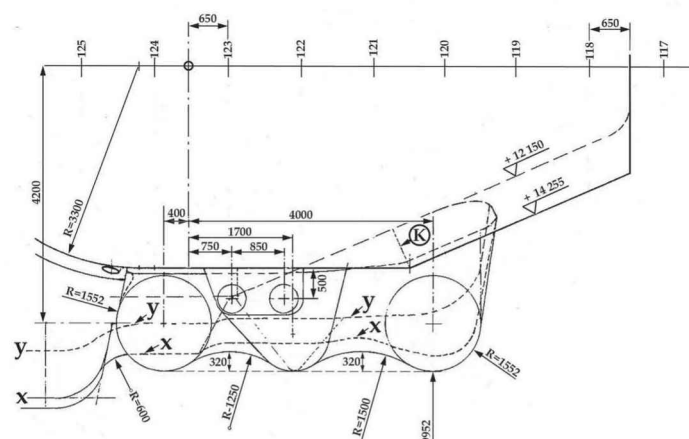
C1/65 Side view

C1/66 Front view

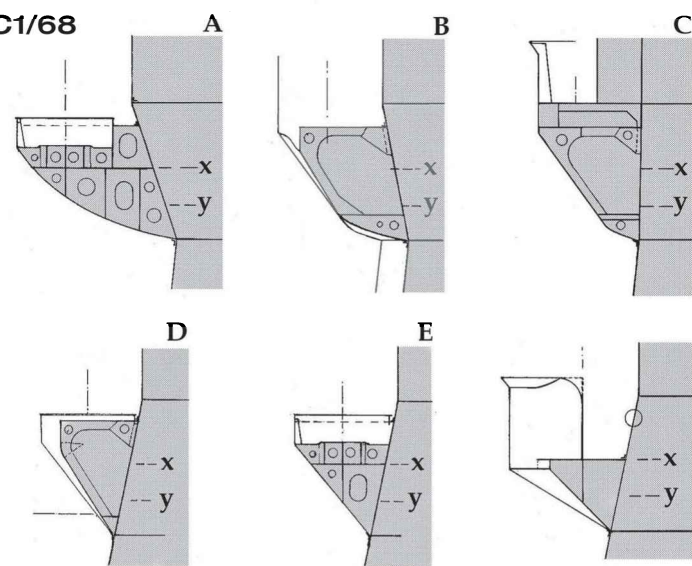
C1/67 Official Japanese Navy drawing

C1/68 Sections

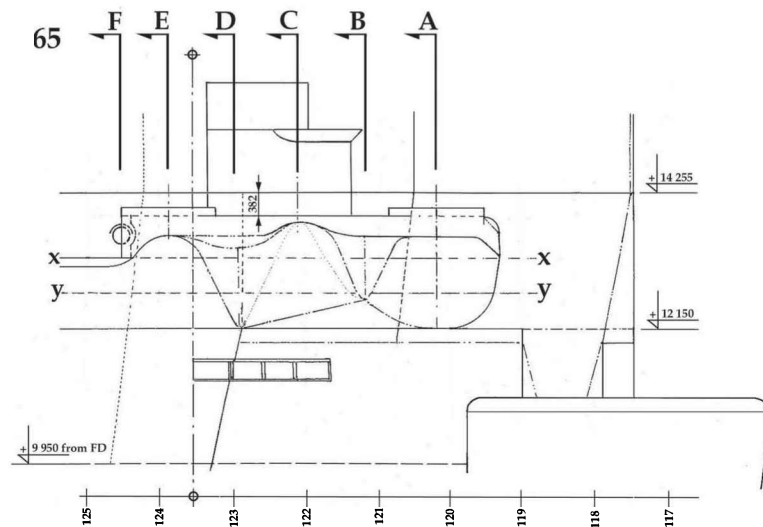
C1/64



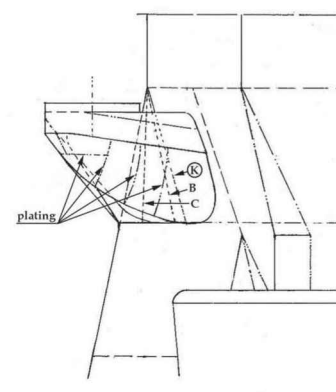
C1/68



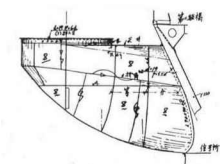
C1/65



C1/66



C1/67



C Superstructure – Tower Bridge

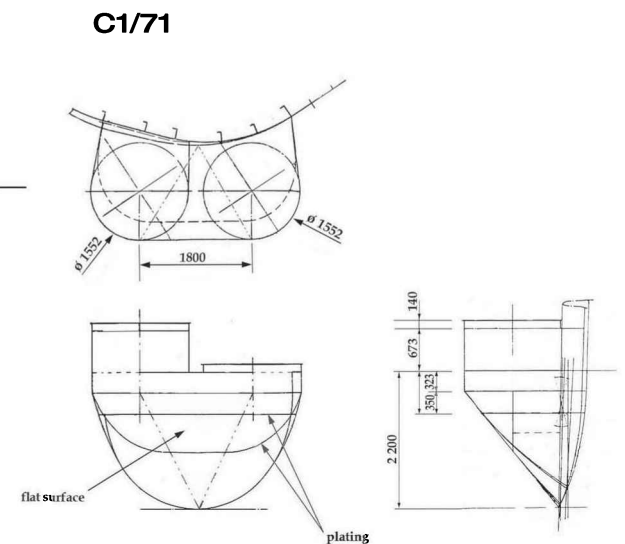
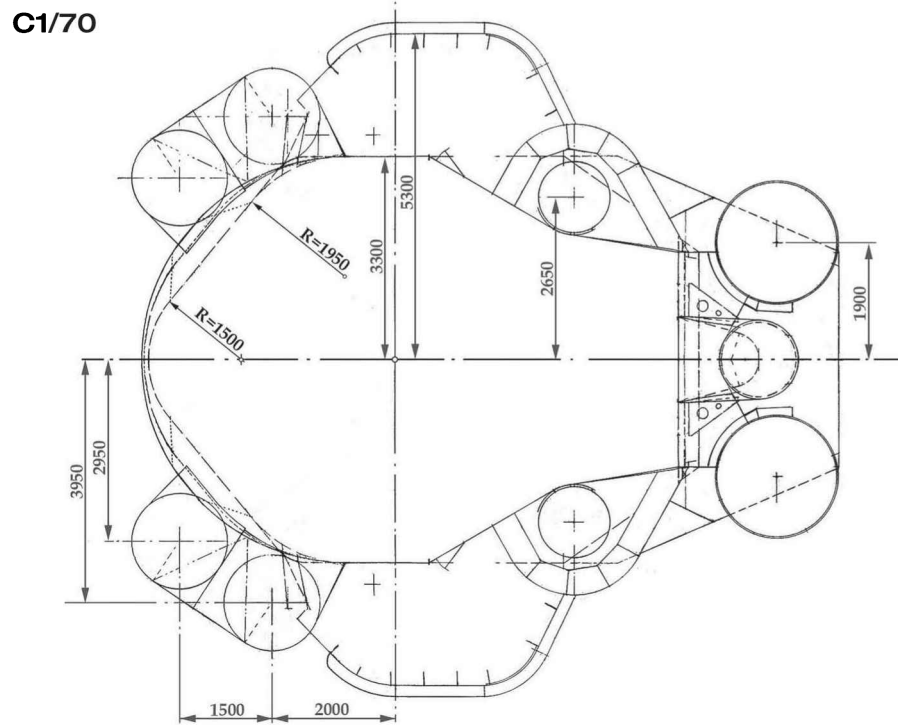
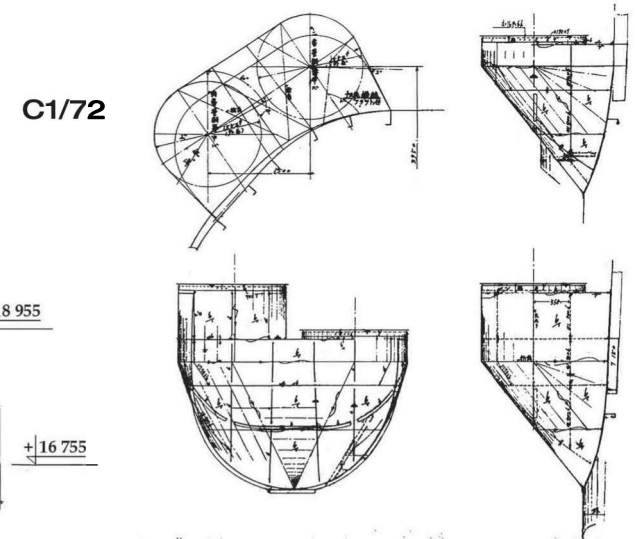
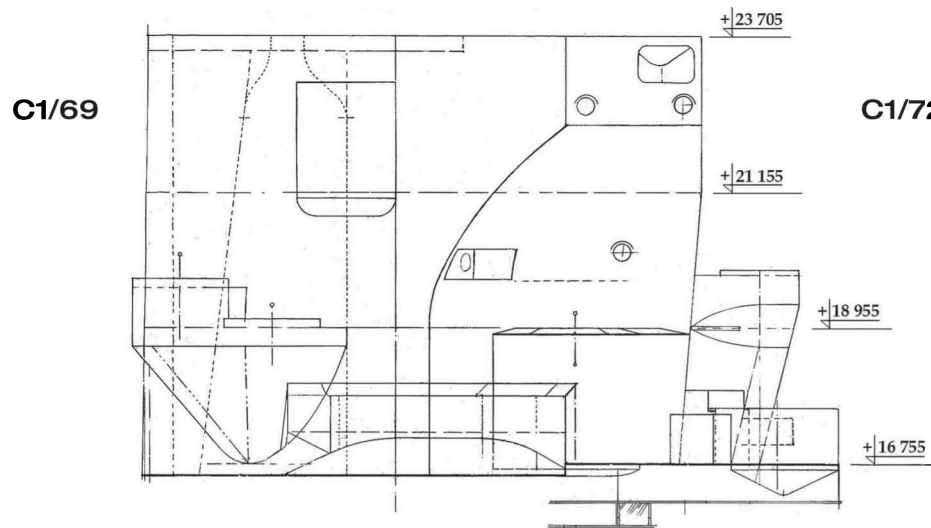
Tower bridge – middle fragment with sponsons of rear
searchlights control towers

C1/69 Side view

C1/70 Plan

C1/71 Sponsons

C1/72 Official Japanese Navy Drawing



Technical drawing of the C/178 C-C section of a bridge. The drawing shows a cross-section of a bridge with a wide deck and a central support. Dimensions are provided in millimeters. The total width of the deck is 6600 mm, with a central section of 3500 mm. The height of the bridge structure is 1950 mm. The drawing includes a side view and a top view.

A diagram of a V-shaped structure, likely a roof or a bridge section, with a central vertical axis. The structure consists of two inclined planes meeting at a central horizontal base. On the left inclined plane, there are two forces labeled 'E' acting perpendicular to the surface. On the right inclined plane, there is one force labeled 'E' acting perpendicular to the surface. At the top of the left inclined plane, there is a force labeled 'B' acting vertically upwards. At the top of the right inclined plane, there is a force labeled 'B' acting vertically upwards. In the center of the horizontal base, there is a force acting vertically upwards, represented by a circle with a cross inside. The entire structure is supported by a horizontal base.

[illegible]

Wind baffle and periscope on upper part of tower bridge

C1/73 Front elevation

C1/74 Plan of air defence platform +26 055mm from upper deck level

C1/75 Plan of combat bridge compartment +23 705mm

C1/76 Upper fore part after modernisation in 1943

C1/77 Front elevation

C1/78 Sections

C1/79 Periscope window

C Superstructure – Wind baffles

Wind baffle sections:

C1/80 Section of fore wall

C1/81 Section of side wall

C1/82 Detail

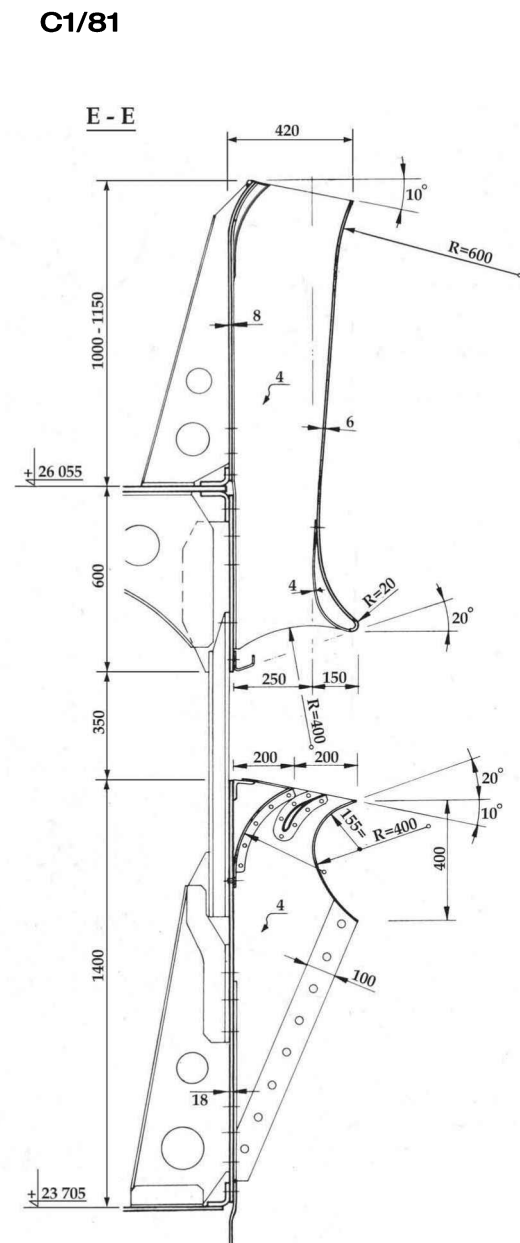
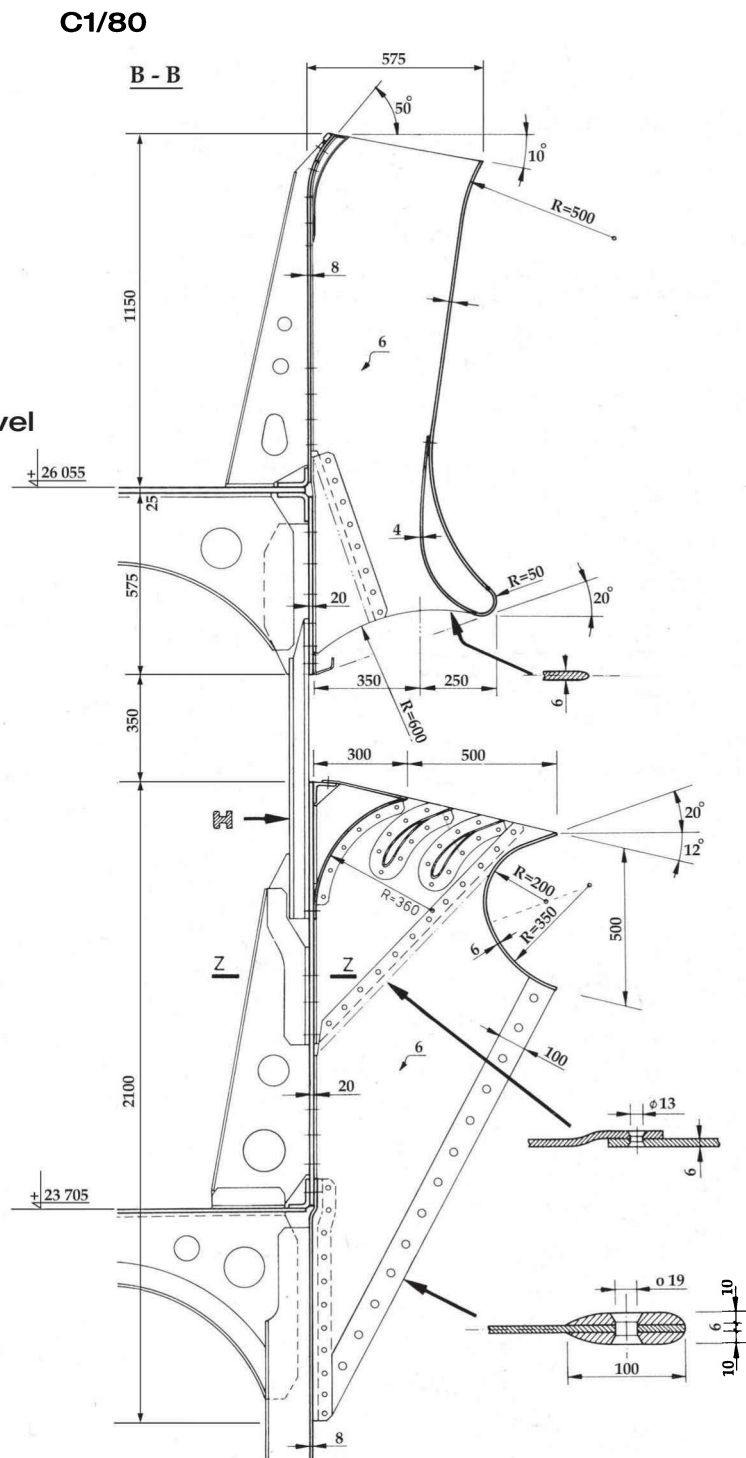
C1/83 Fore and side wind baffle with additional angle steel plates (400–300 x 6mm)

C1/84 Section of side small platform (Yamato 1941)

Grating from air defence platform level
+26 055

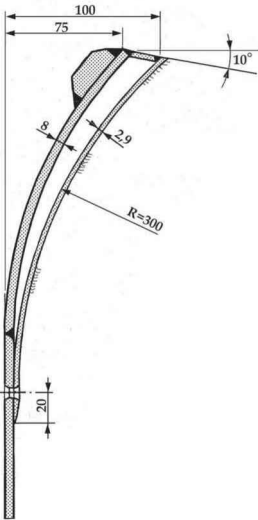
C1/85 Section

C1/86 Plan (fragment)

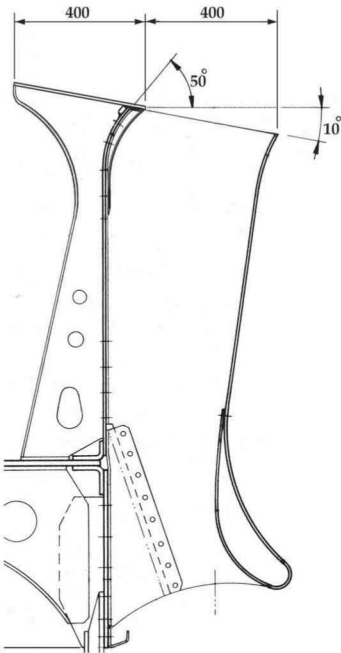


C1/82

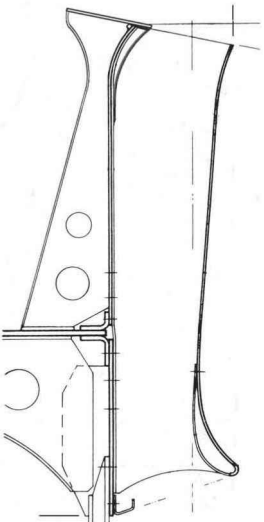
A - A



C1/83



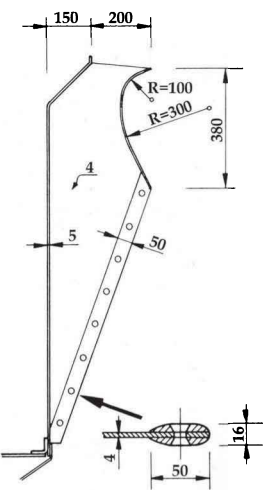
B - B



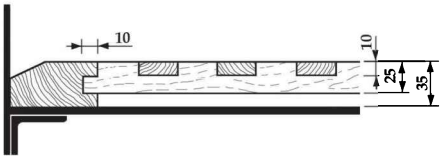
E - E

C1/84

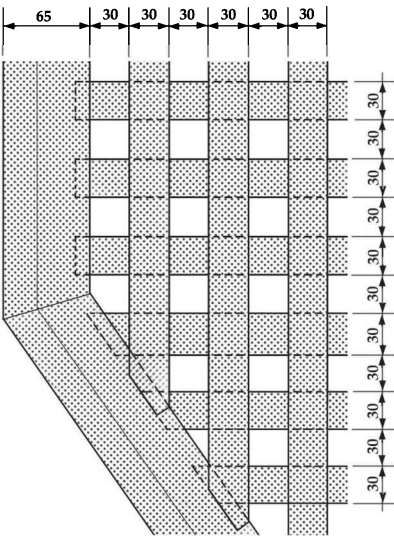
G - G



C1/85



C1/86



C Superstructure – Platforms

C2/1 Air defence command platform (+26 055)
(1/150 scale)

C2/2 Fore part of platform in 1943

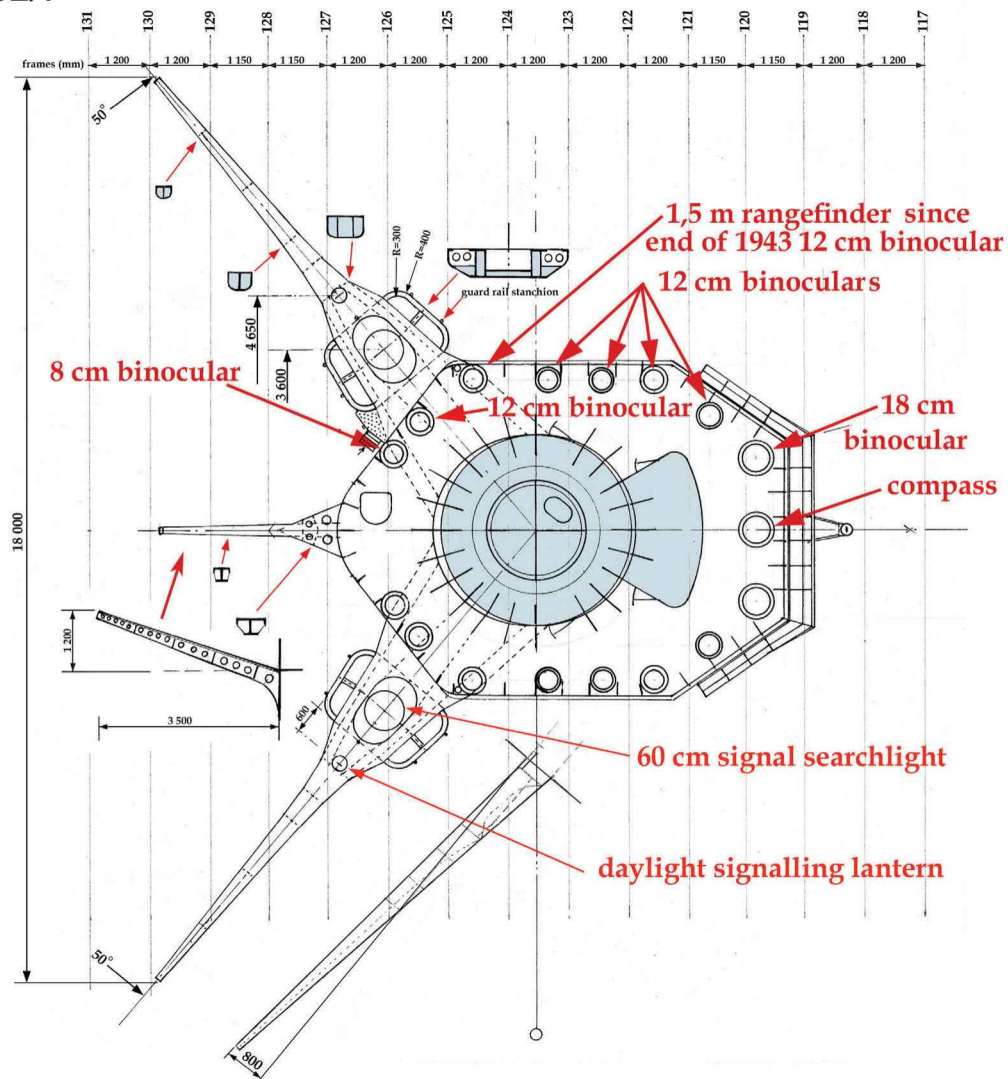
Construction of signal and antenna yards:

C2/3 Signal yard side sections

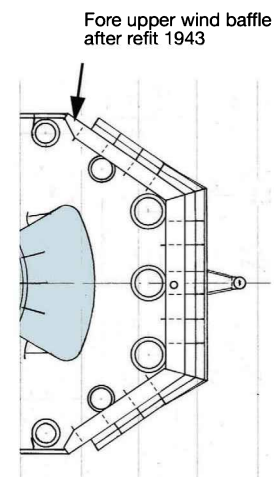
C2/4 Plan

C2/5 Antenna yard

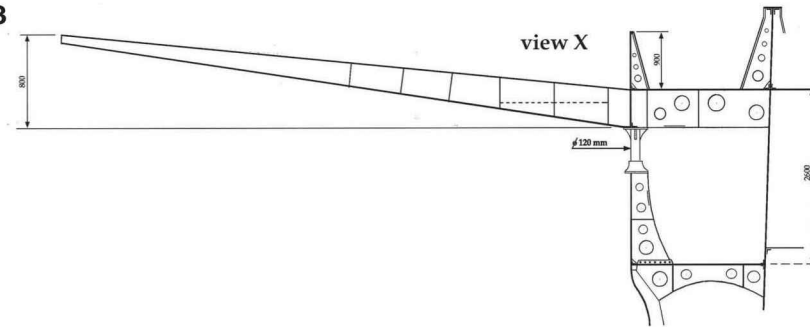
C2/1



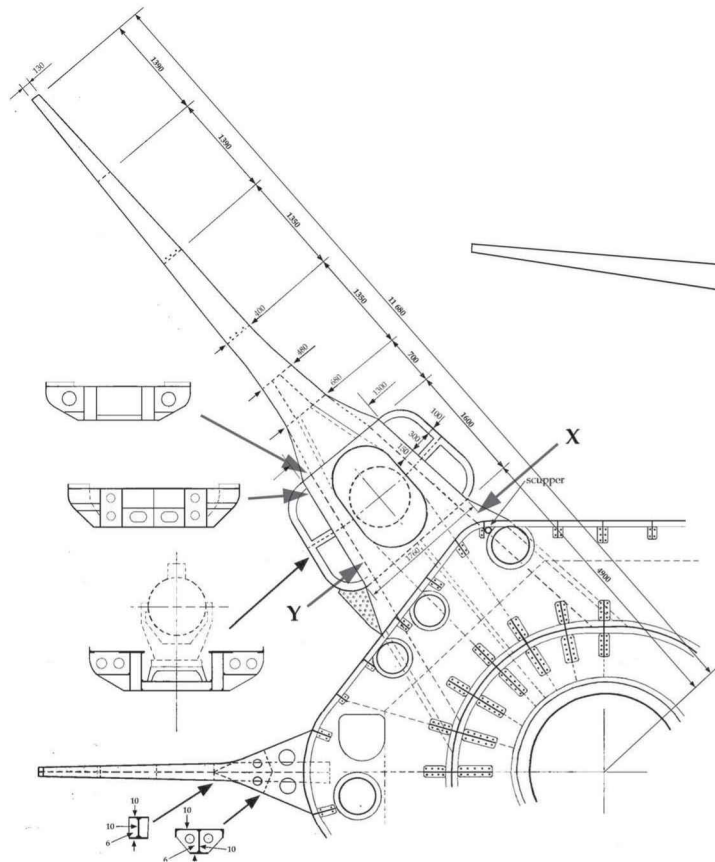
C2/2



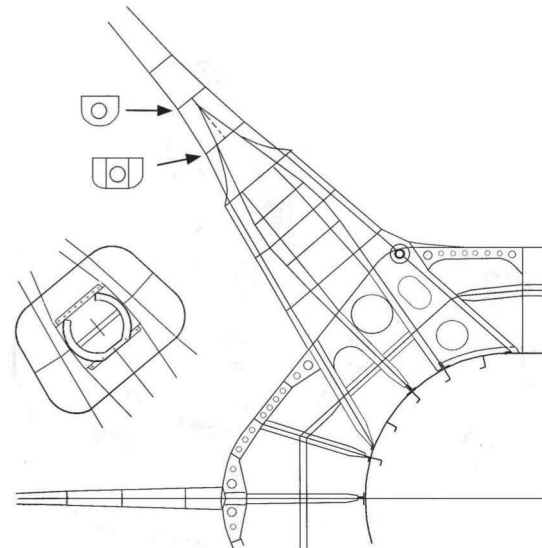
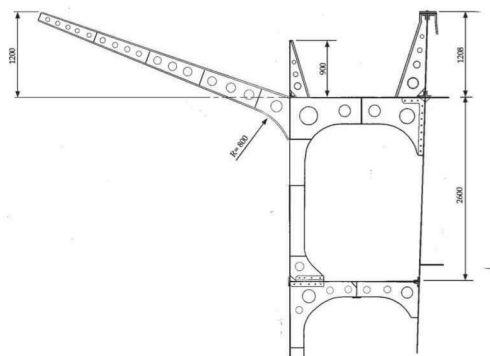
C2/3



C2/4



C2/5



C Superstructure – Platforms

Compact bridge level +23 705 / +23 455 (1/150 scale)

C2/6 Yamato 1941

C2/7 Musashi 1942

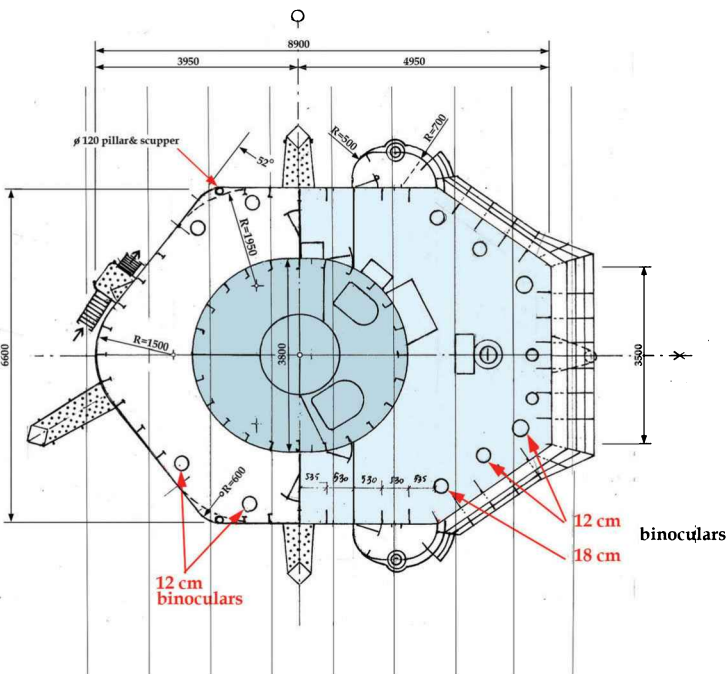
C2/8 Platform level +21 155

C2/9 Platform level +18 955

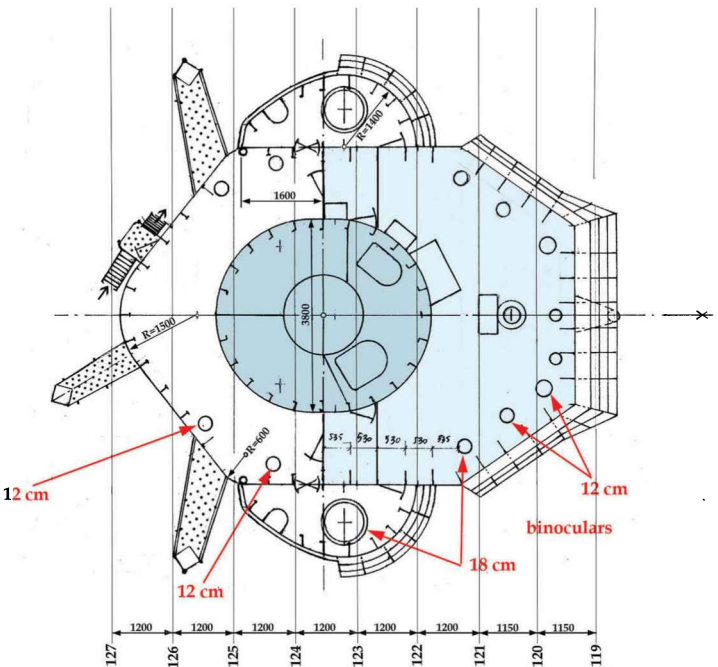
C2/10 Sponsons for searchlight control towers

C2/11 Platform level +16 755

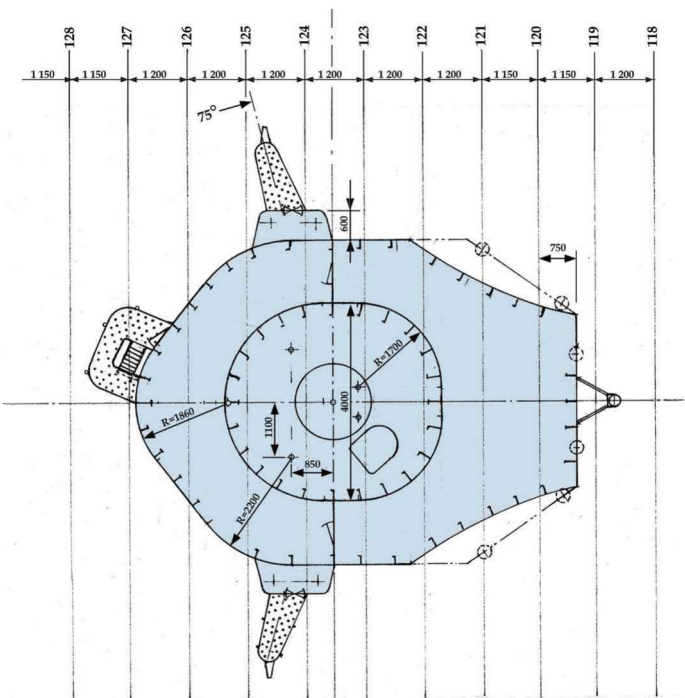
C2/6



C2/7



C2/8



[illegible]

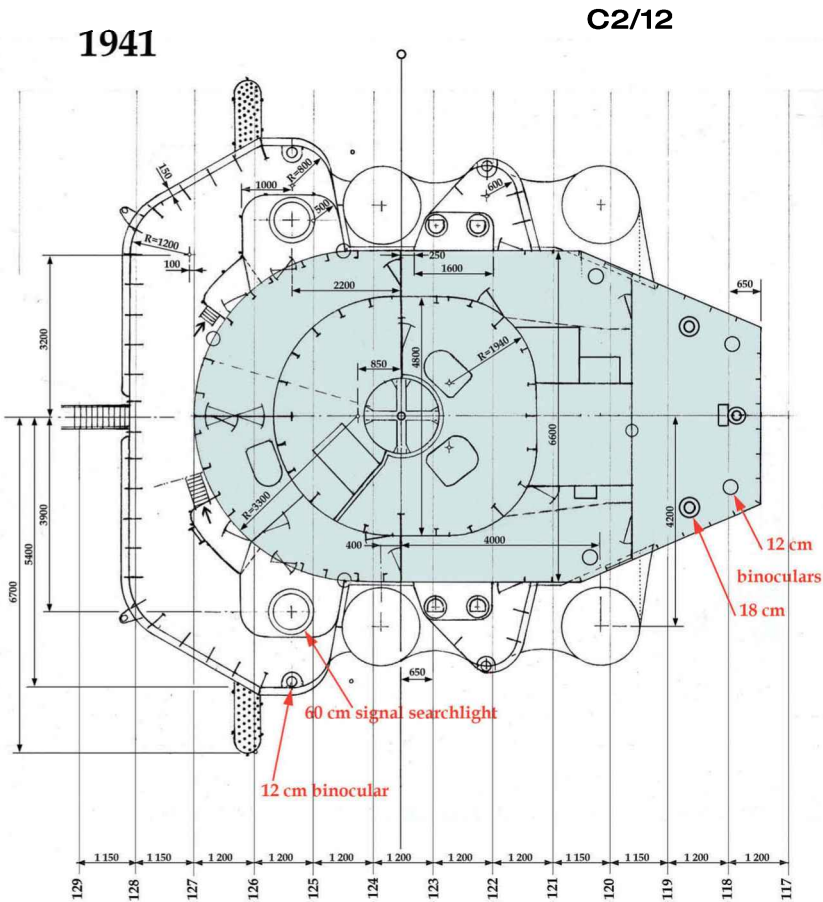
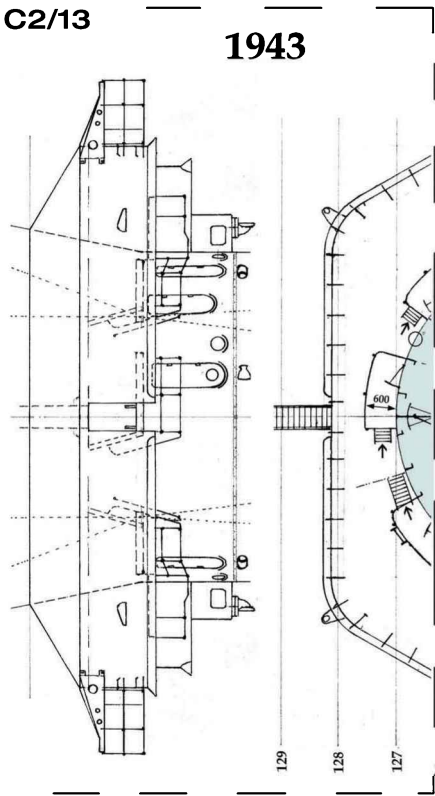
Figure 1 consists of two schematic diagrams of a hull cross-section. Diagram (a) is the starboard cross-section, showing a curved hull with a flat surface indicated by a dashed line and a shaded area representing the plating. Diagram (b) is the port cross-section, showing the hull structure with dimensions: 2,200 (total height), 350 (height of the upper section), 673 (height of the lower section), and 140 (height of the bottom section).

C Superstructure – Platforms

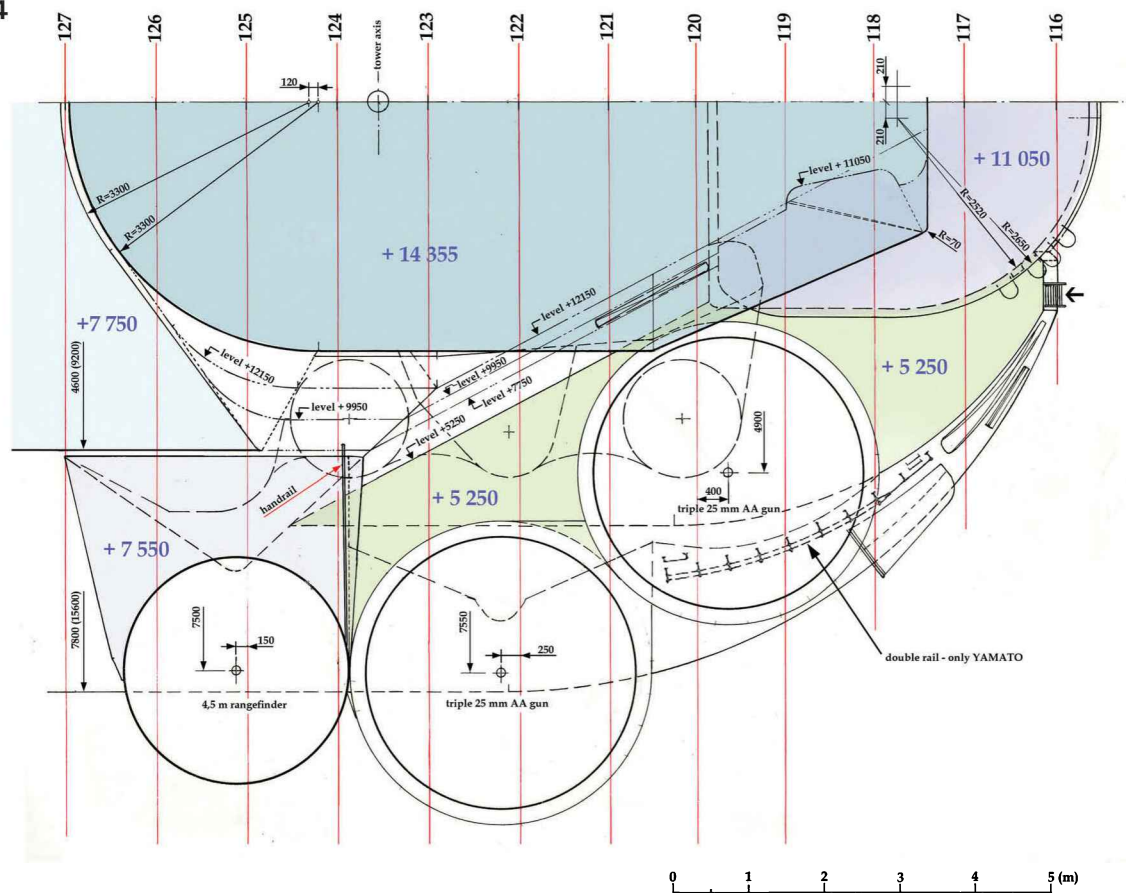
C2/12 Platform level + 14 355 in 1941 (1/150 scale)

C2/13 Signal platform in 1943

C2/14 Lower platforms of superstructure fore part
(1/100 scale)



C2/14



C Superstructure – Platforms

Conning Tower (1/100 scale)

C2/15 Periscope in conning tower - section

C2/16 Conning tower compartment plan

Upper part of rear tower

C2/17 Support plates

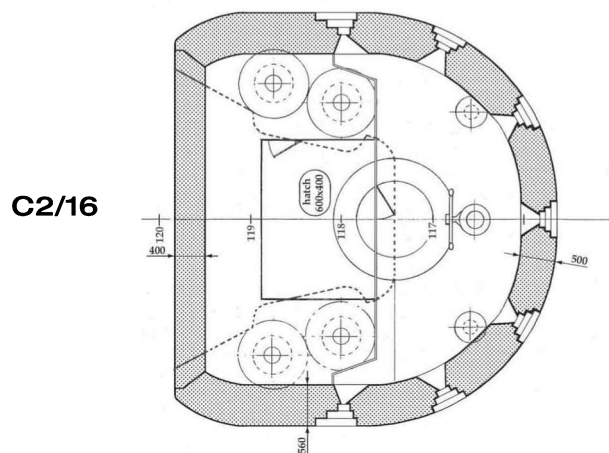
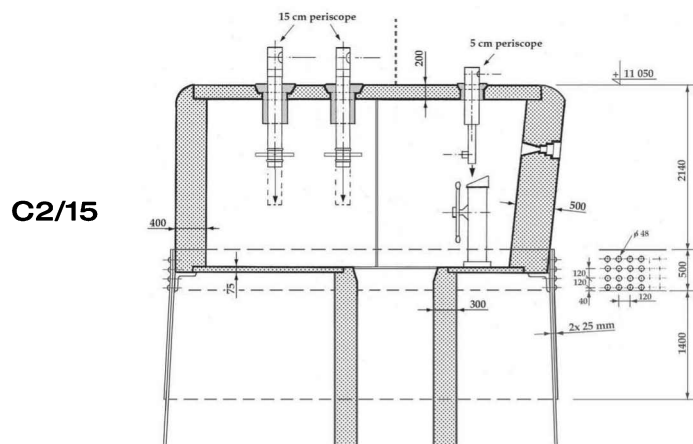
C2/18 Plan of support plates

Rear part of superstructure levels

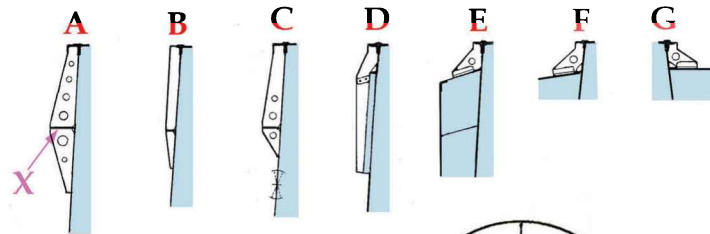
C2/19 Rear elevation

C2/20 Plan

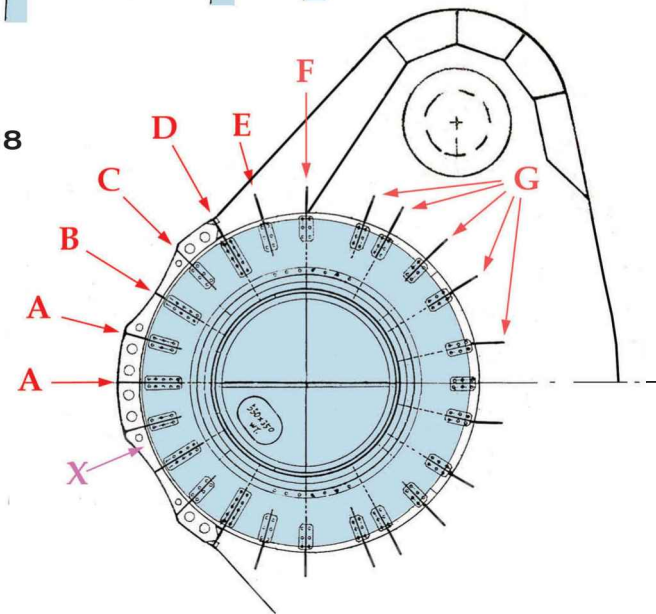
C2/21 Bottom view of 25mm MG sponsons



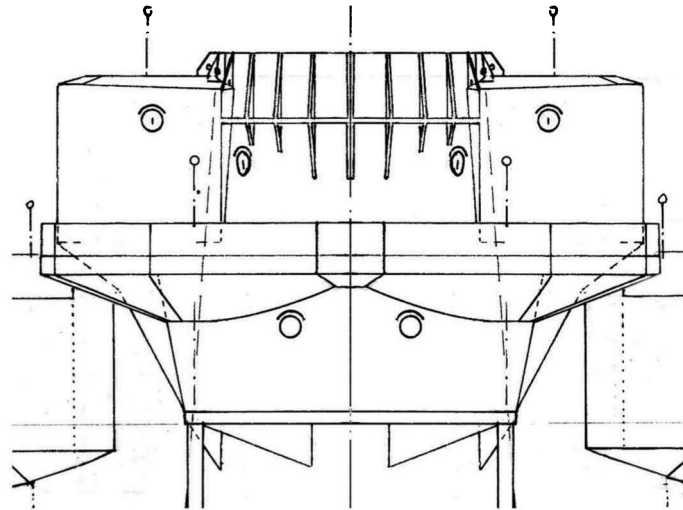
C2/17



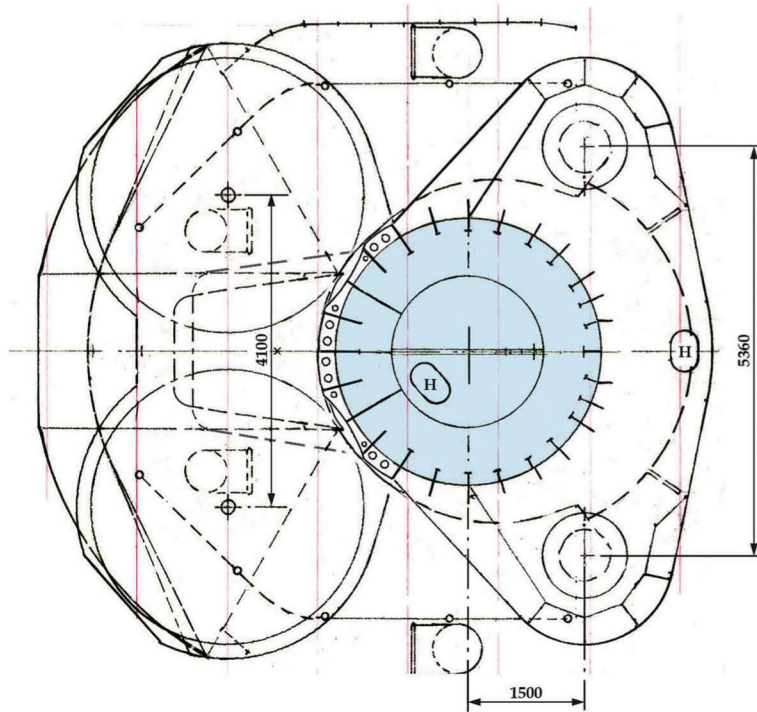
C2/18



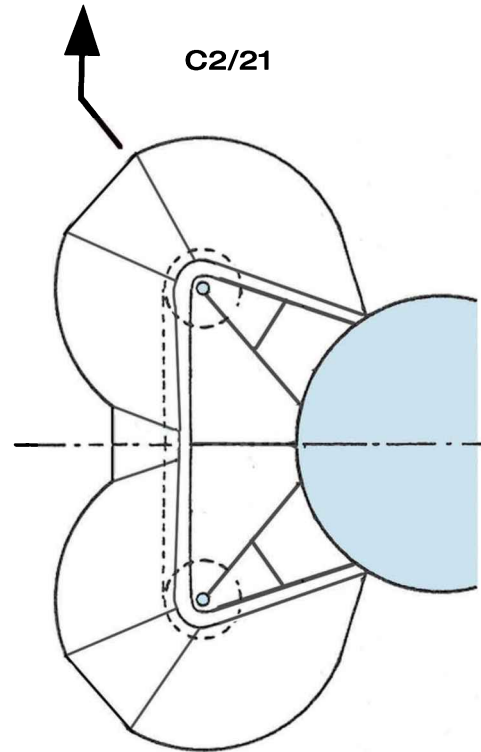
C2/19



C2/20



C2/21



C Superstructure – Platforms

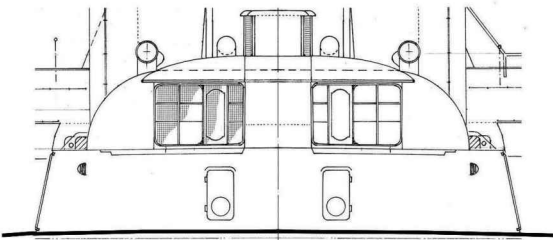
Yamato/Musashi superstructure 1941-1943
(1/200 scale)

C2/22 Plan of lower decks of superstructure

C2/23 Rear view

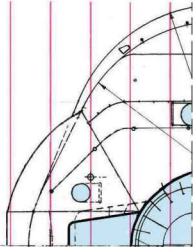
C2/24 Plan of lower platforms

C2/24 Profile of rear part

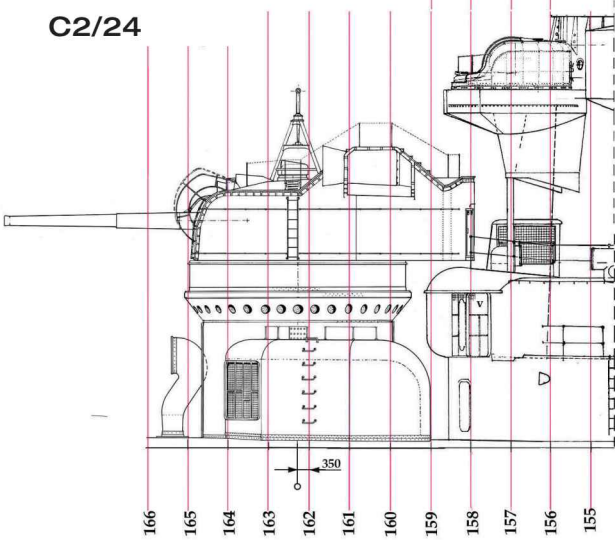


C2/23

C2/23

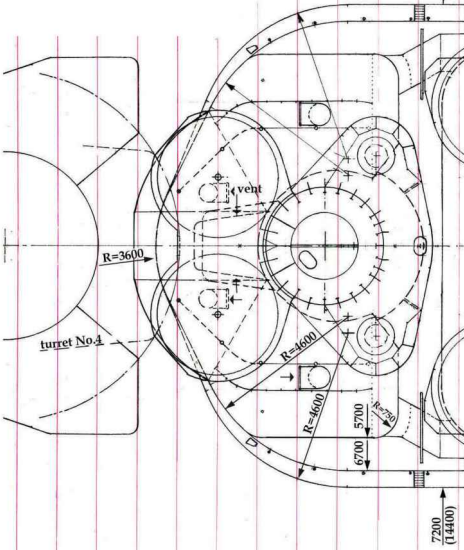


C2/24

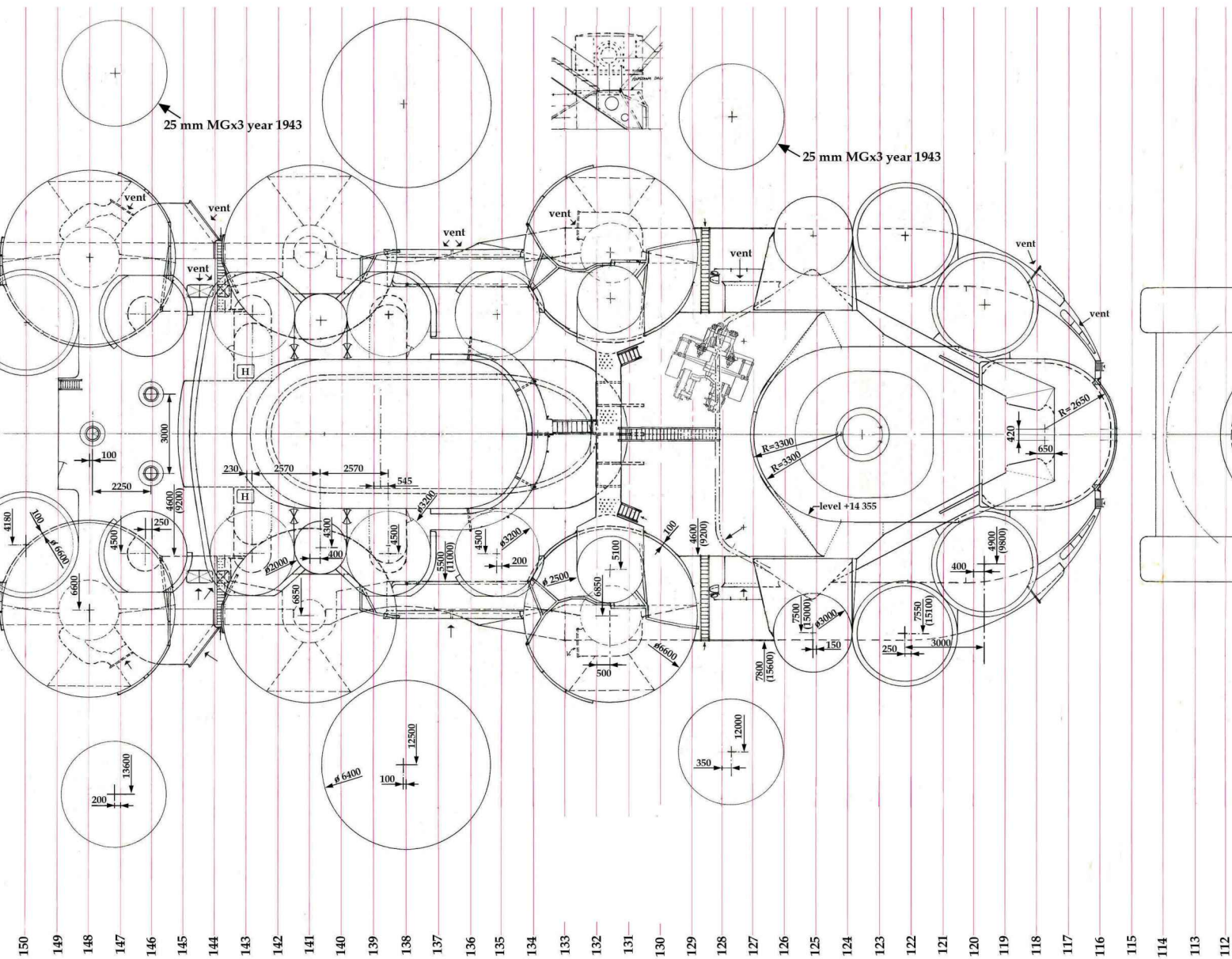


166
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C2/22



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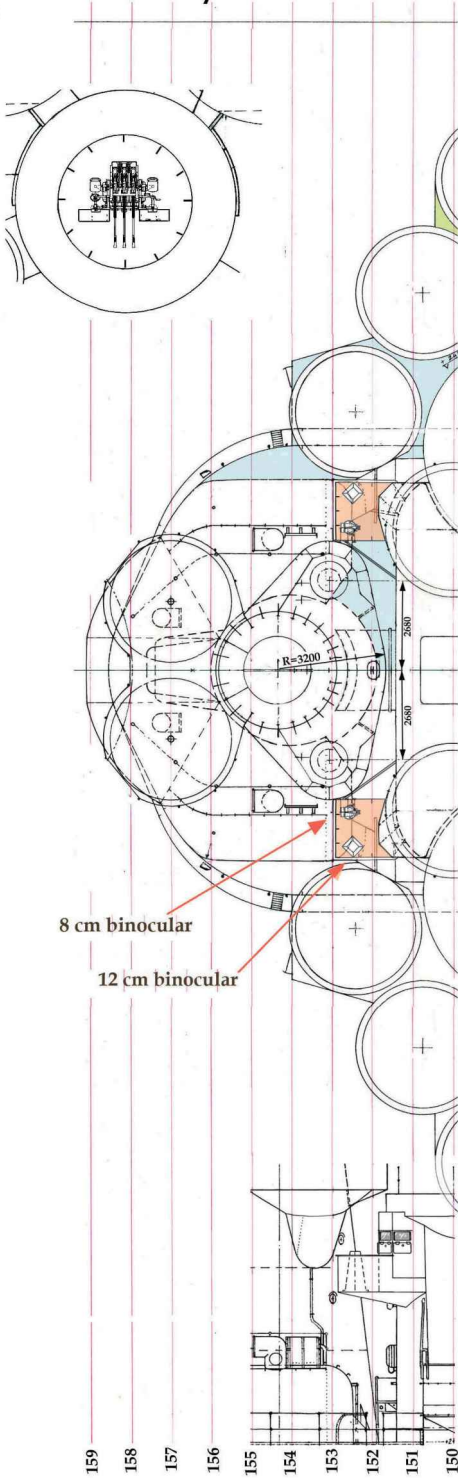


C Superstructure – Platforms

C2/25 Yamato (Musashi) 1944-45 plan (1/200 scale)

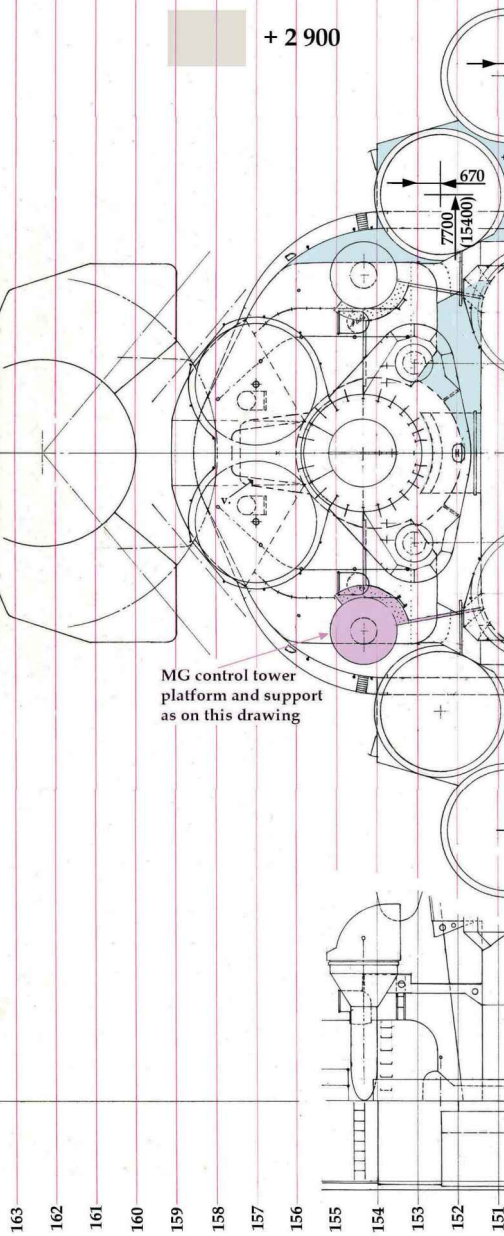
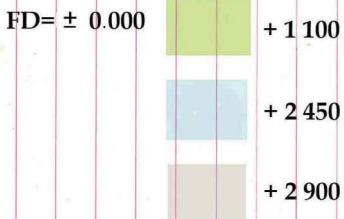
C2/26 Musashi 1944 – differences in comparison to Yamato

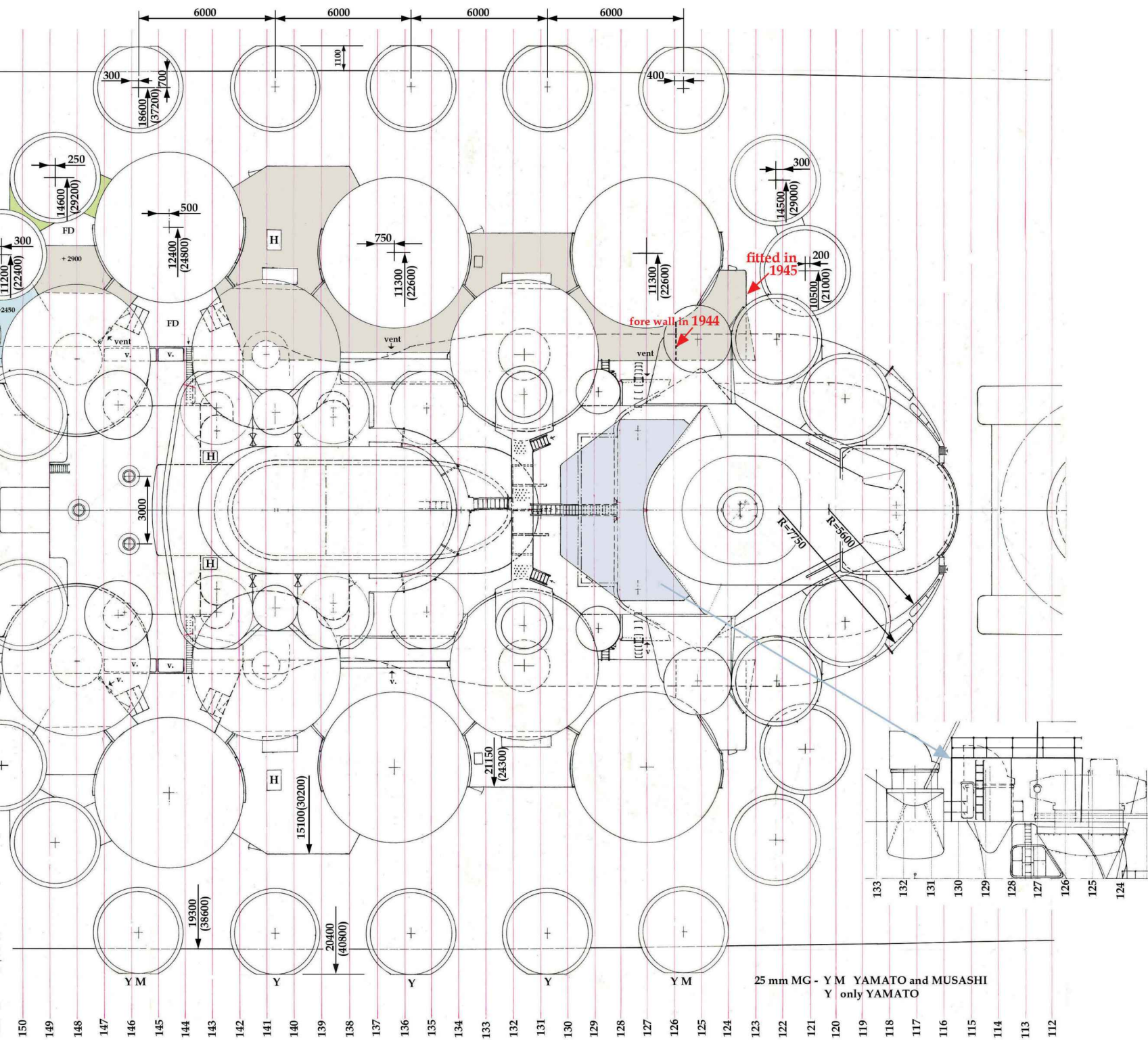
C2/26



C2/25

Deck levels of the additional superstructure:





C Superstructure – Funnel

C3/1 Starboard profile (1/150 scale)

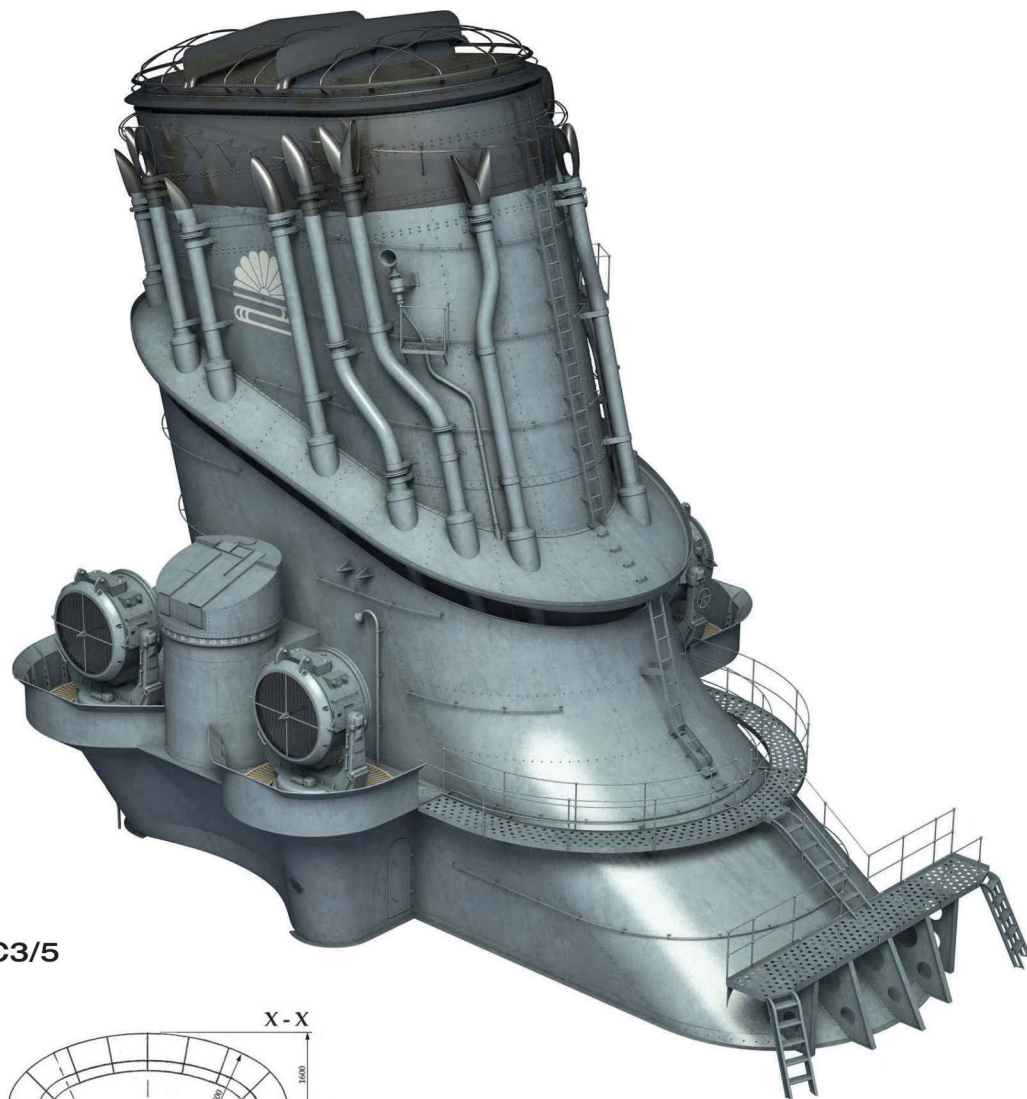
C3/2 Front elevation of lower part

C3/3 Details of steam pipe

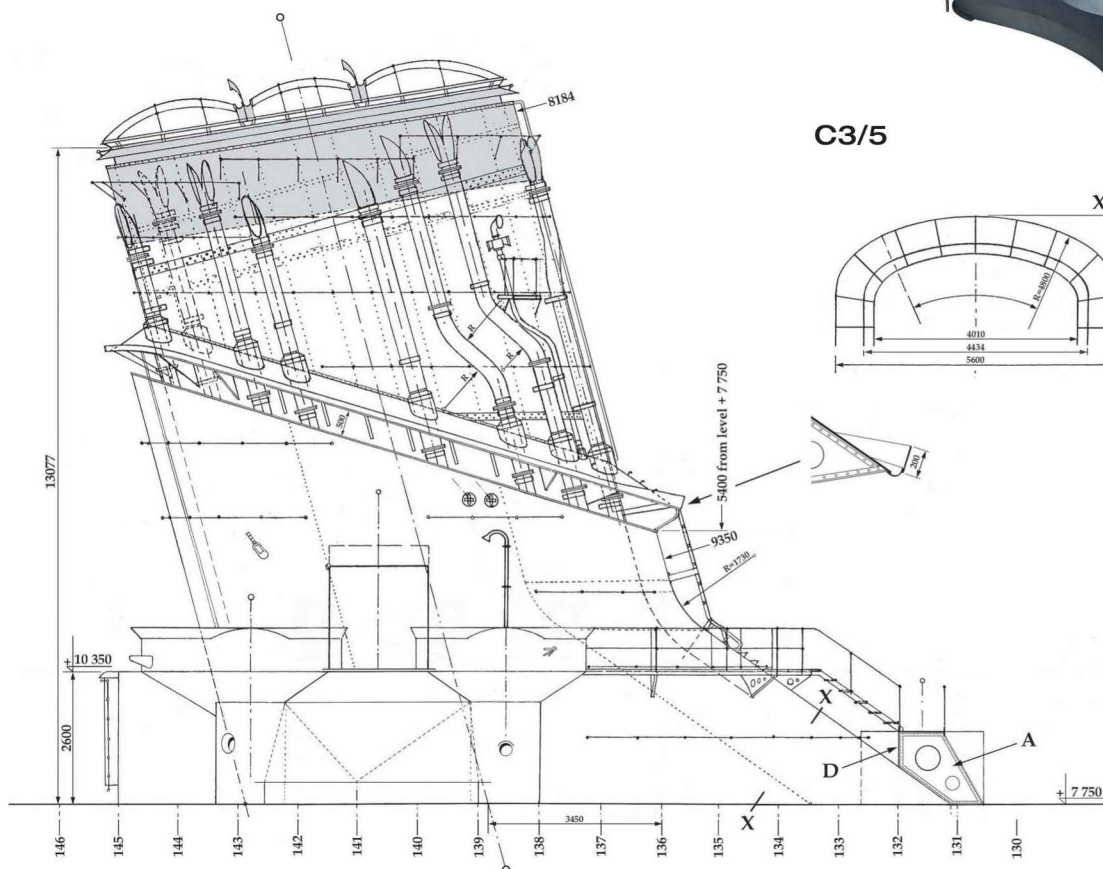
C3/4 Detail of air space rain cover

C3/5 Section X-X

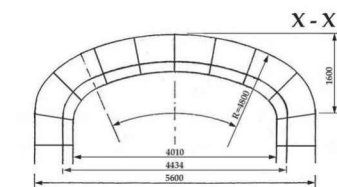
C3/6 Side detail of rain cover



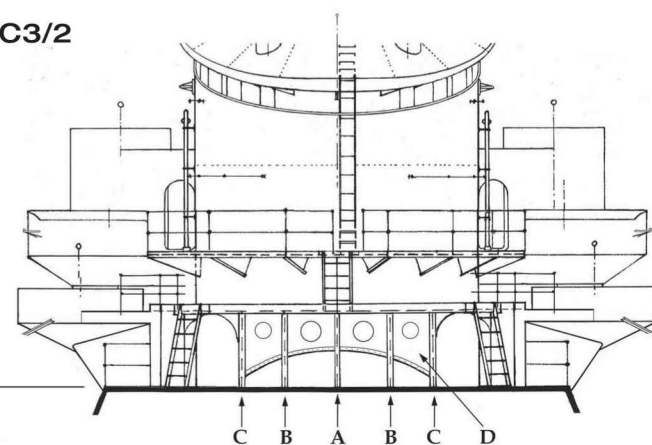
C3/1



C3/5

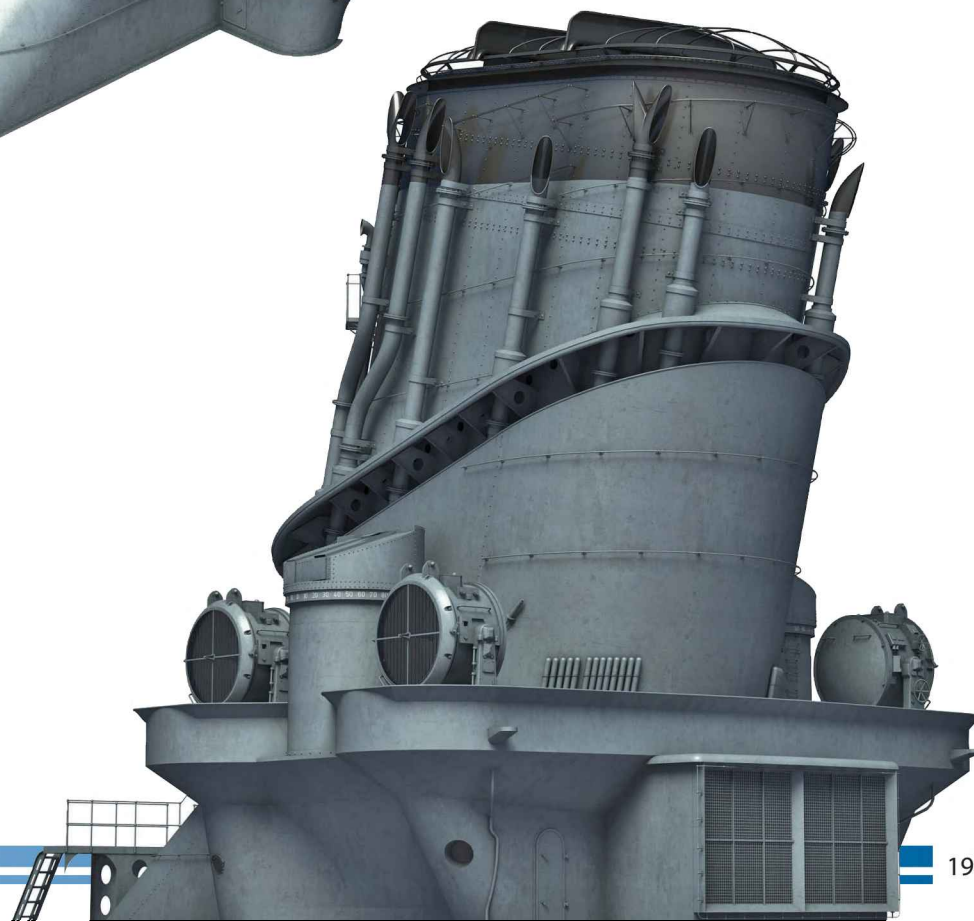
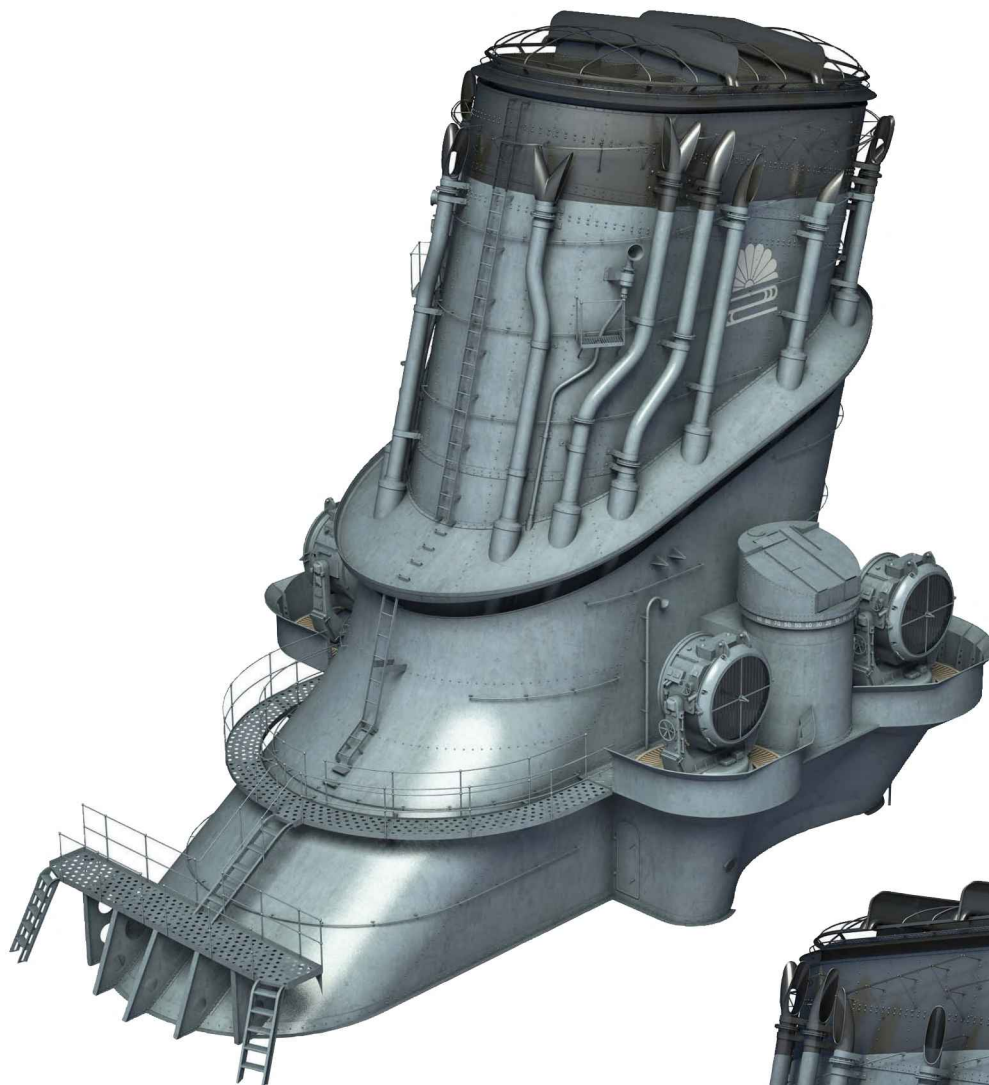
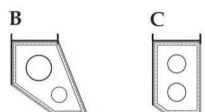


C3/2



[illegible]

Technical drawing of a roof truss section. The drawing shows a gable roof structure with rafters and purlins. A corrugated metal plate is shown with dimensions: 100mm vertical offset, 500mm horizontal span, and a 75x10mm plate. A note indicates "vent holes ø 160".



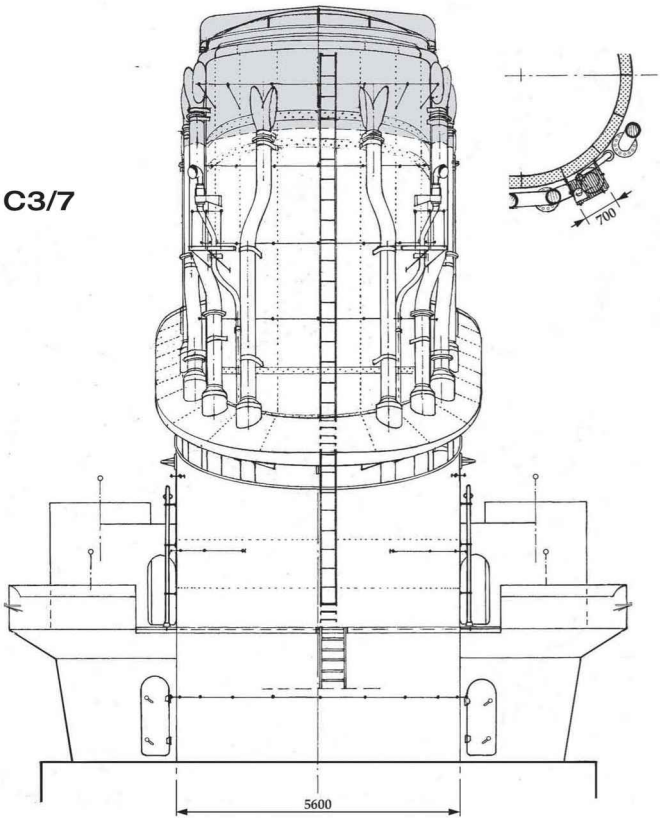
C Superstructure – Funnel

C3/7 Front elevation (1/150 scale)

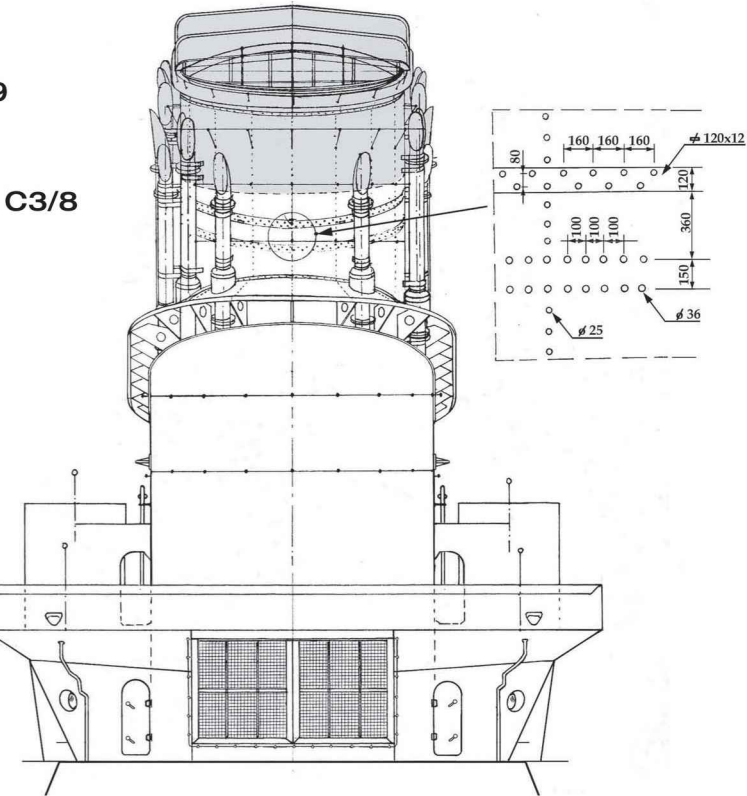
C3/8 Rear elevation

C3/9 Plan of fog horn

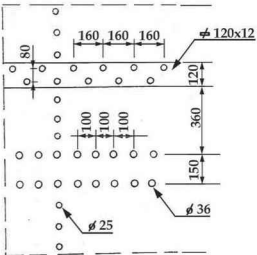
C3/10 Detail of riveting



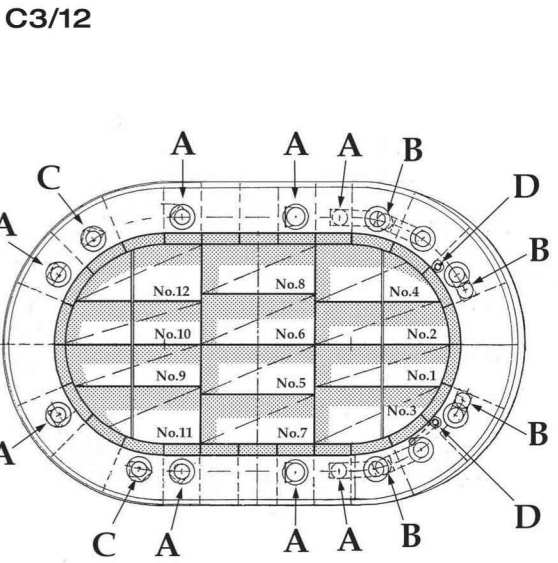
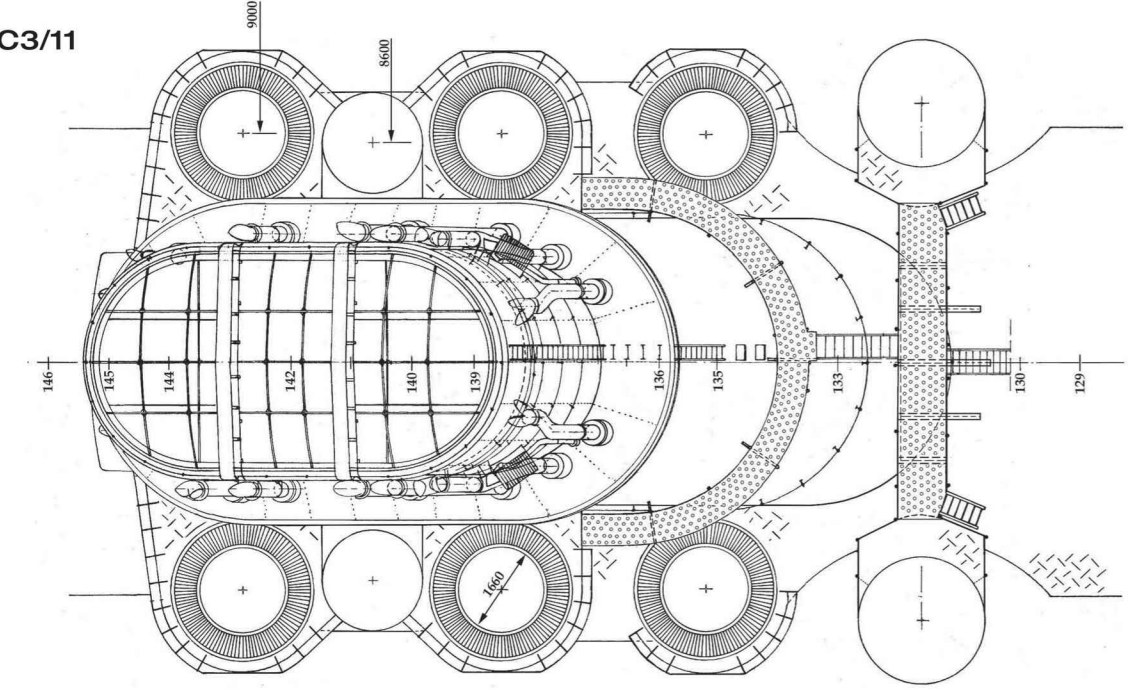
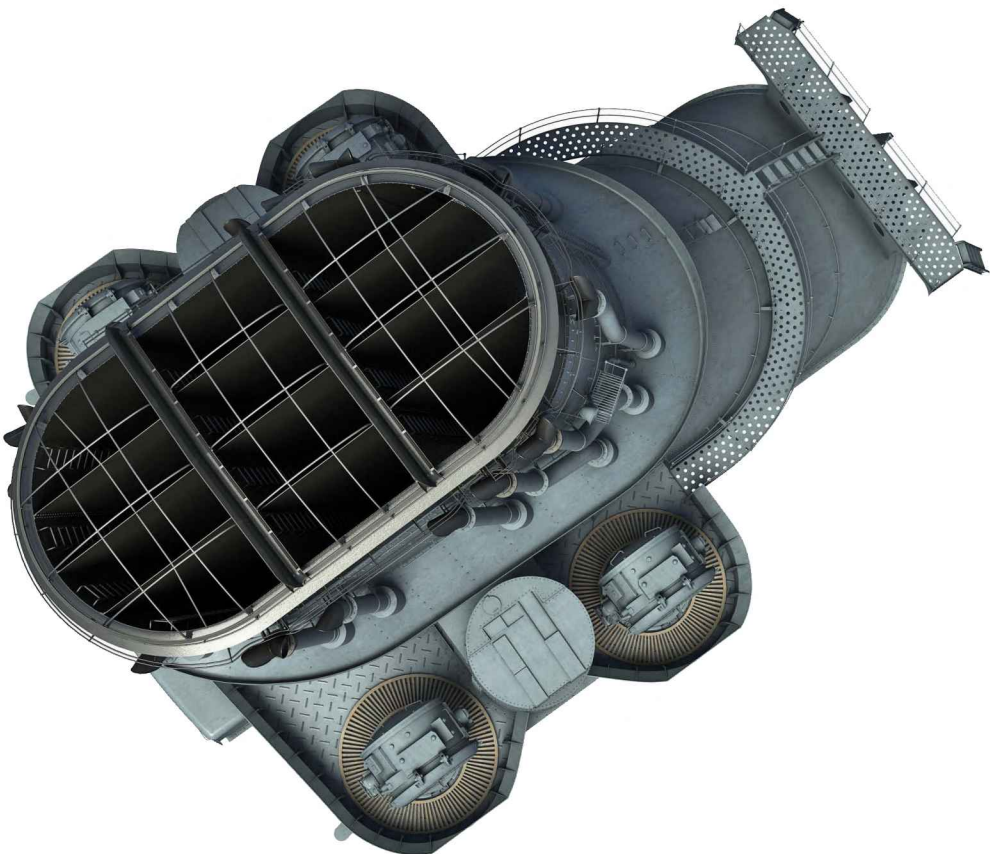
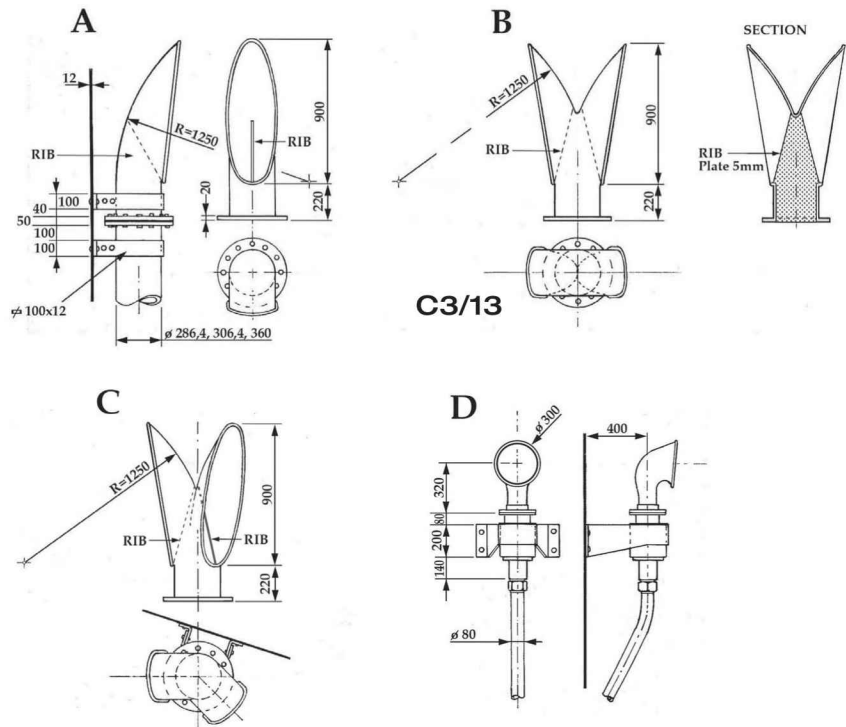
C3/9



C3/10



C3/11 Plan with 150cm searchlight platform
 C3/12 Plan of steam pipes and division plates
 C3/13 Upper part of steam pipes



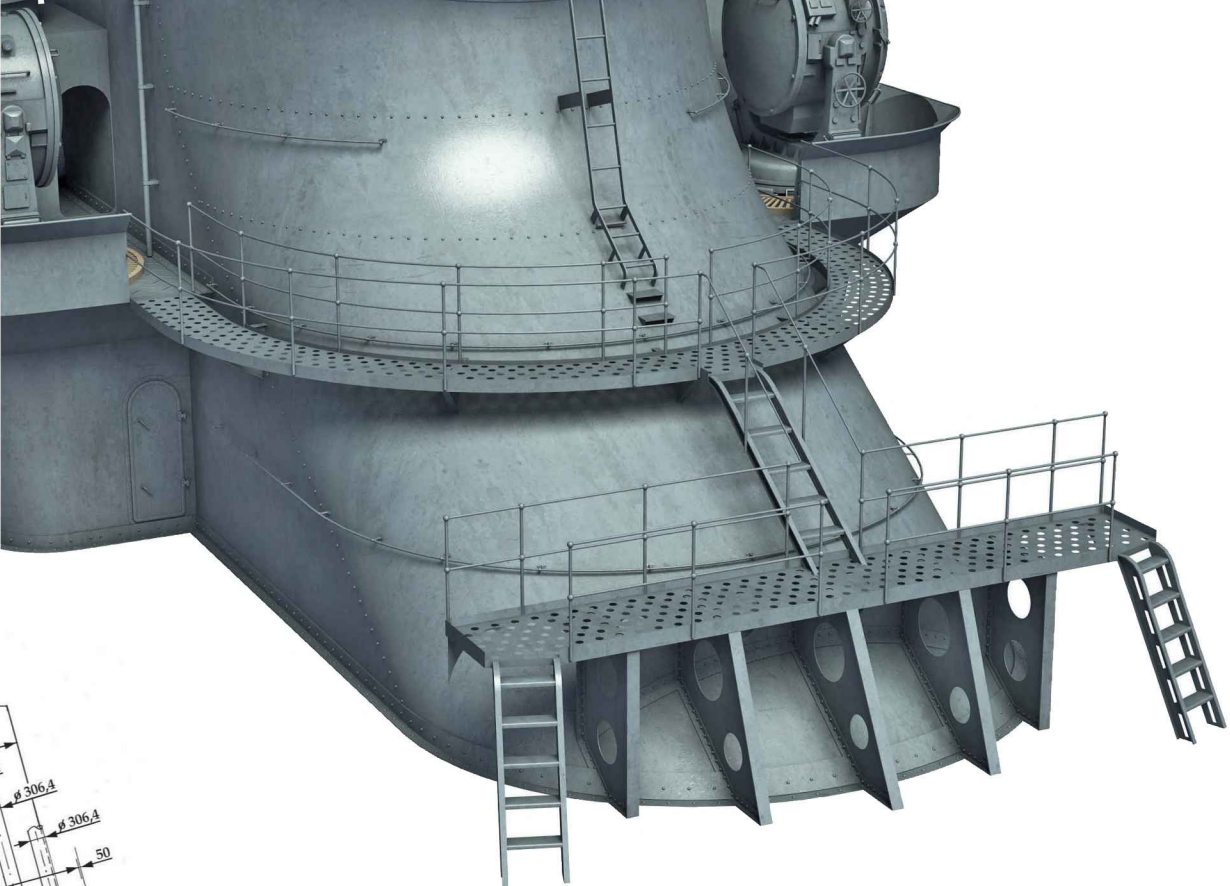
C Superstructure – Funnel

C3/14 Funnel dimensions
(1/150 scale)

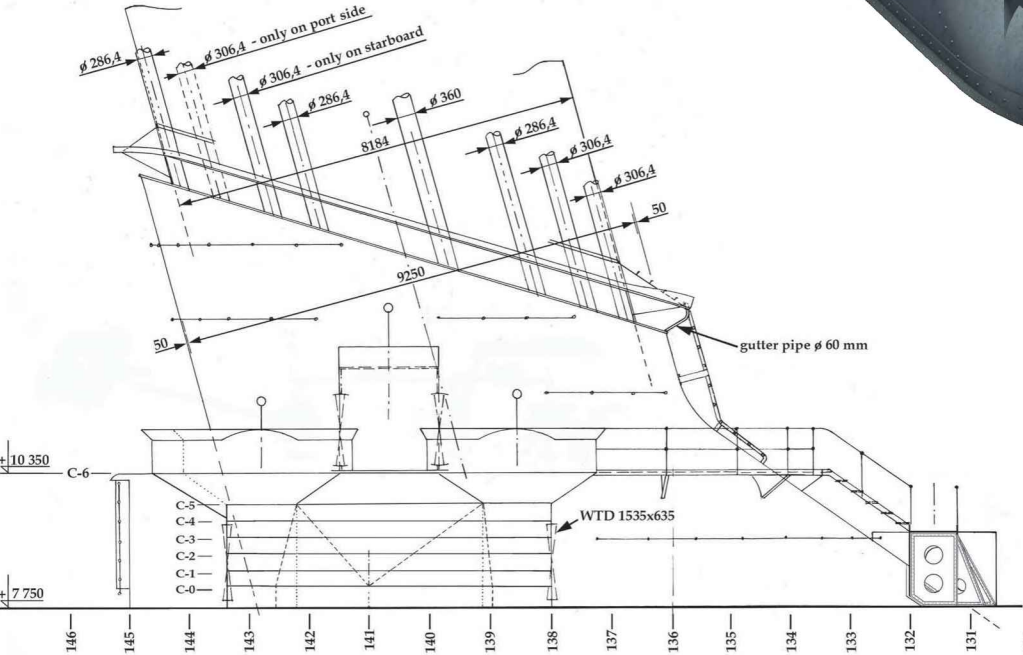
C3/15 Section (scheme)

C3/16 Geometrical form of
searchlights platform support

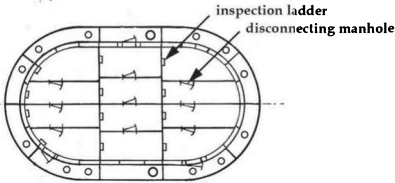
C3/17 Section at frame 141



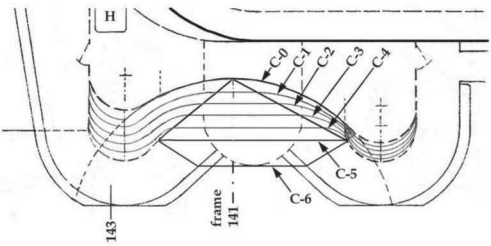
C3/14



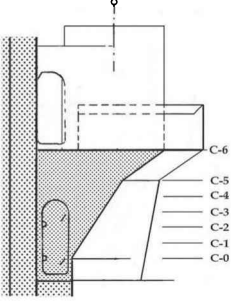
C3/15

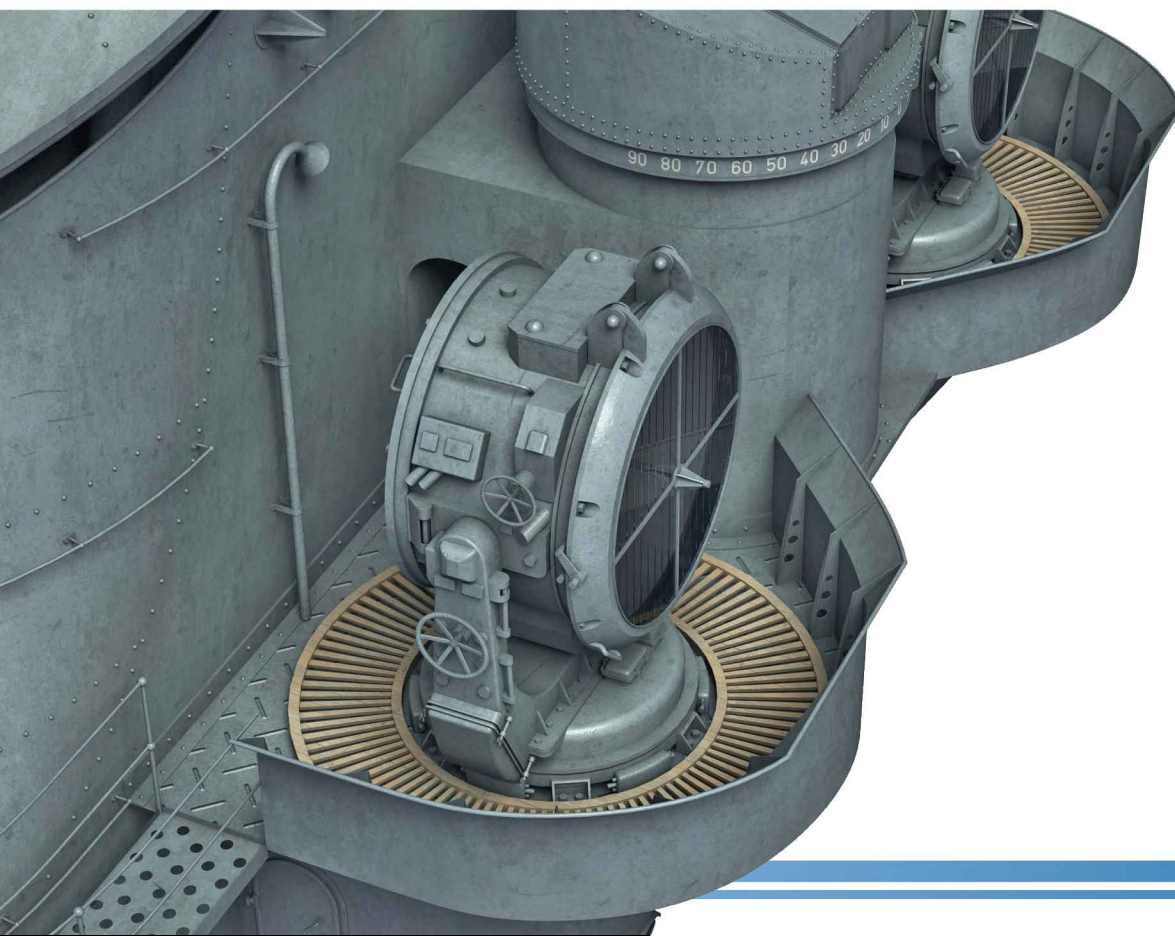
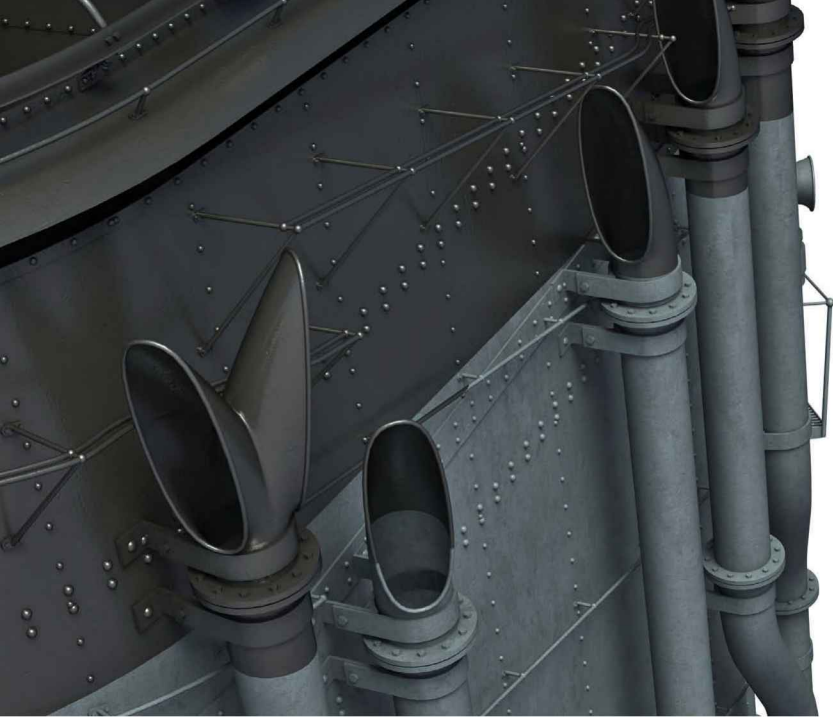


C3/16



C3/17





C Superstructure – Funnel

C3/18 Details of hood (no scale)

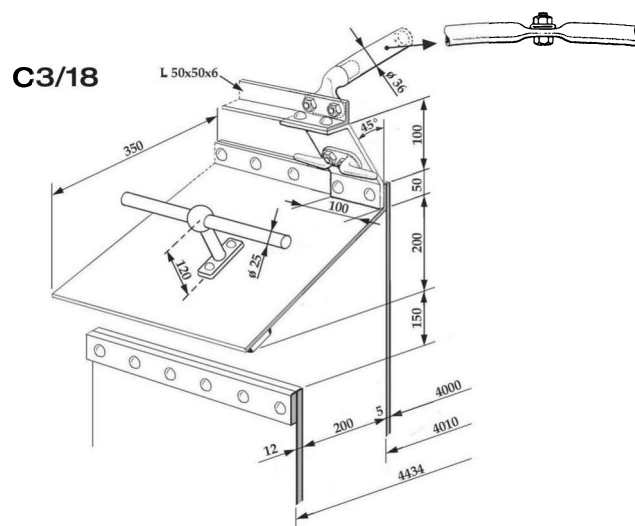
C3/19 Wind shield and gutter

C3/20 Section

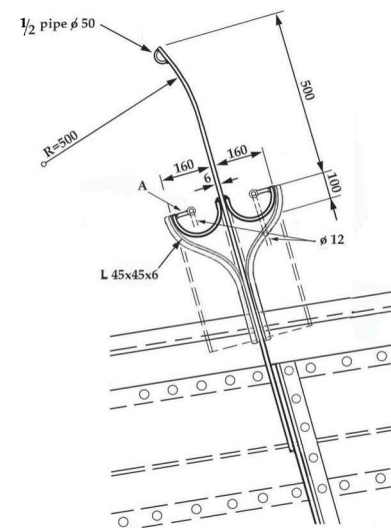
C3/21 Wind shield and gutter

C3/22 Longitudinal section

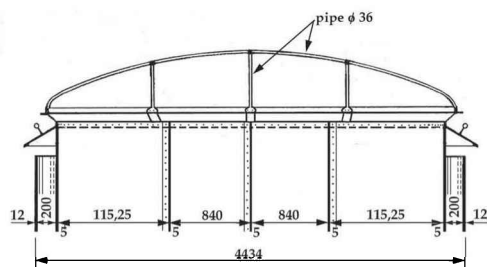
C3/23 Casting ang uptake



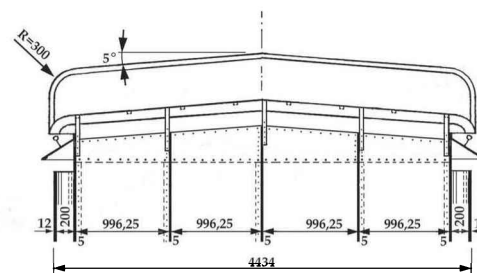
C3/19



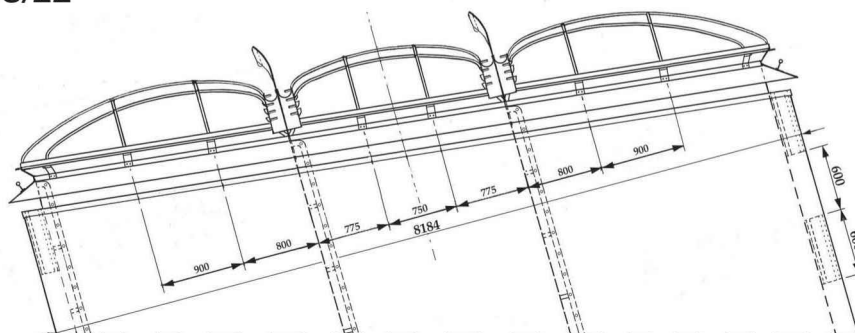
C3/20



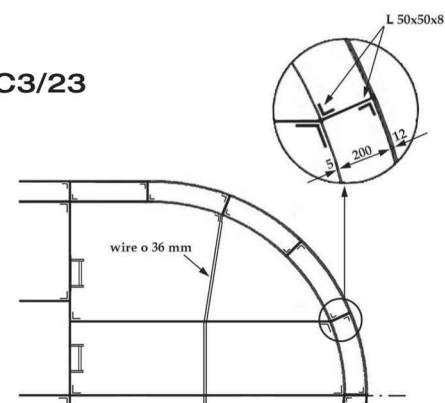
C3/21



C3/22



C3/23





C3/24 White-painted chrysanthemum crest at
'Ten Ichi Gō' Operation (April 1945)

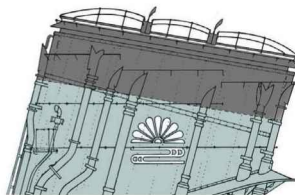
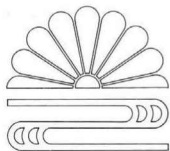
C3/25 Imperial Japanese Navy ensign

C3/26 Vice Admiral's flag

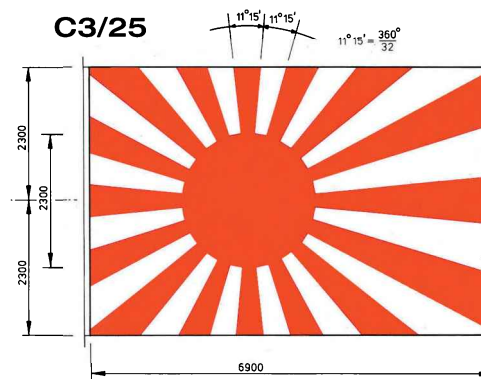
C3/27 Jack

C3/28 Main mast flags as flown on 5-7 April
1945 with Samurai banner

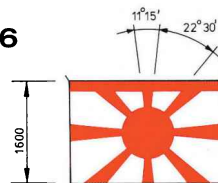
C3/24



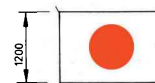
C3/25



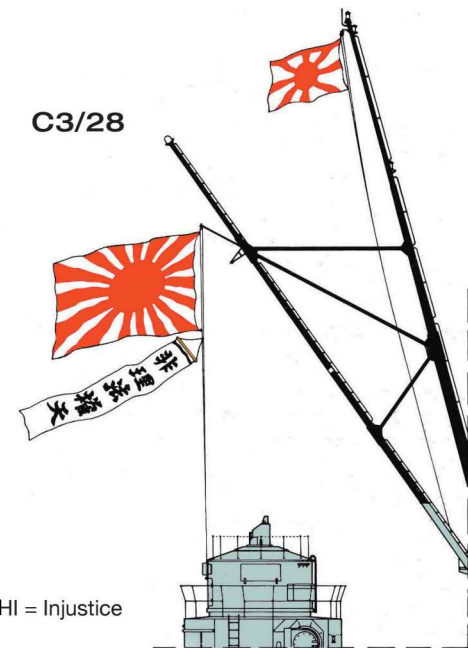
C3/26



C3/27



C3/28



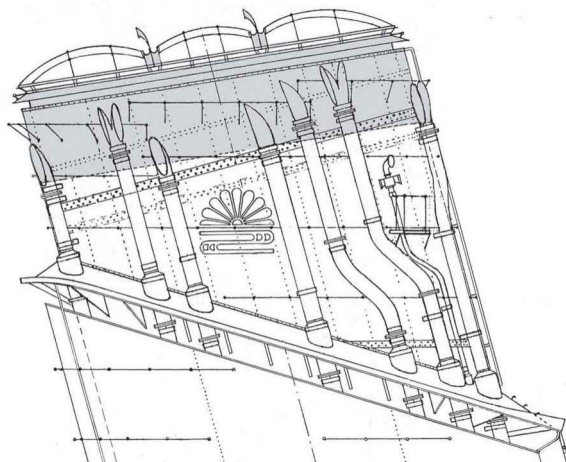
HI = Injustice

RI = Fairness

HO = Law

KEN = Power

TEN = Heaven



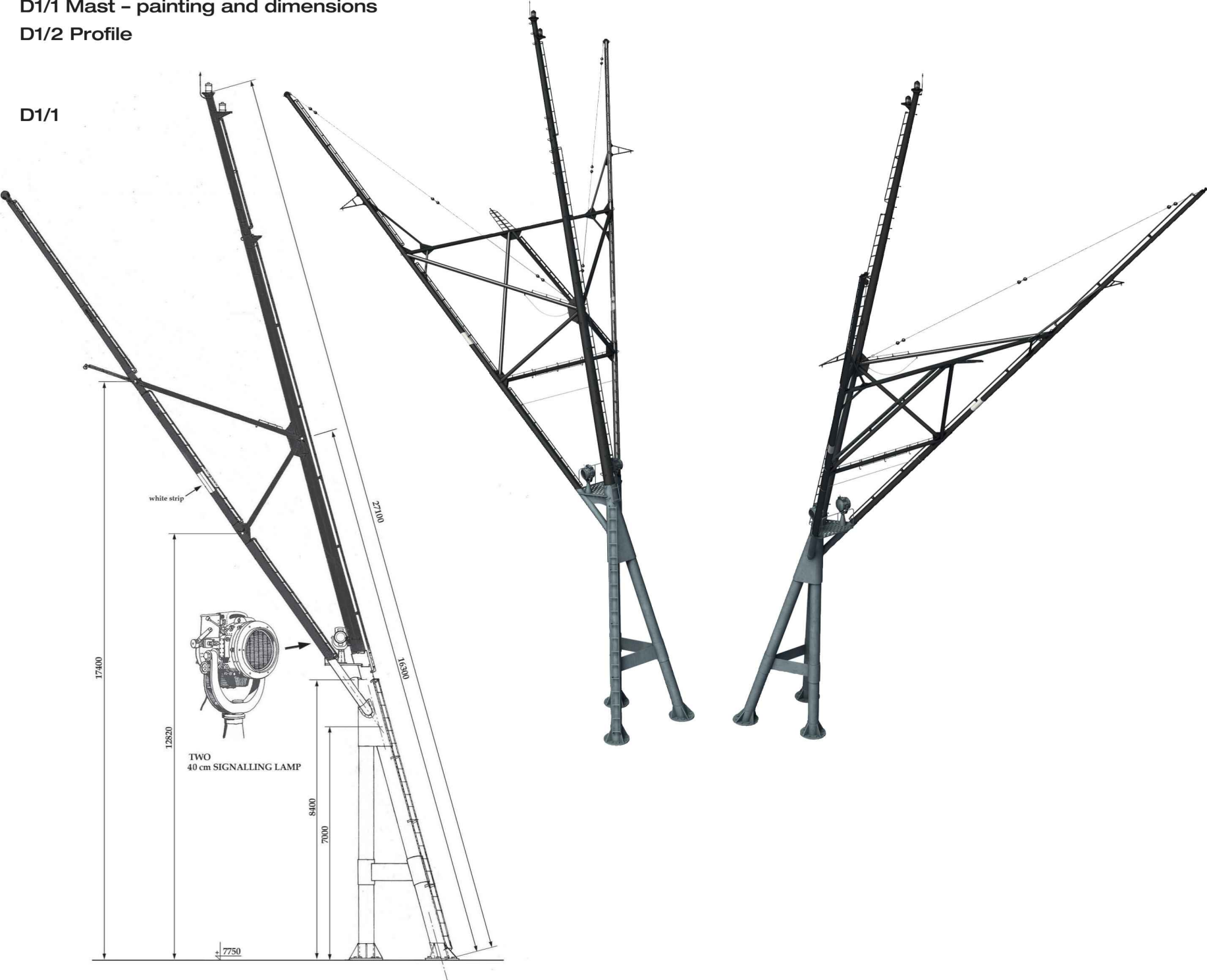
D Rig – Tripod Main Mast

Main mast in the years 1941–43 (1/150 scale)

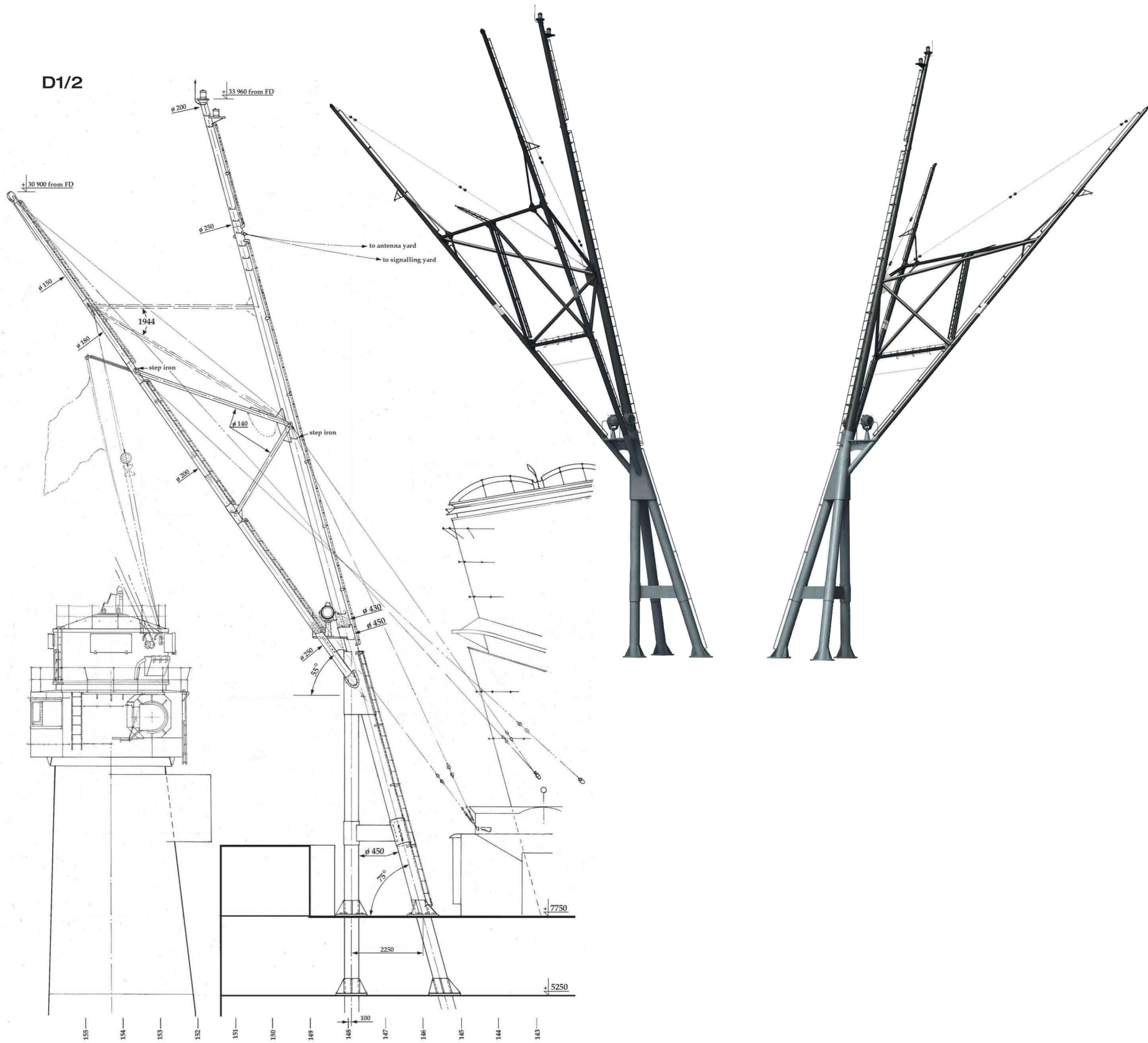
D1/1 Mast – painting and dimensions

D1/2 Profile

D1/1



D1/2



D Rig – Tripod Main Mast

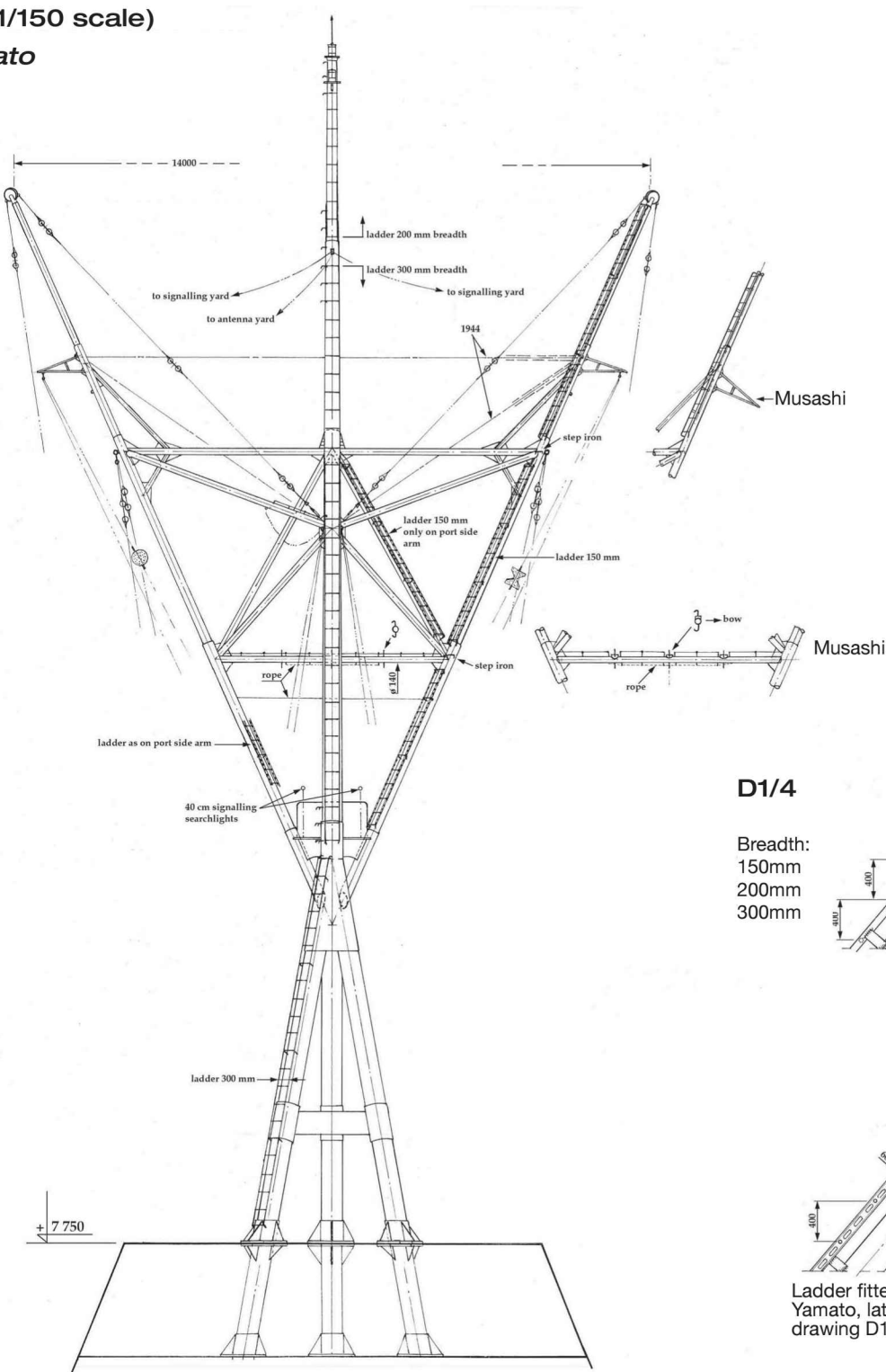
D1/3 View from bow direction (1/150 scale)

D1/4 Ladder *Musashi* and *Yamato*

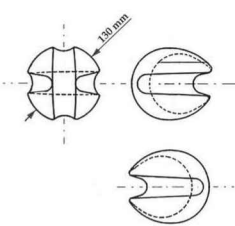
D1/5 Scheme of mast 1941-43

D1/6 Scheme of mast 1943-45

D1/3

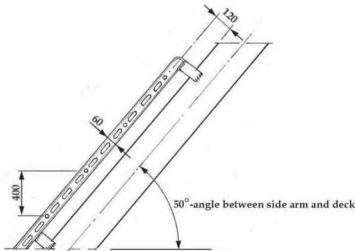
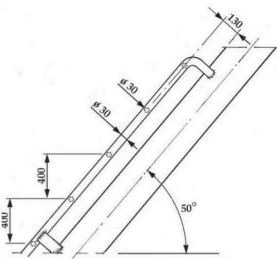


Ball Insulator

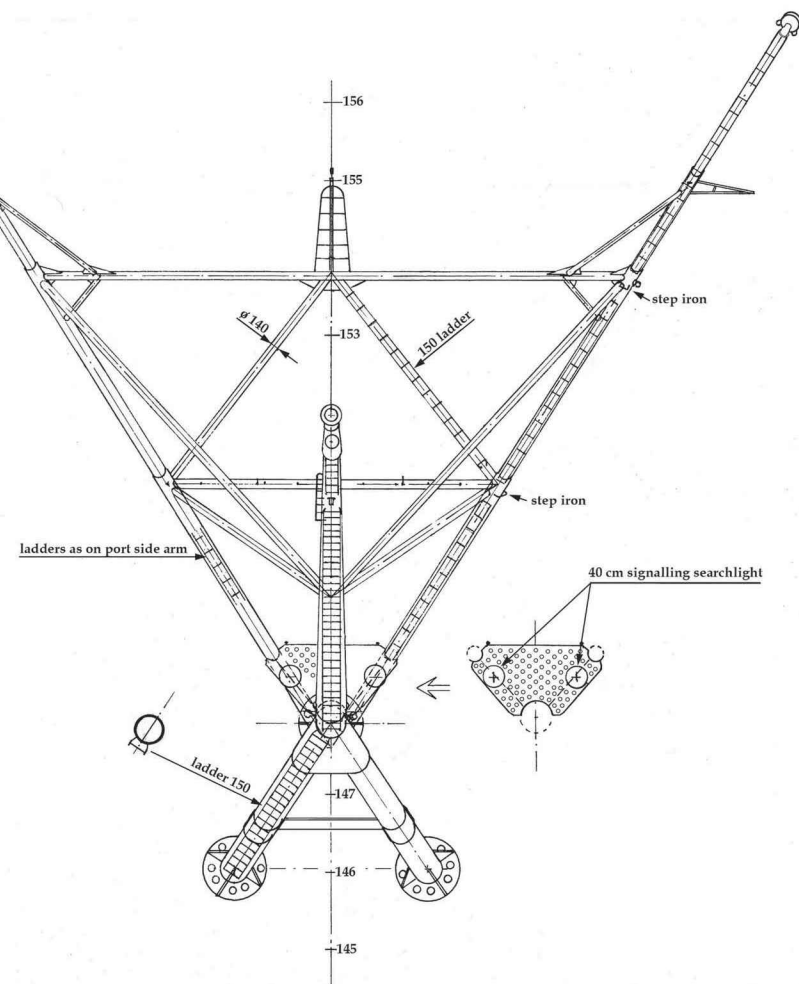
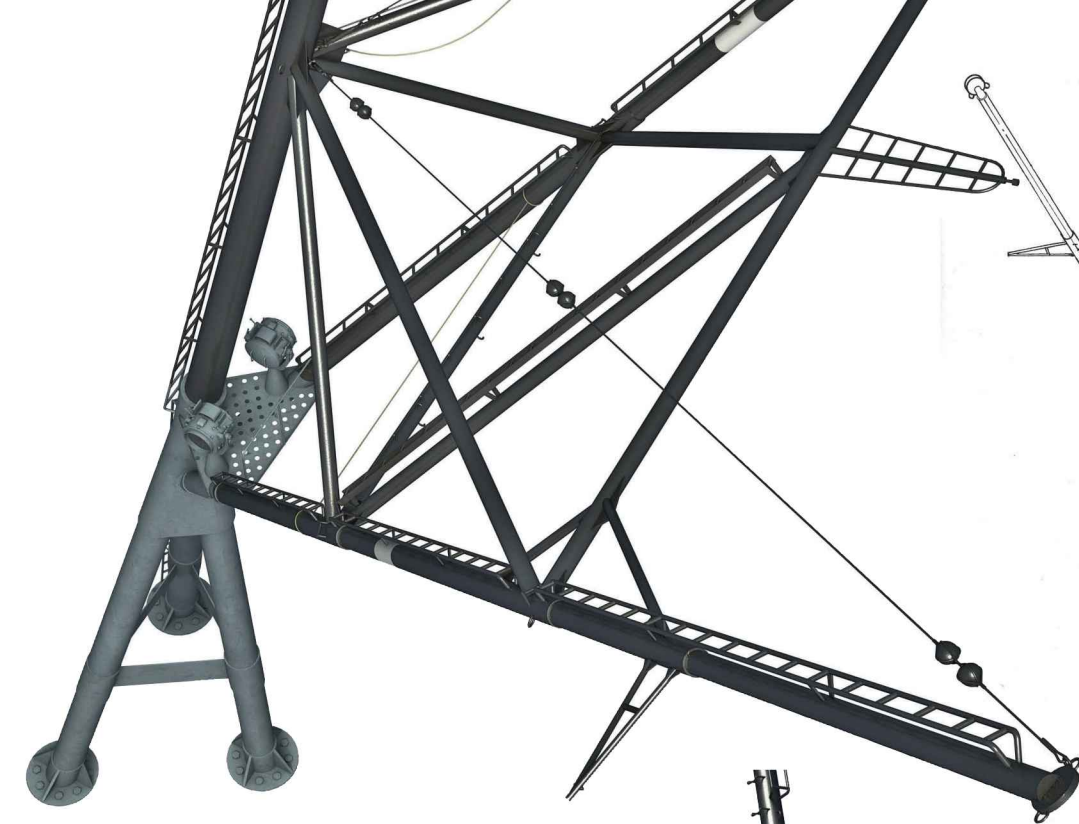


D1/4

Breadth:
150mm
200mm
300mm

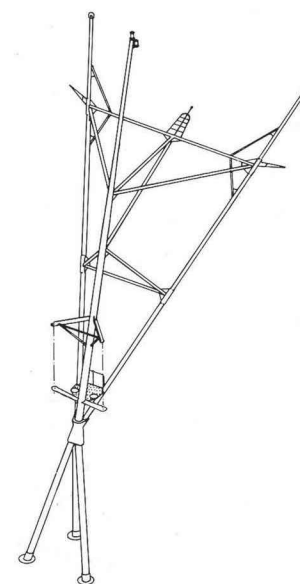
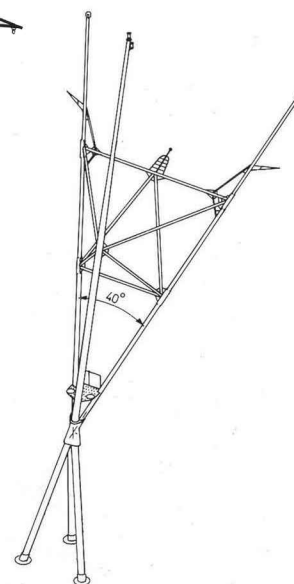


Ladder fitted on right arm of mast on Yamato, later replaced by ladder as drawing D1/4



D1/5

D1/6

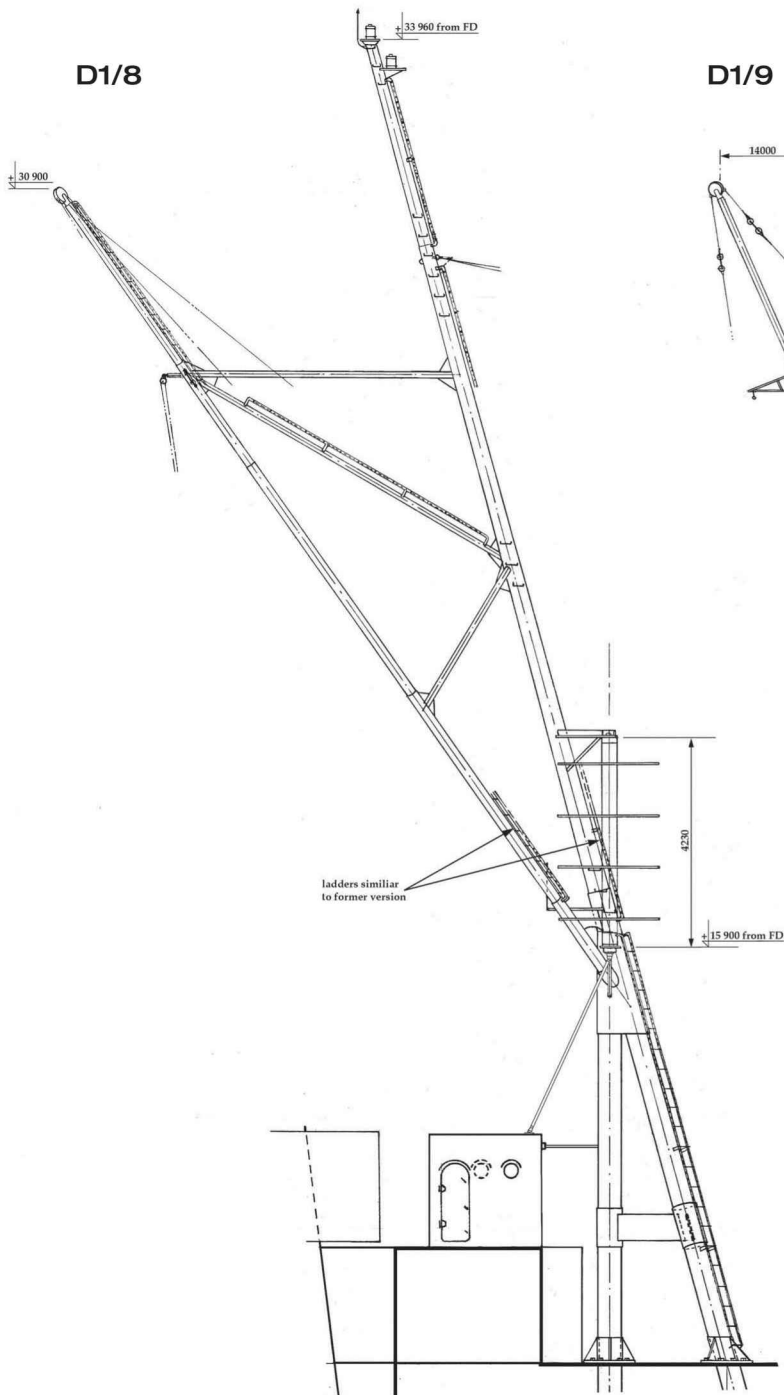


D Rig – Tripod Main Mast

Tripod mast after modernisation (1/150 scale)

D1/7 Profile

D1/8 Front view after April 1944



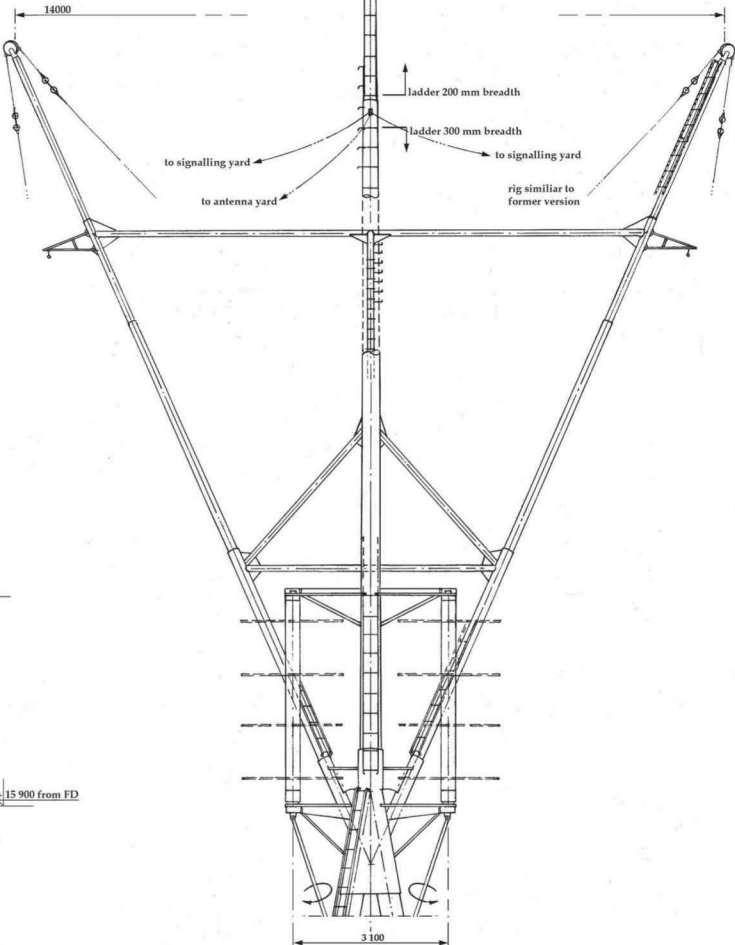
D1/9 Type 13 ('13 Gō') radar antenna

D1/10 Enlarged antenna arms after December 1944

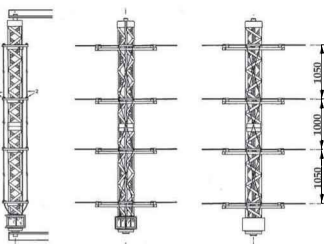
D1/11 Plan after April 1944

D1/12 Plan after December 1944

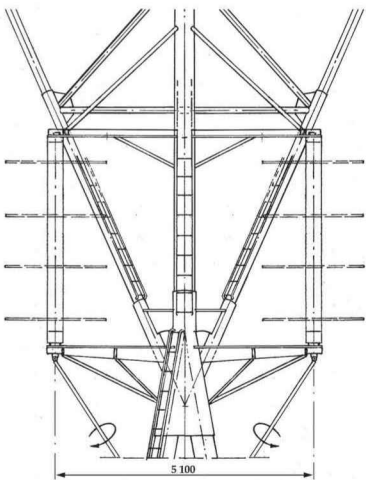
D1/9



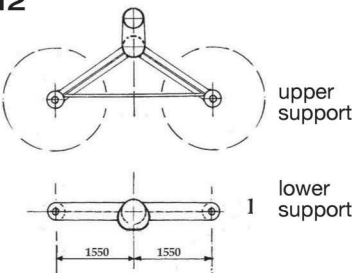
D1/10



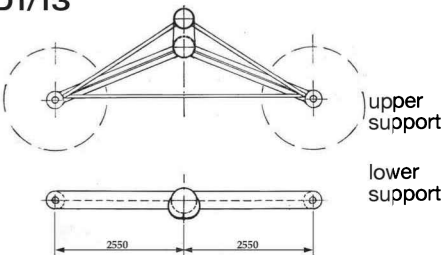
D1/11

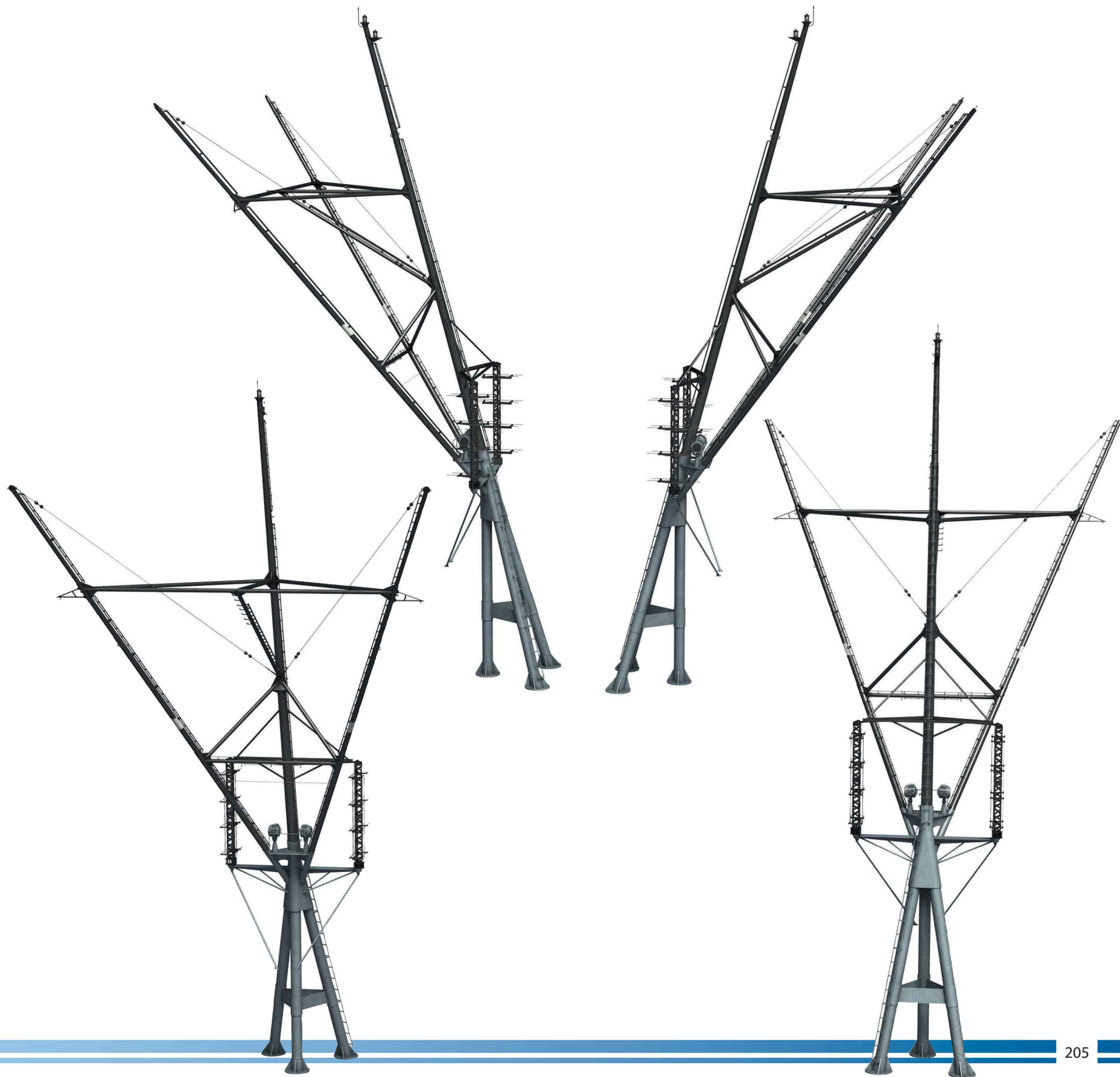


D1/12



D1/13



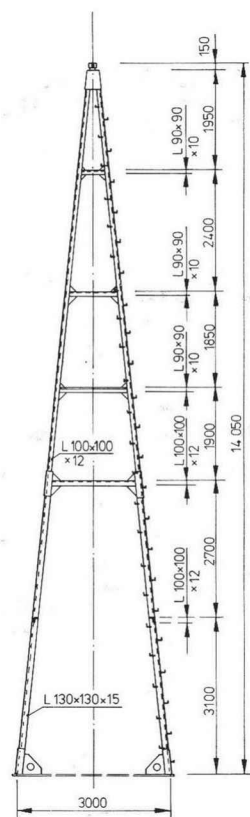


D Rig – Antenna Mast

Antenna mast with crane for aircraft and boats
(1/150 scale)

D1/14 Rear view of mast

D1/15 Profile view



D1/14

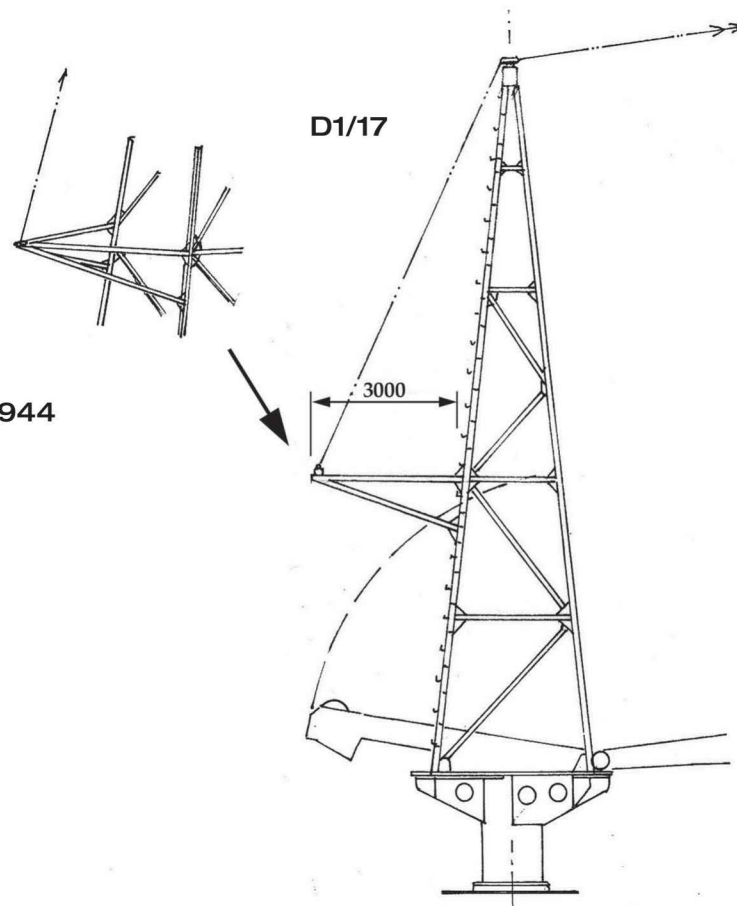
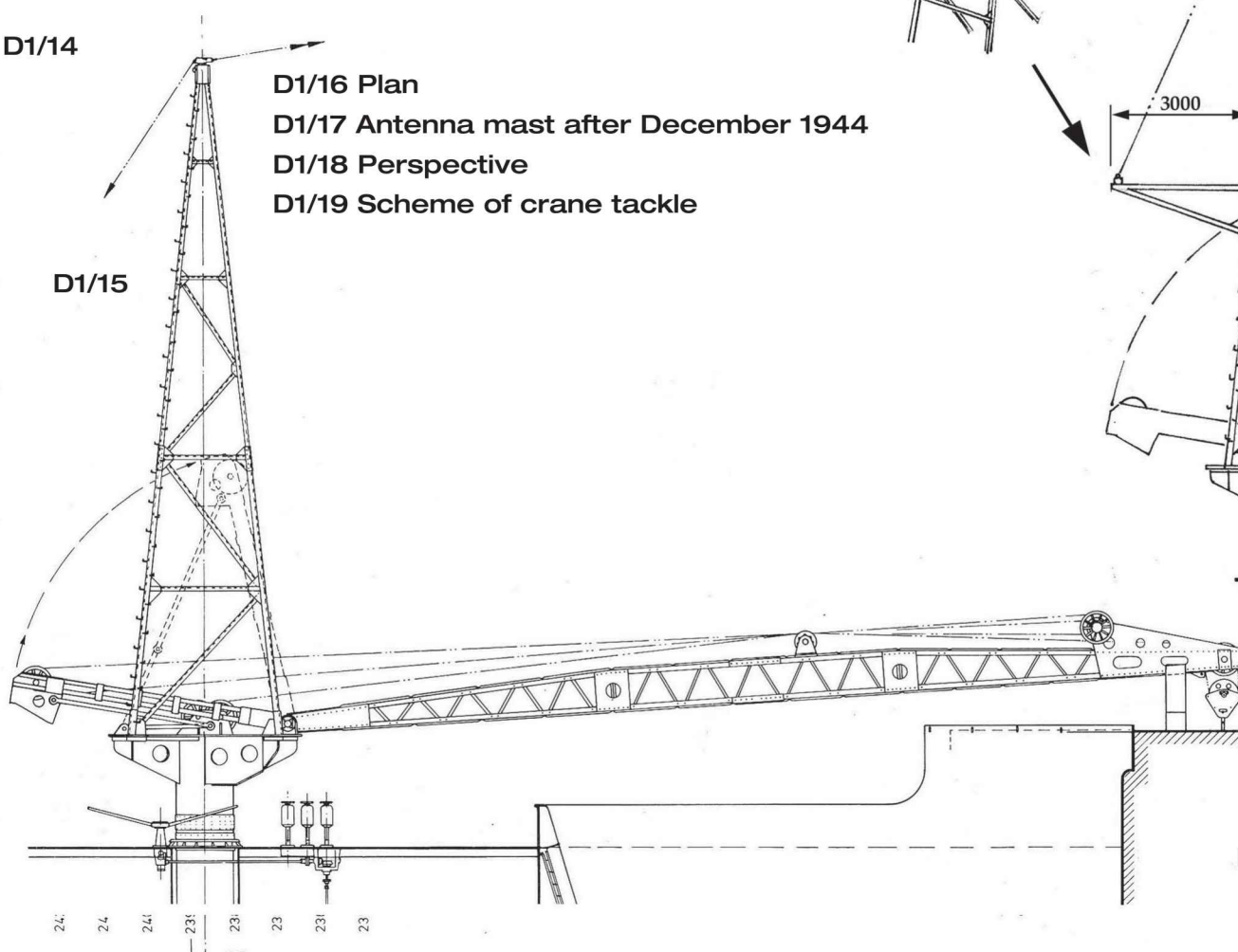
D1/15

D1/16 Plan

D1/17 Antenna mast after December 1944

D1/18 Perspective

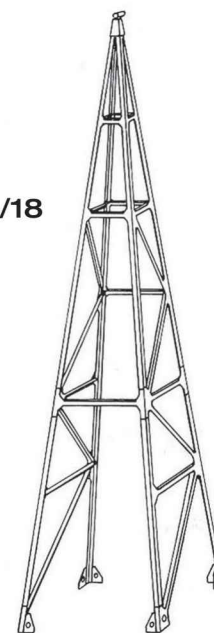
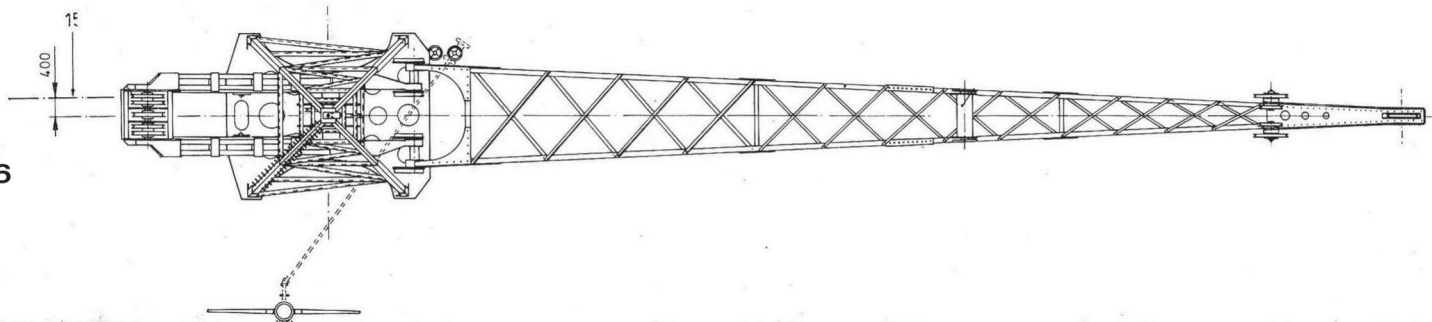
D1/19 Scheme of crane tackle



D1/17

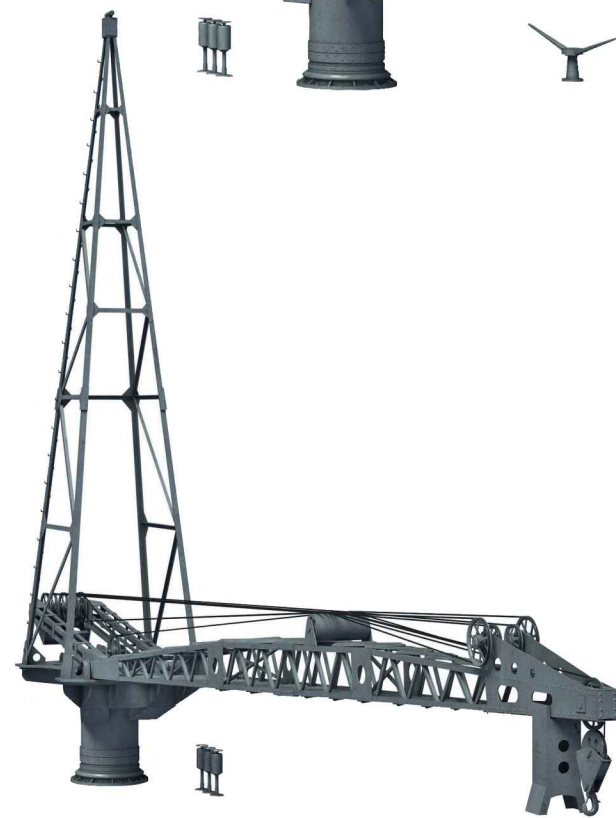
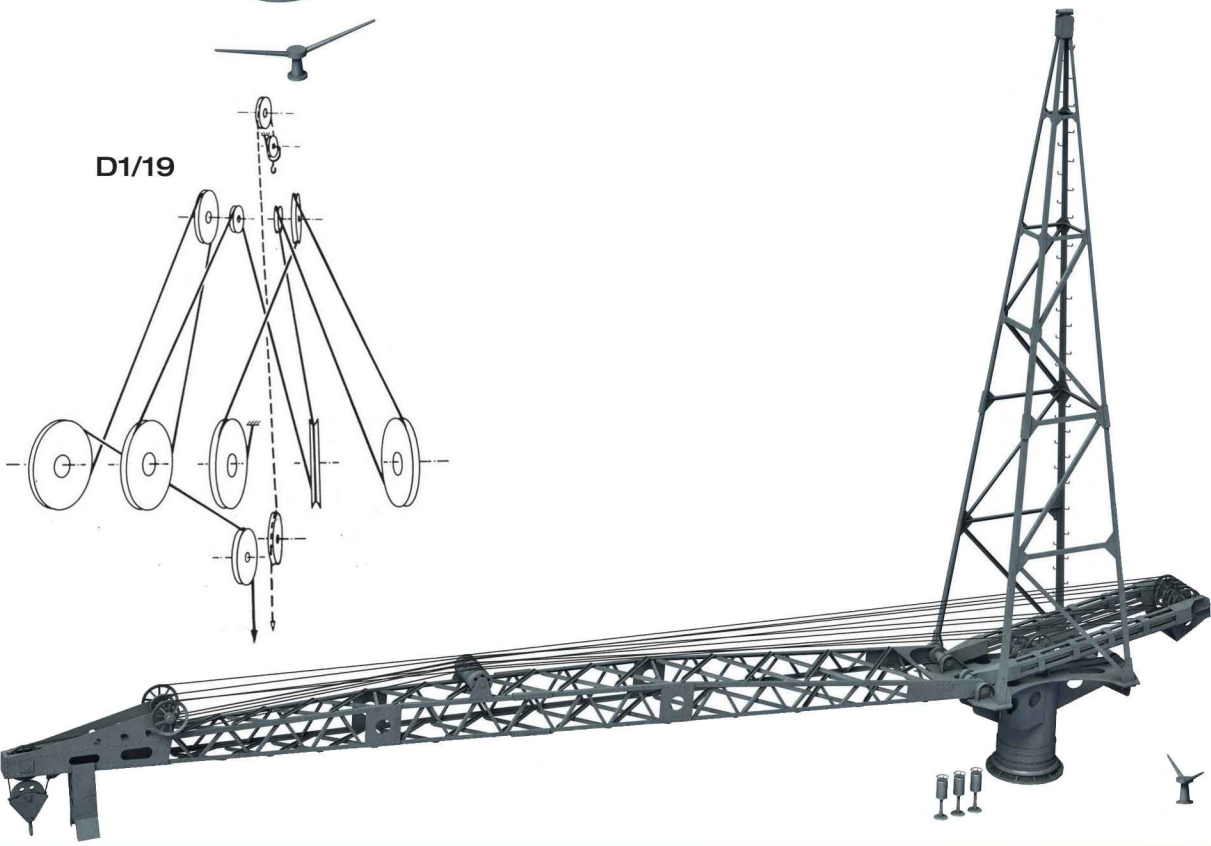
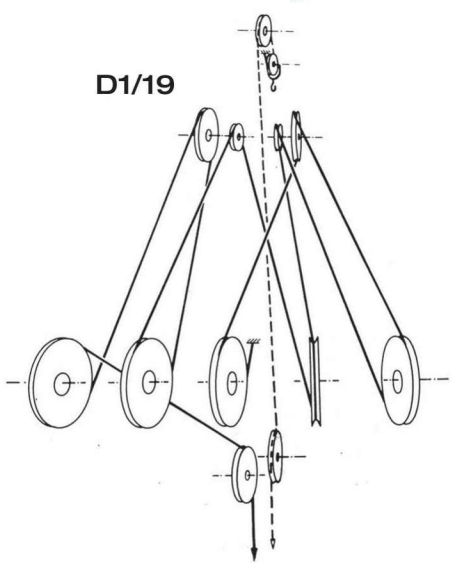
D1/18

D1/16





D1/19



D Rig – Crane

Crane Jib (1/100 scale)

D1/20 Profile

D1/21 Plan

D1/22 Bottom view

D1/23 Sections

Crane platform

D1/24 Plan

D1/25 Section A-A

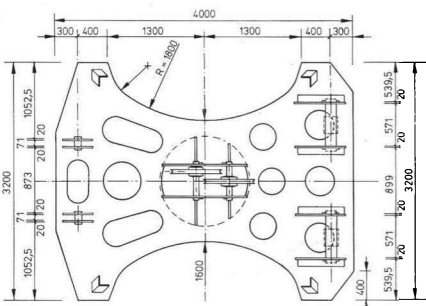
D1/26 Profile

D1/27 Front view

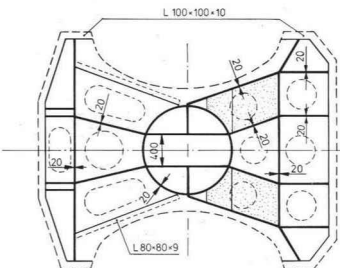
D1/28 Rear view

D1/29 Section B-B

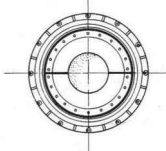
D1/24



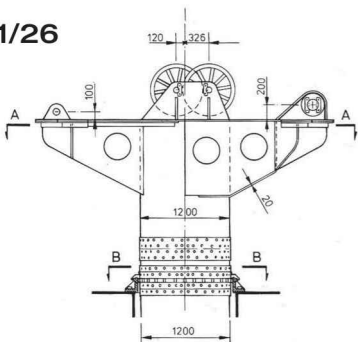
D1/25



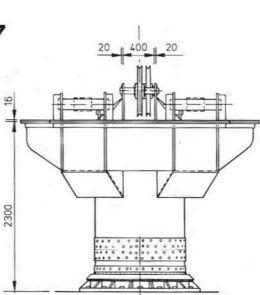
D1/29



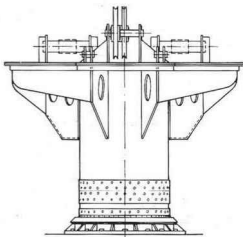
D1/26



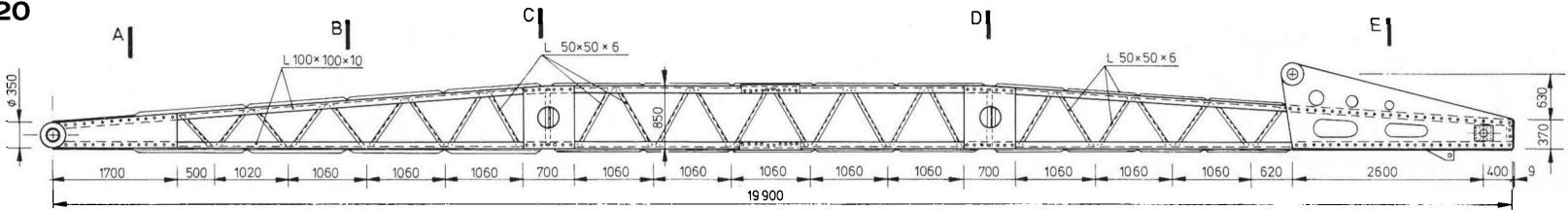
D1/27



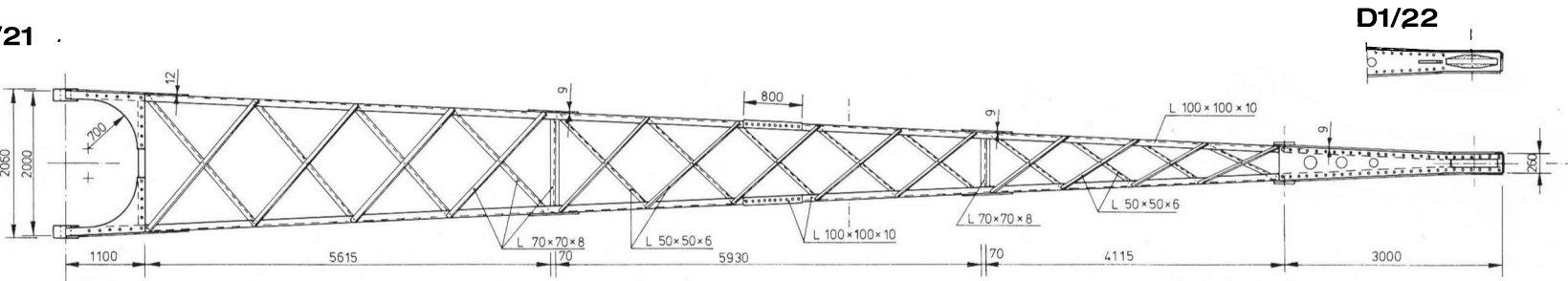
D1/28



D1/20



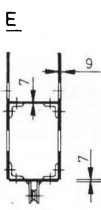
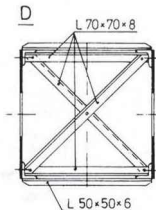
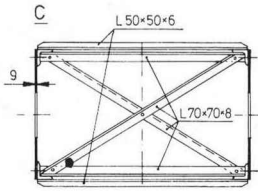
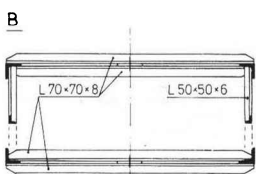
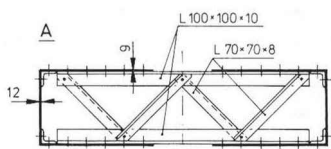
D1/21

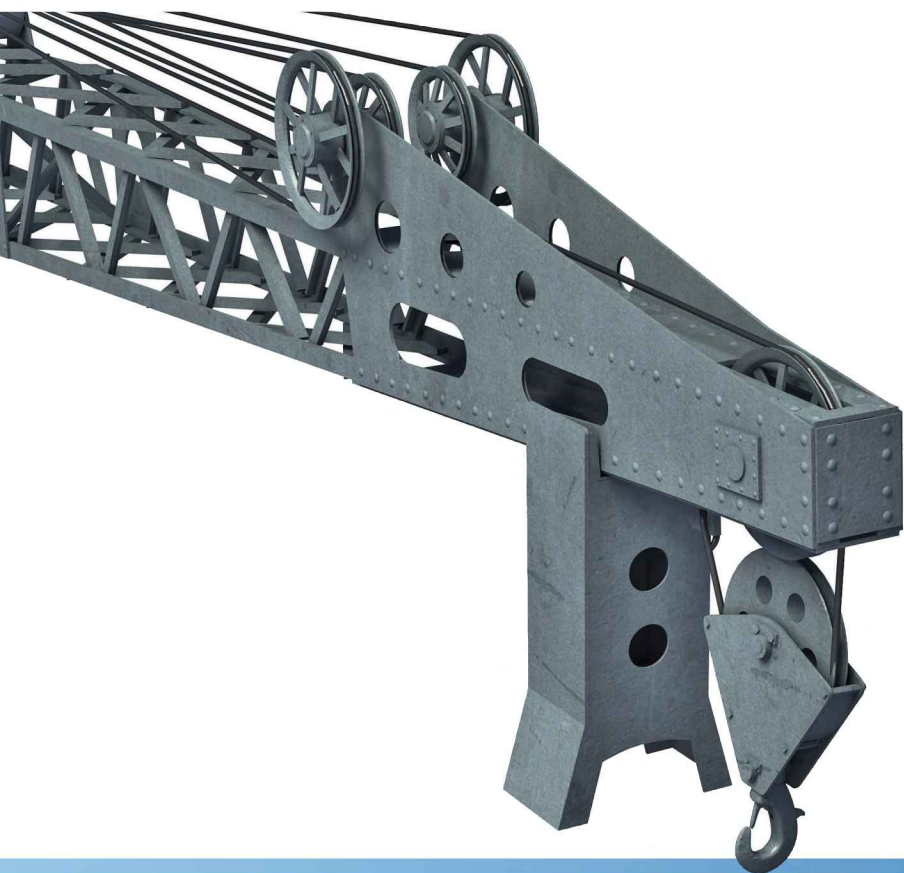
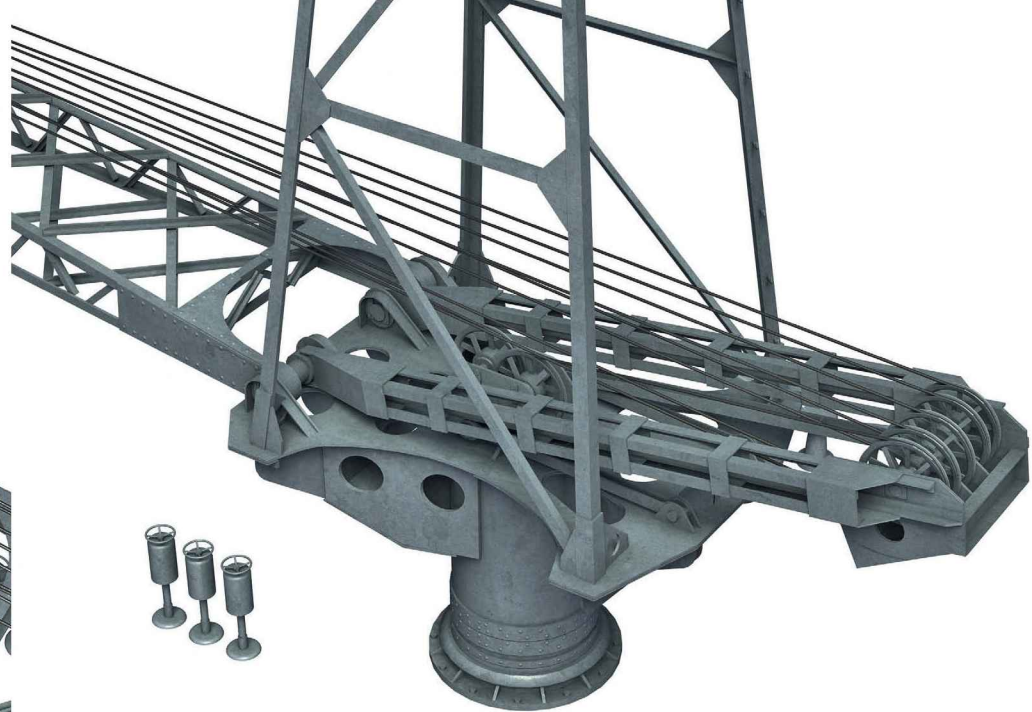
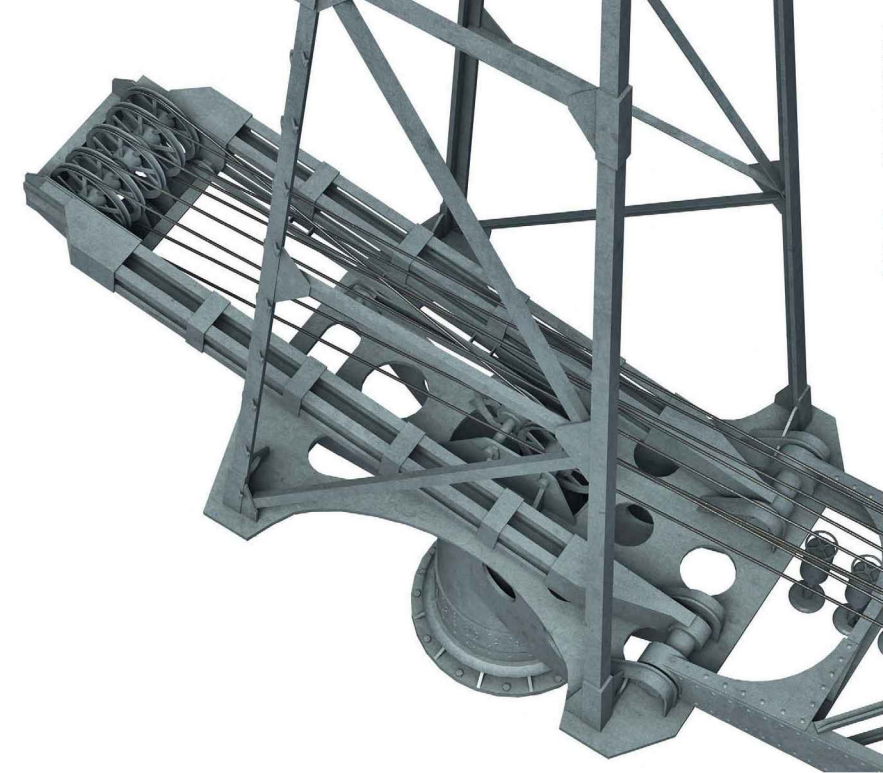


D1/22



D1/23





D Rig – Crane

Crane details (no scale)

D1/30 Crane rear frame with luff pulleys – profile

D1/31 Plan

D1/32 Bottom view and sections

D1/33 Folding bracket of rear frame – profile, plan and details

D1/34 Crane hook – front view, section, profile

D1/35 Fore and aft luff pulleys

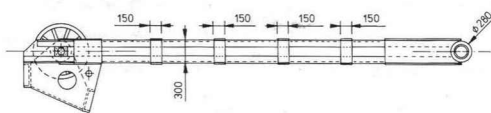
D1/36 Pulley from platform base

D1/37 Crane electric motor

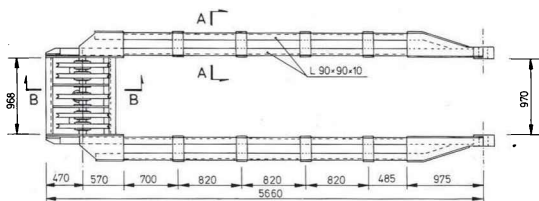
(this type used as winch for paravane)

D1/38 Deck support of crane arm

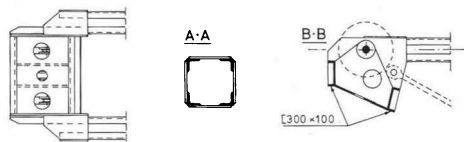
D1/30



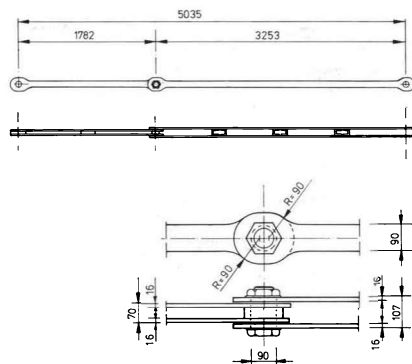
D1/31



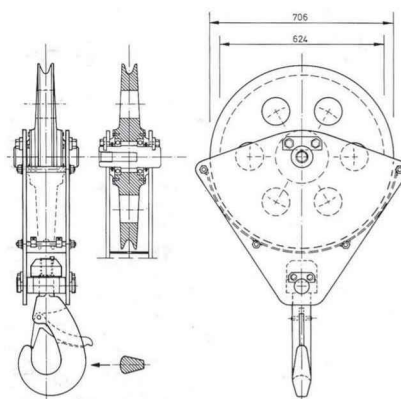
D1/32



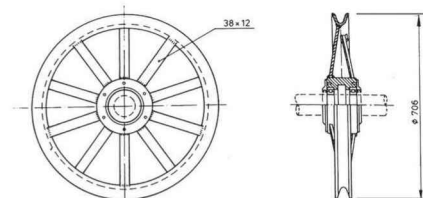
D1/33



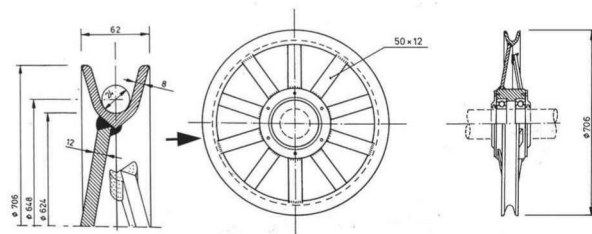
D1/34



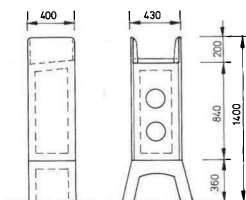
D1/35



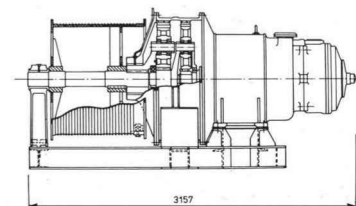
D1/36



D1/38



D1/37

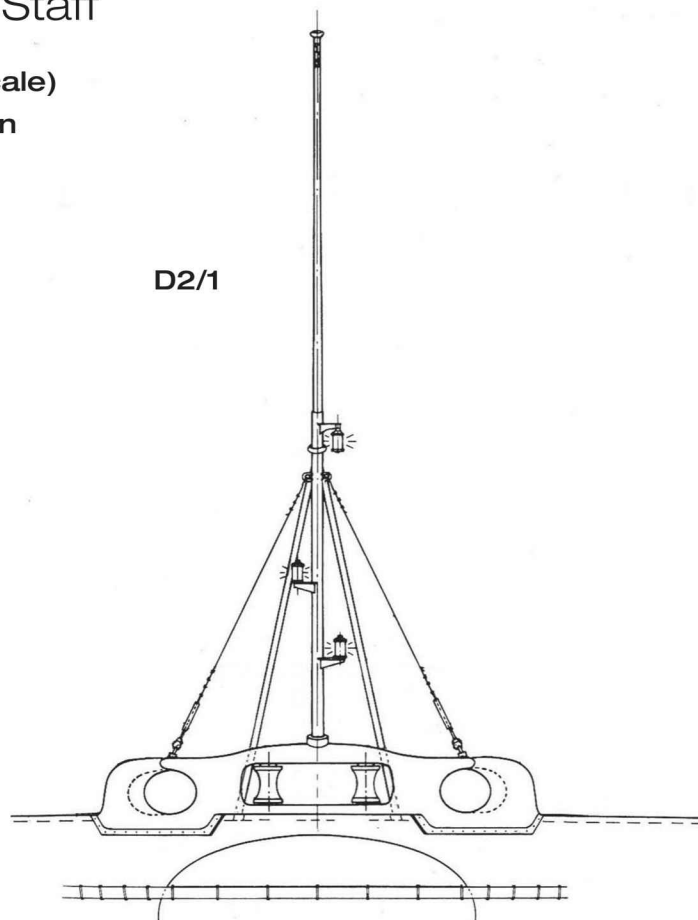


D Rig – Ensign Staff

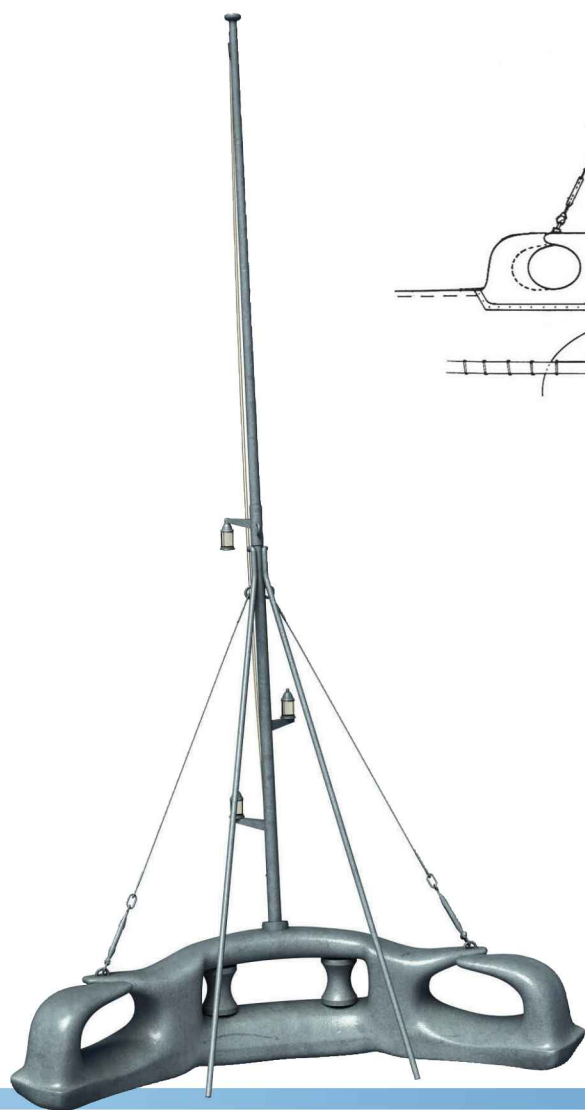
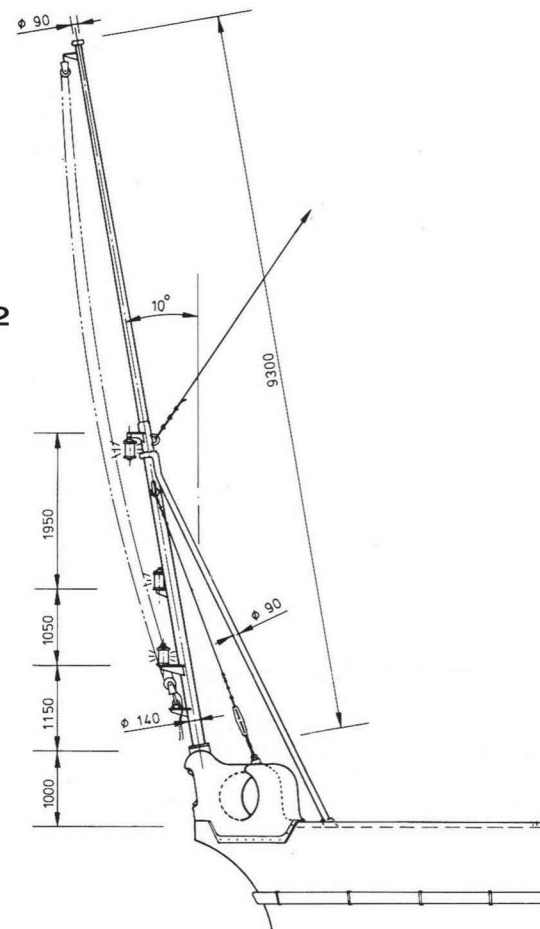
Ensign staff (1/100 scale)

D2/1 View from astern

D2/2 Side view



D2/2

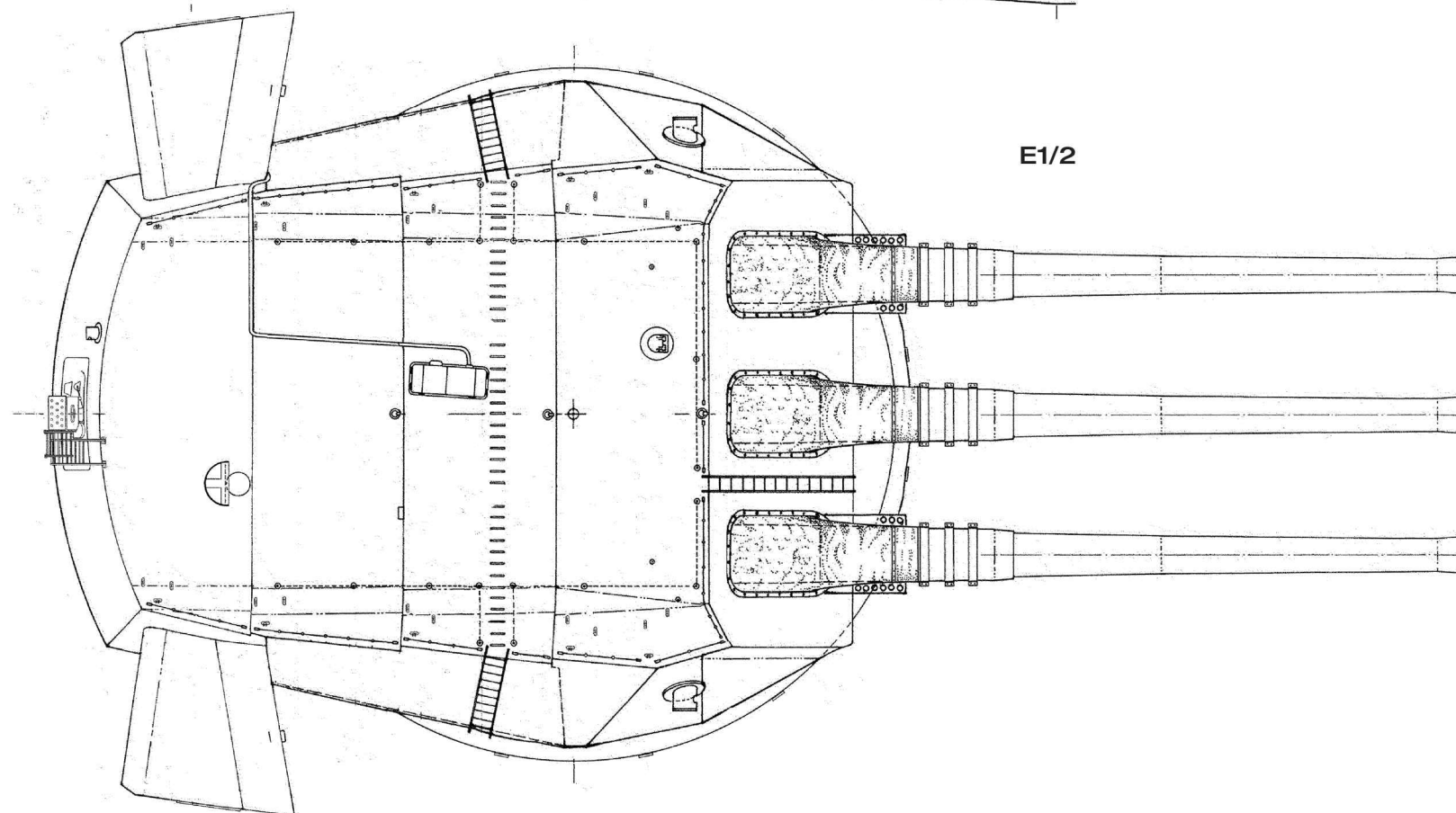
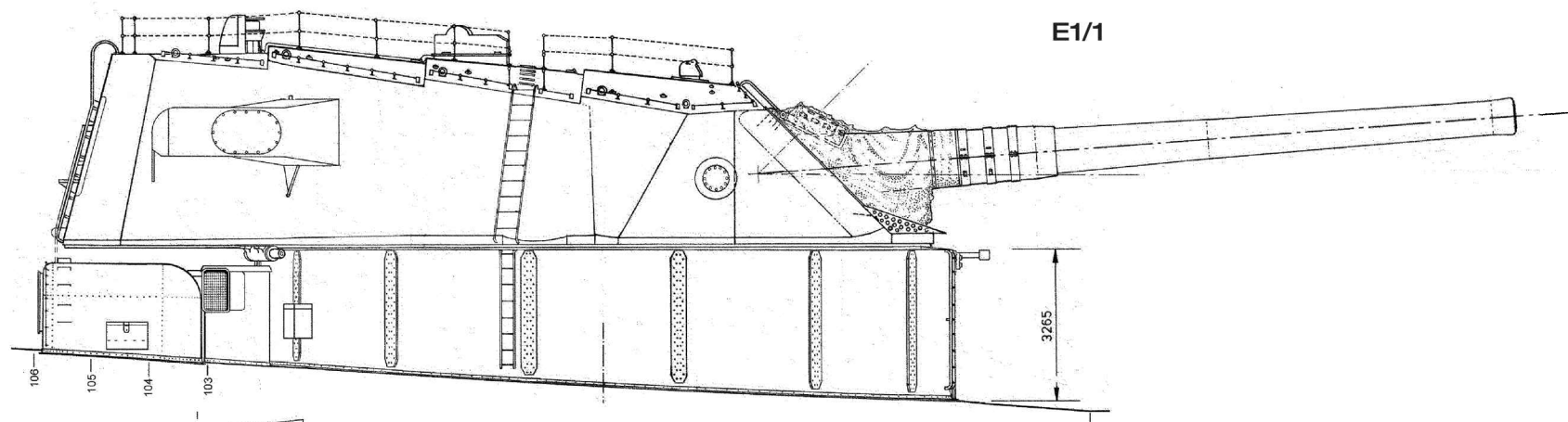


E Armament – 46cm Guns

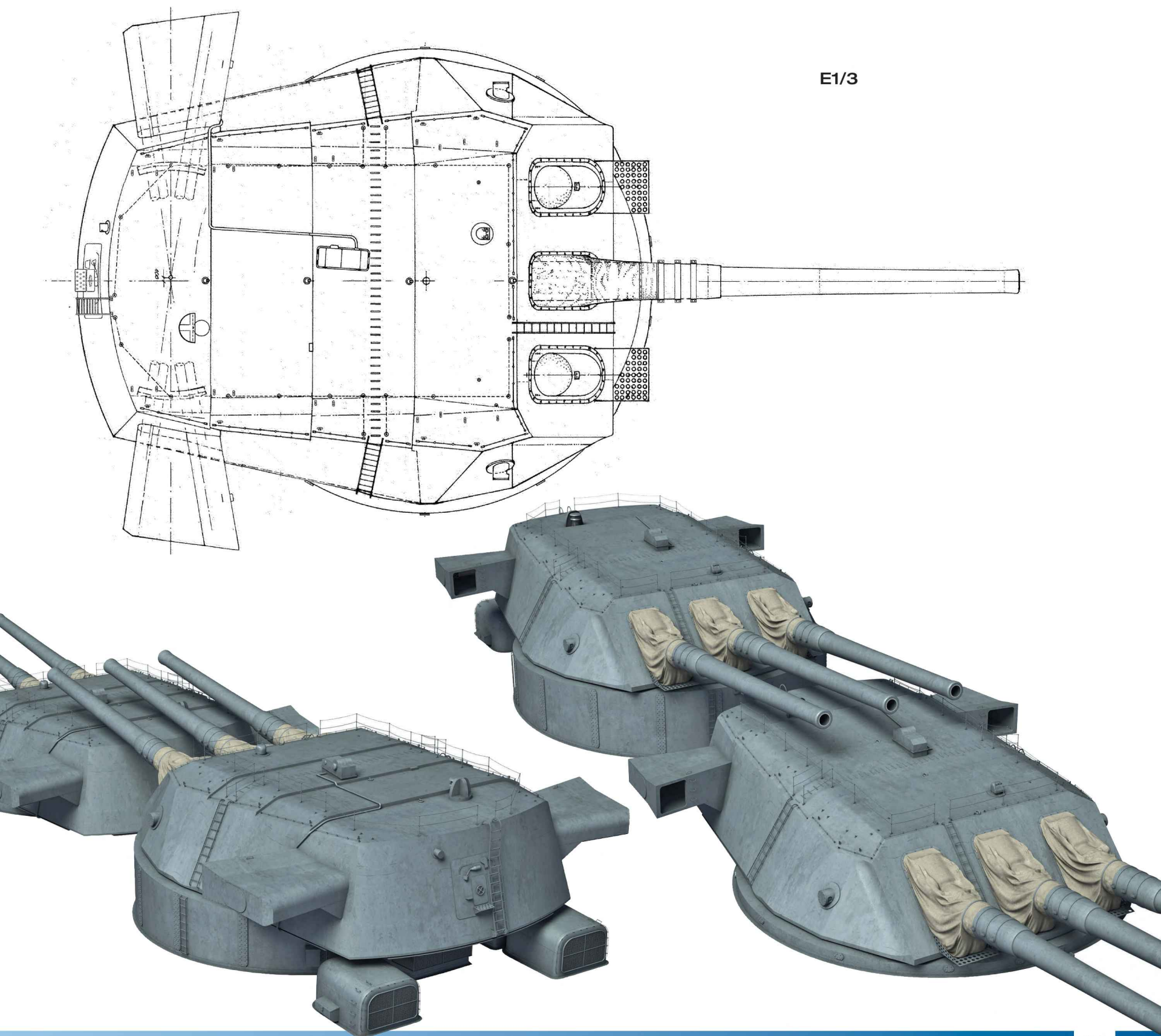
E1/1 46cm gun turret no.2 - elevation (1/150 scale)

E1/2 Turret no.2 – plan

E1/3 Turret no.3 – plan



E1/3



E Armament – 46cm Guns

E1/4 Turret no.2 rear view (1/150 scale)

E1/5 Turret no.3 rear view

E1/6 Turret no.1 front view

E1/7 Fragment of front elevation

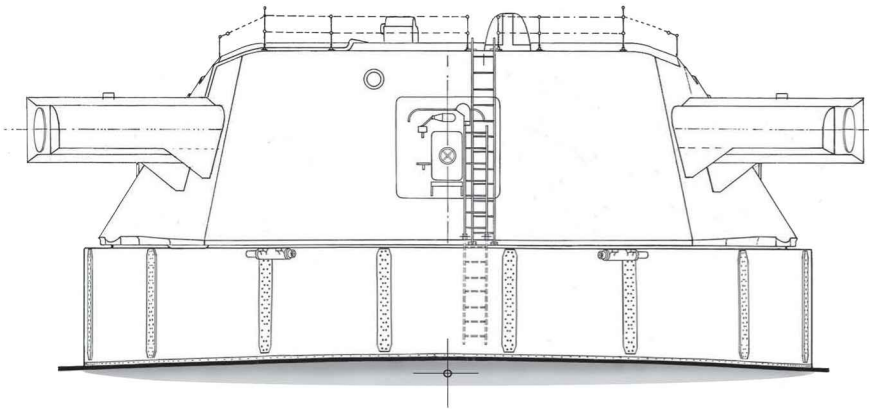
E1/8 Rear ladder of turret

Barbette of turret no.1 max. Height = 600mm

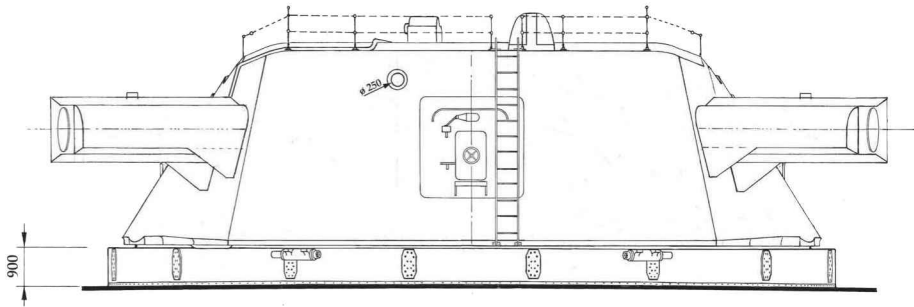
Barbette of turret no.3 max. Height = 900mm



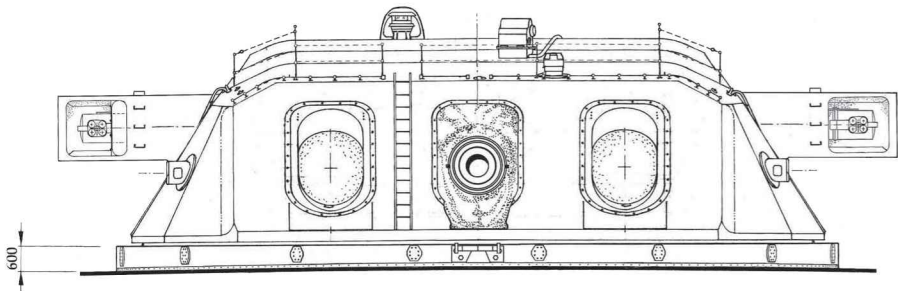
E1/4



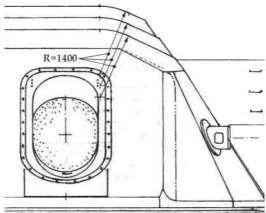
E1/5



E1/6



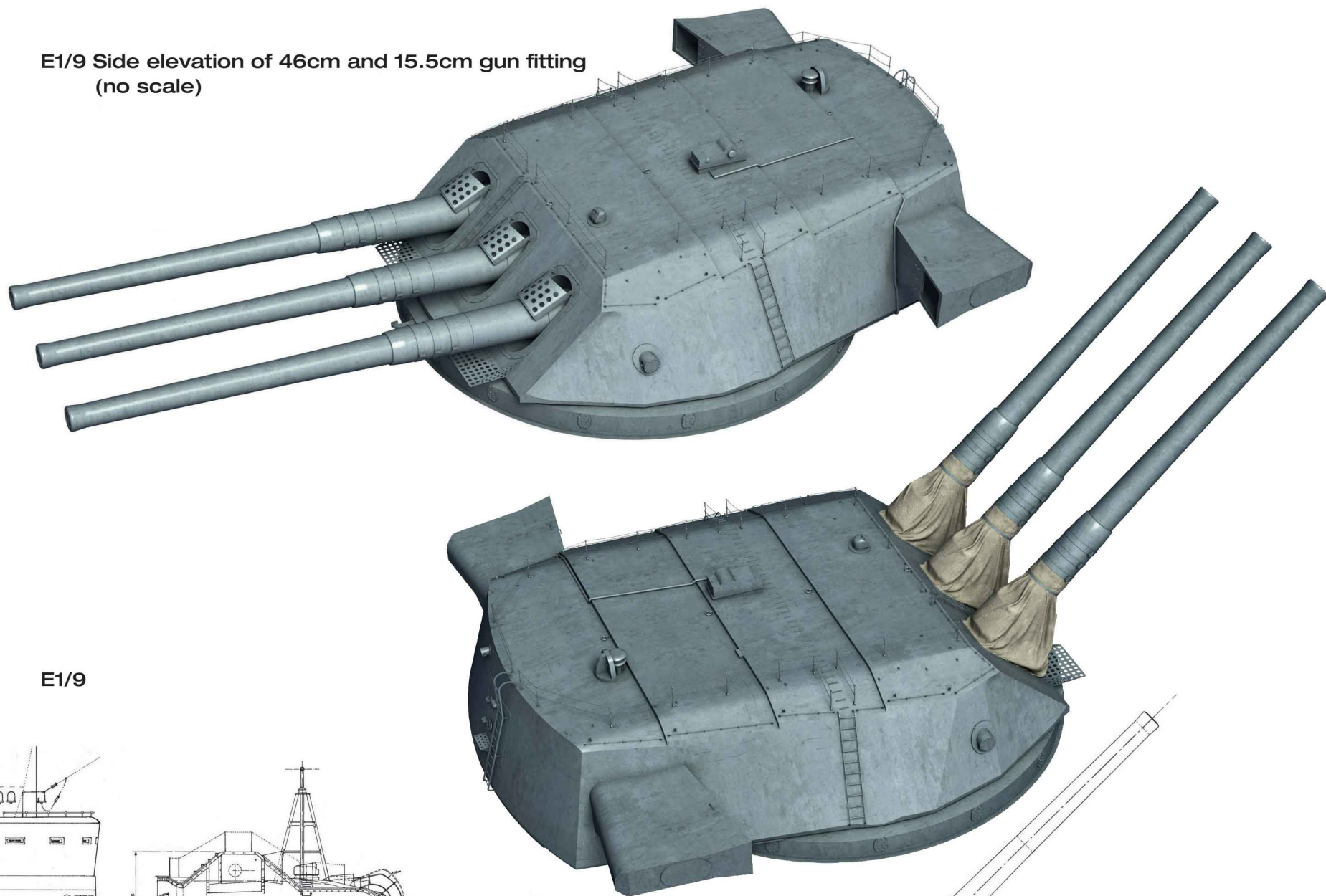
E1/7



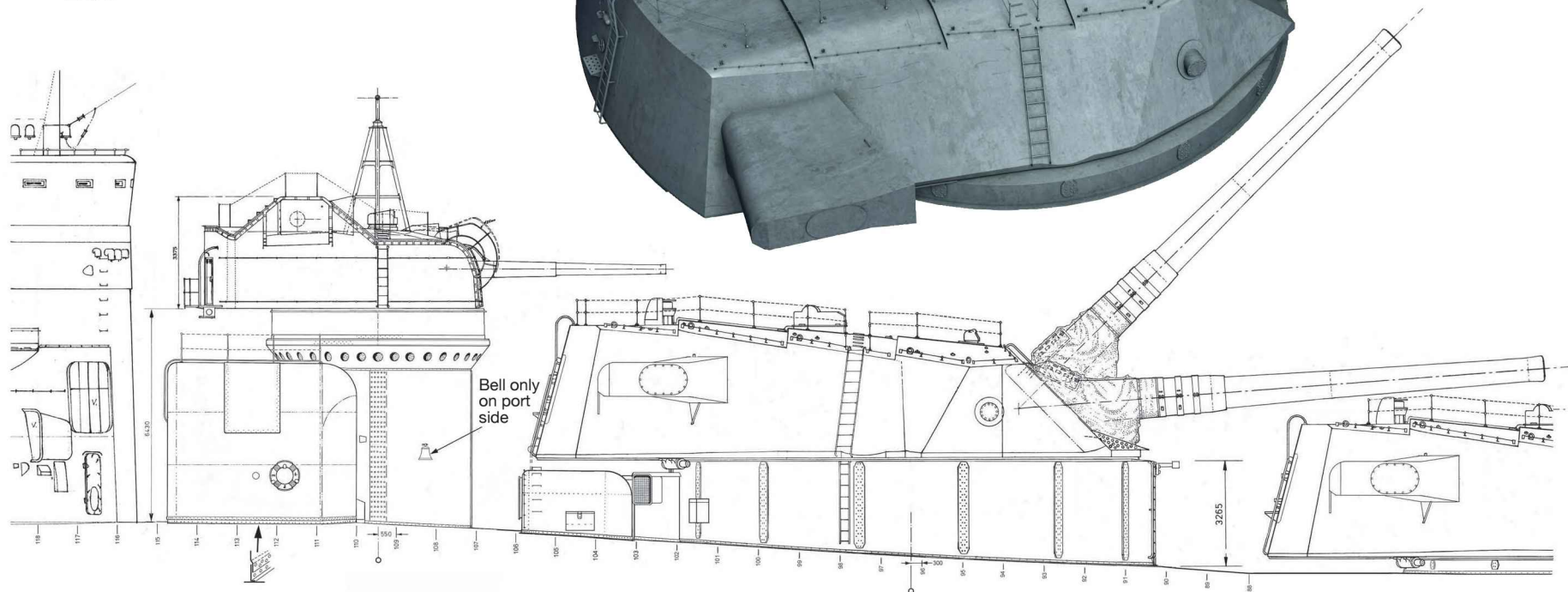
E1/8



E1/9 Side elevation of 46cm and 15.5cm gun fitting
(no scale)



E1/9

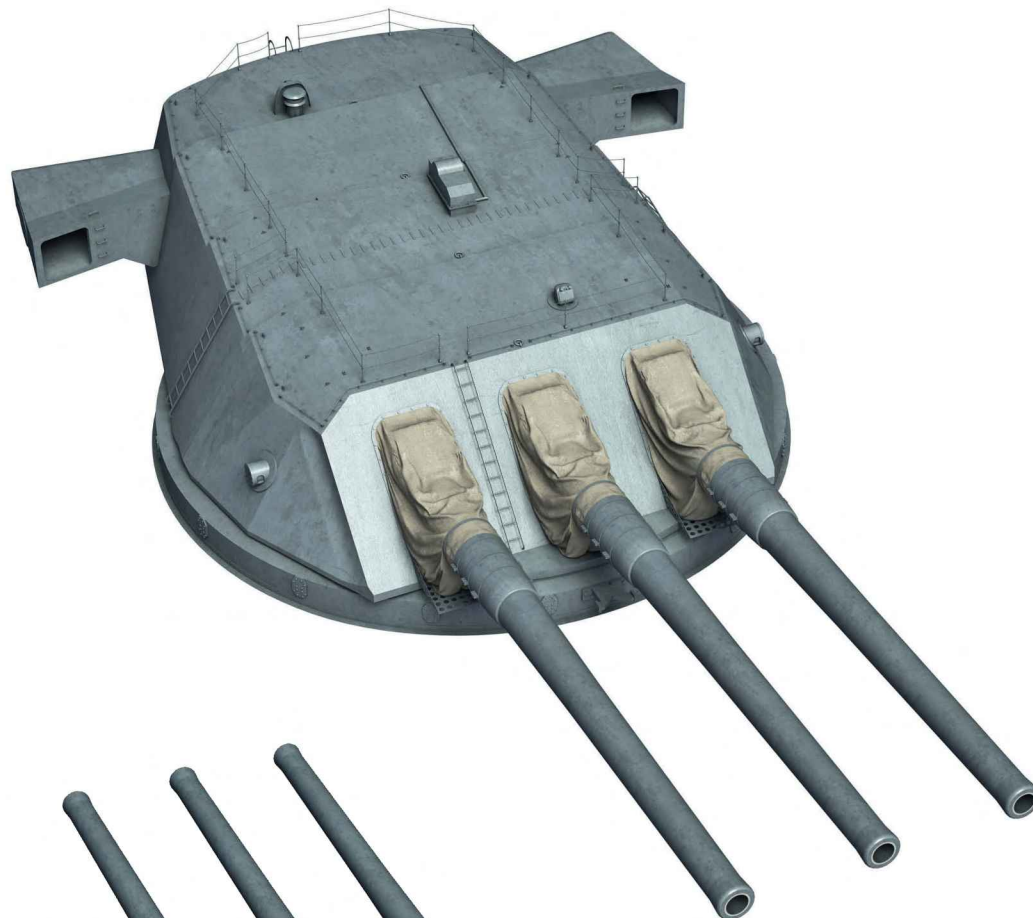


E Armament – 46cm Guns

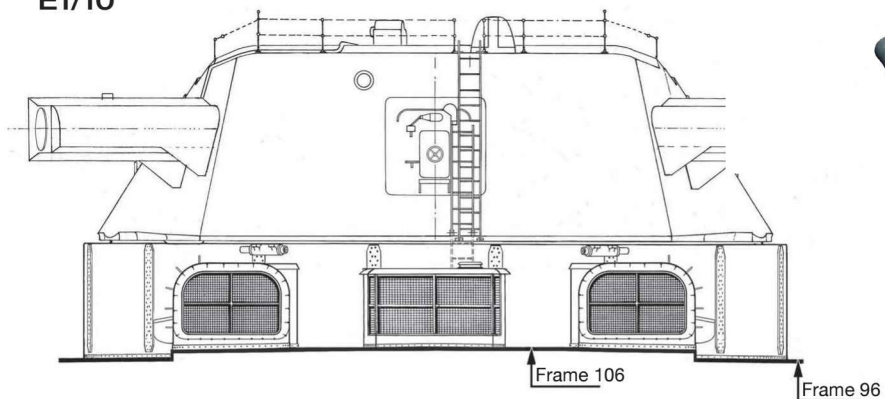
E1/10 Rear view of turret no.2 and ventilators
(1/150 scale)

E1/11 Plan on ventilator intakes

E1/12 Profile view on starboard side ventilator

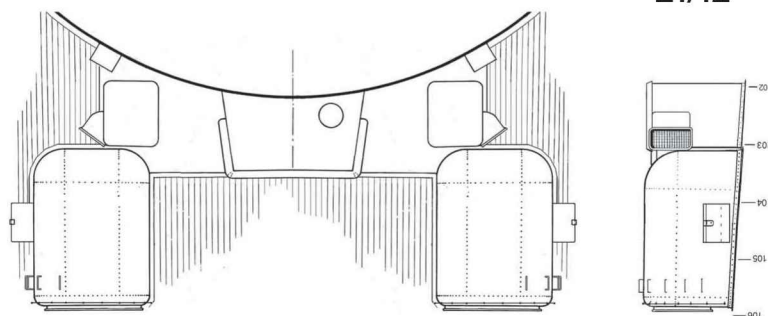


E1/10



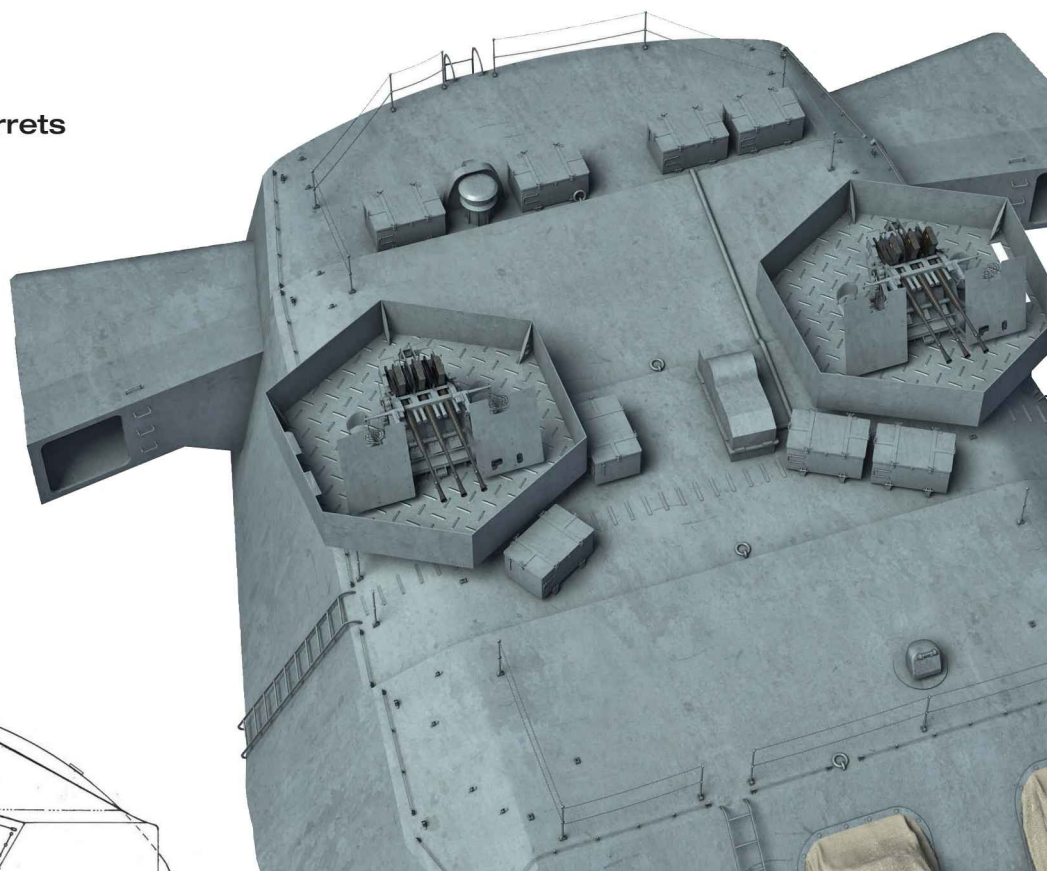
E1/12

E1/11

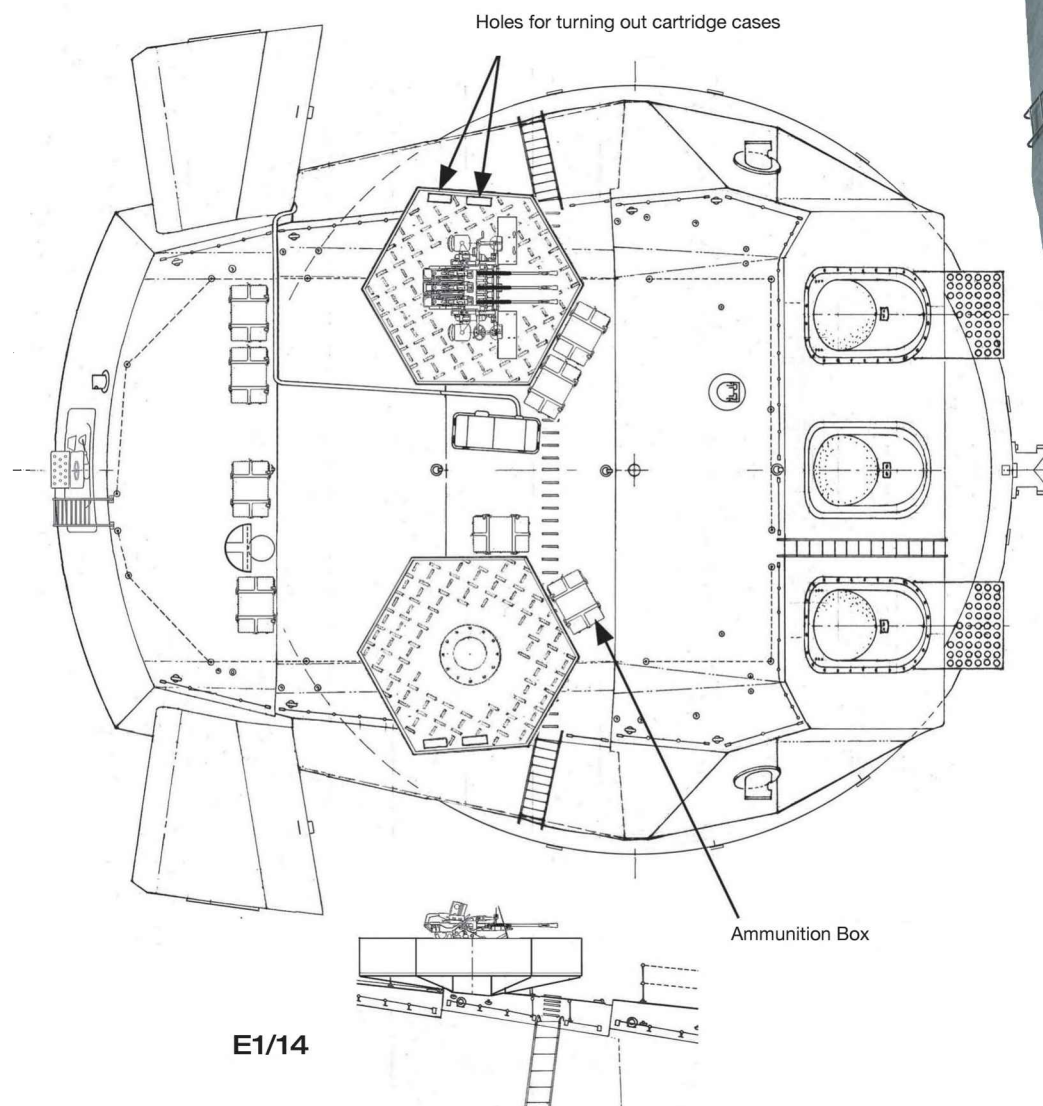


E1/13 25mm x III MG platforms fitted on *Yamato* turrets
no.2 and no.3 January 1945 (1/150 scale)

E1/14 Side view of triple 25mm MG mount on
turret roof



E1/13



E1/14

E Armament – 46cm Guns

Geometry of 46cm gun turret

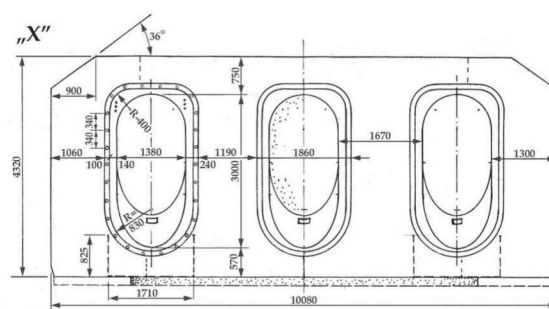
**E1/15 Plan of fore 650mm thick
armour plate**

E1/16 Port side elevation of turret

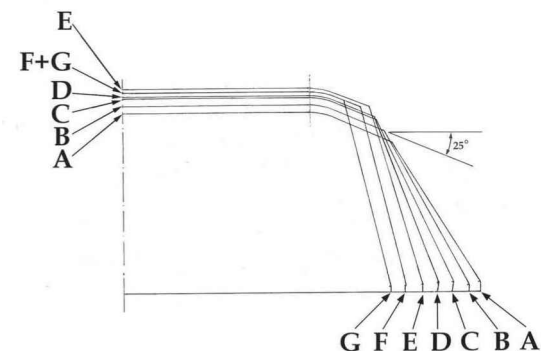
E1/17 Plan

E1/18 Turret's profiles (body plan)

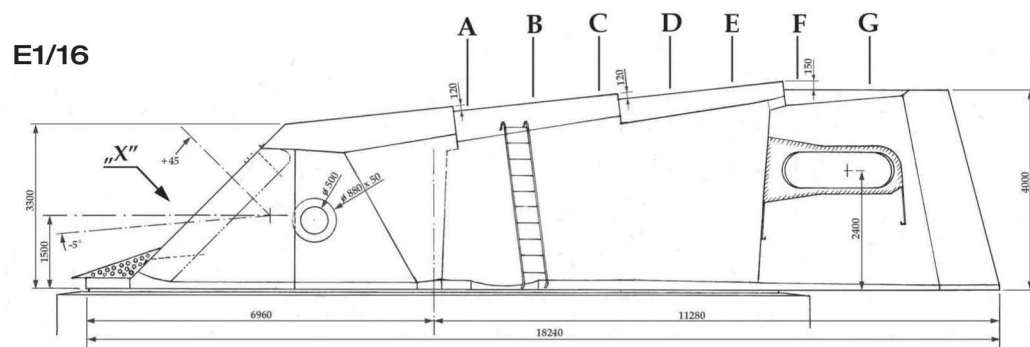
E1/19 Basket for canvas blast cover



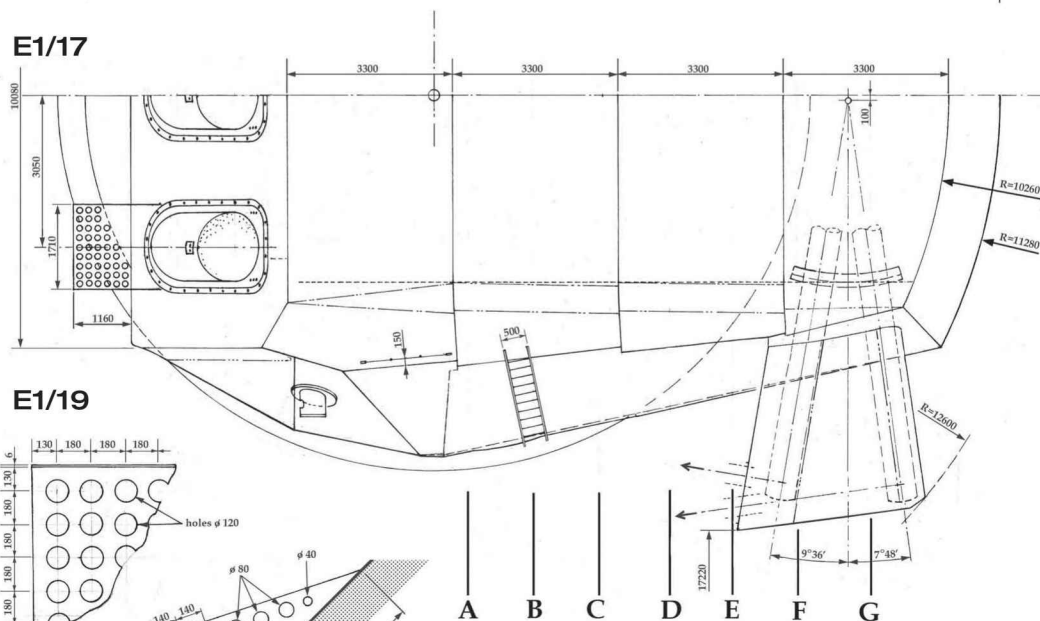
E1/15



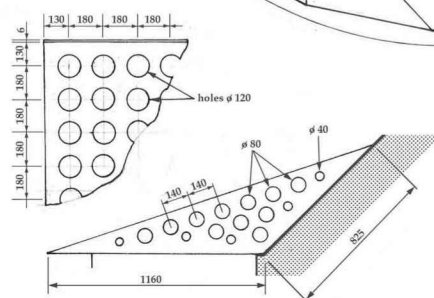
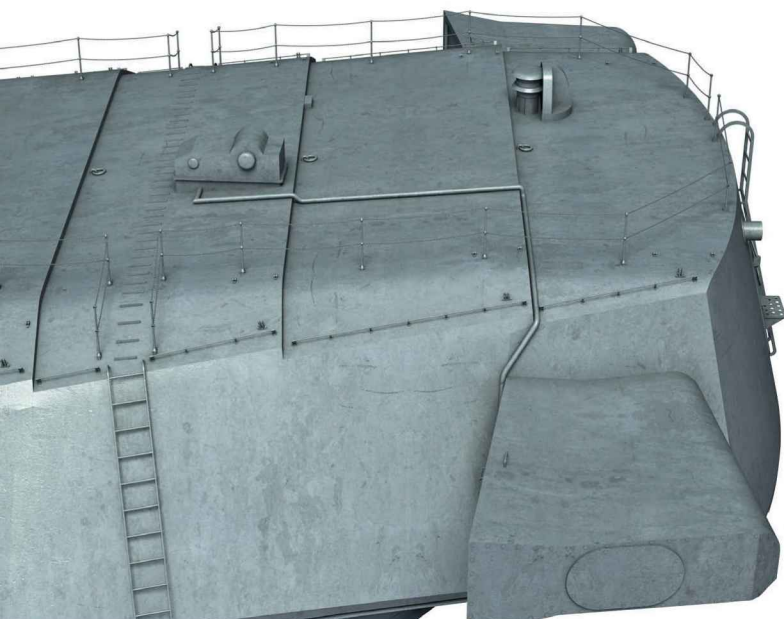
E1/18



E1/16



E1/19

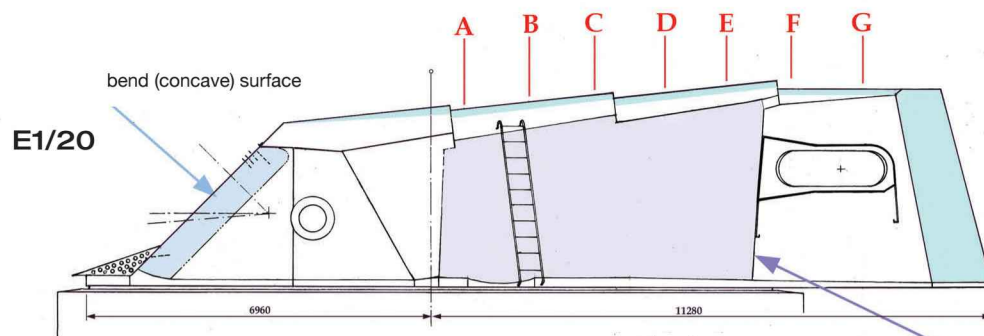


Surfaces of 46cm gun turret

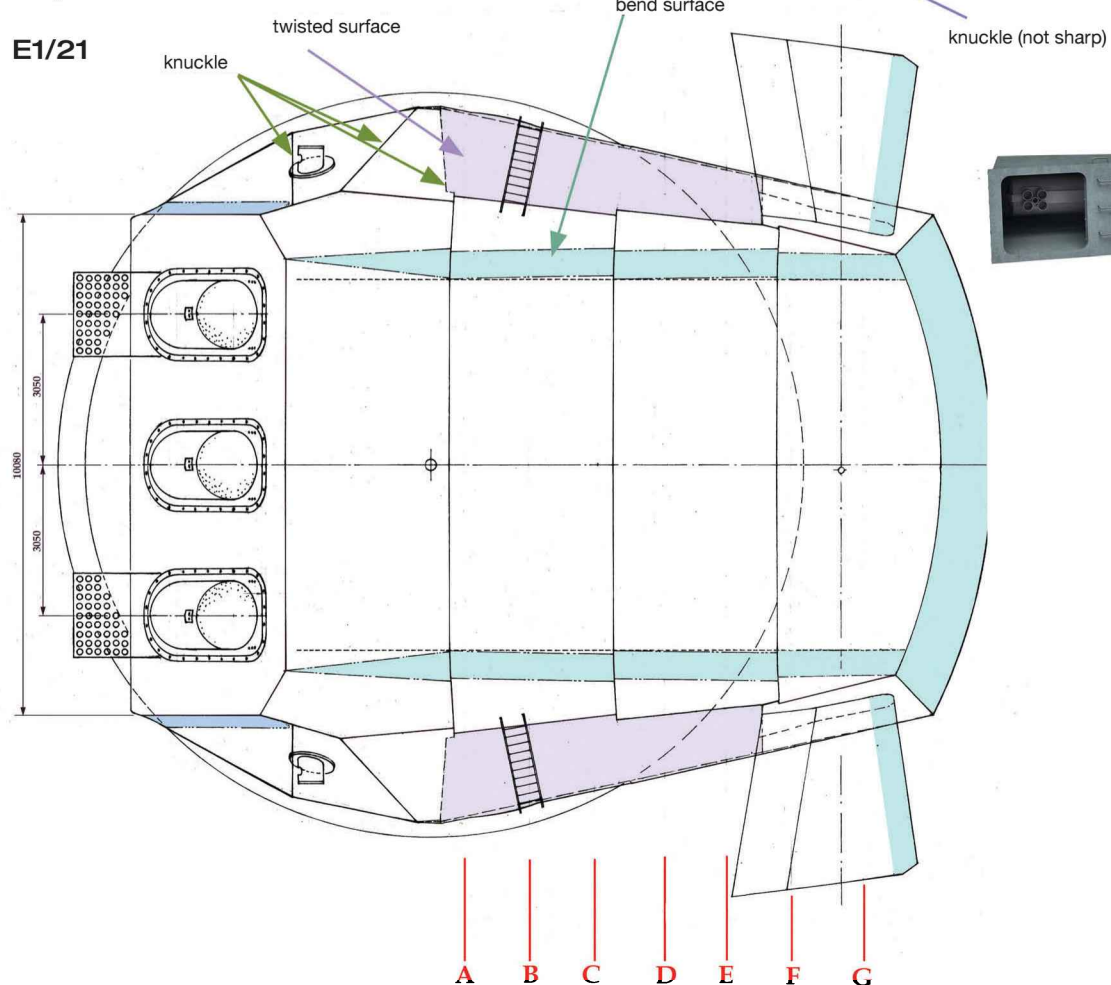
E1/20 Elevation

E1/21 Plan

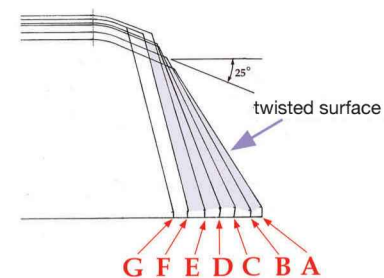
E1/22 Profiles (sections)



E1/21



E1/22



E Armament – 46cm Guns

Upper support for canvas blast cover (1/75 scale)

E1/23 Profile

E1/24 Plan

E1/25 Front view

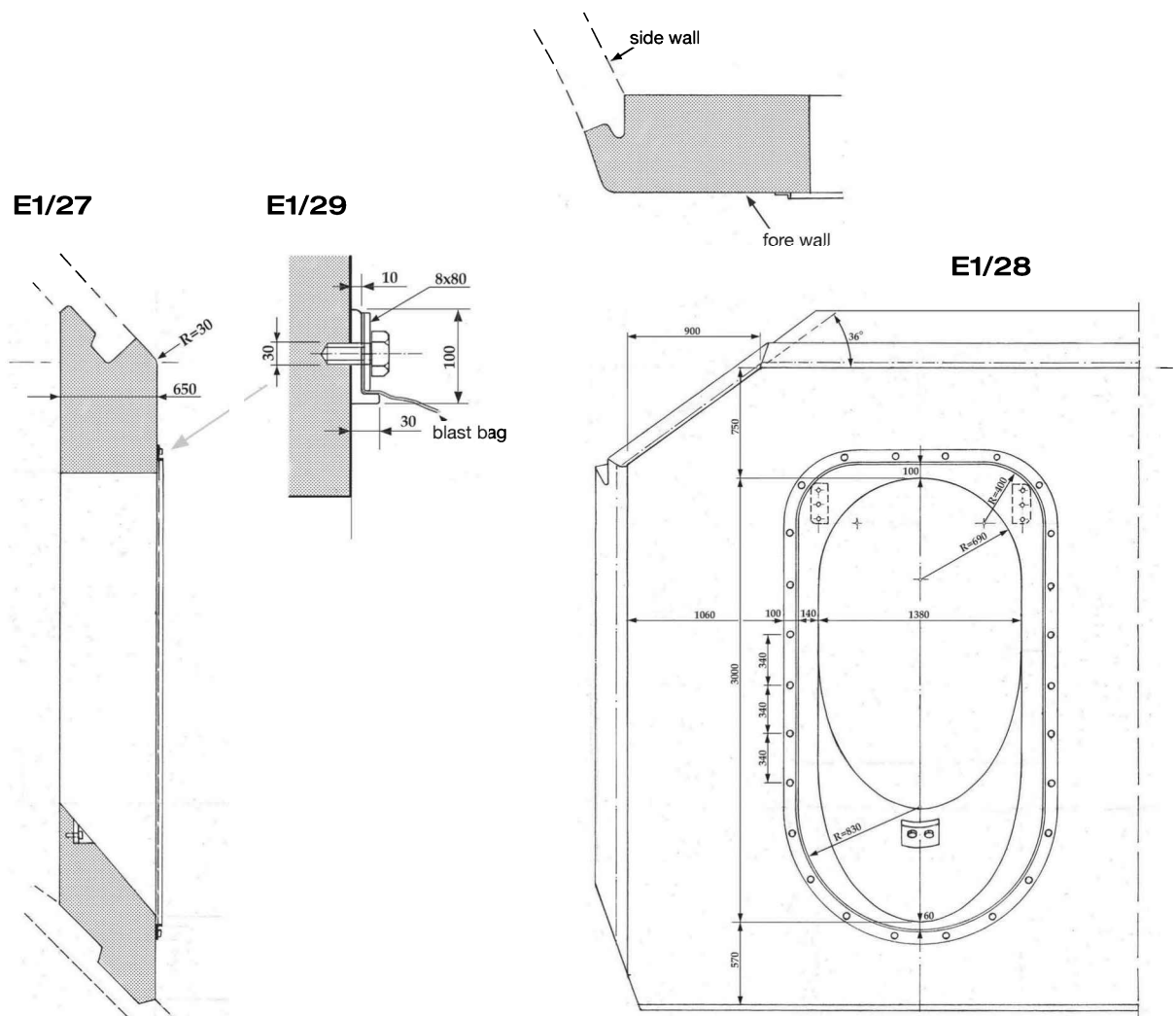
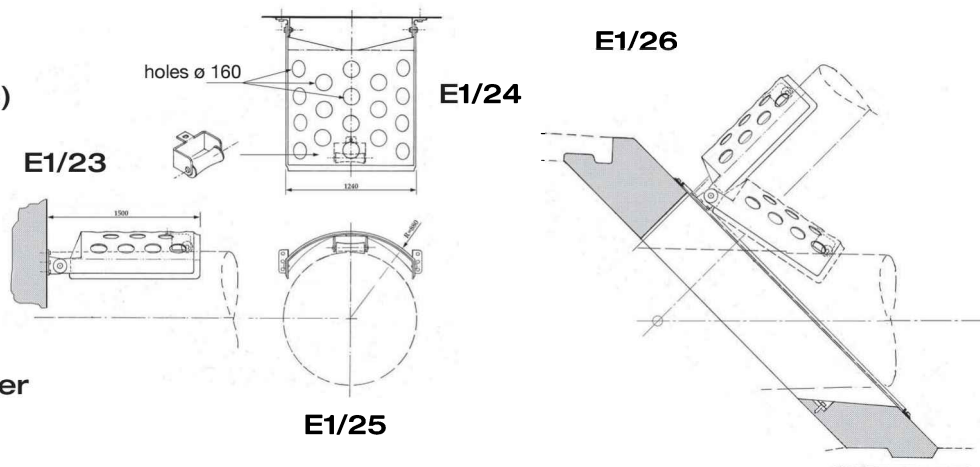
E1/26 Fitting the support to fore 650mm thick armour plate

Fore 650mm armour plate with canvas blast cover frame (1/75 scale)

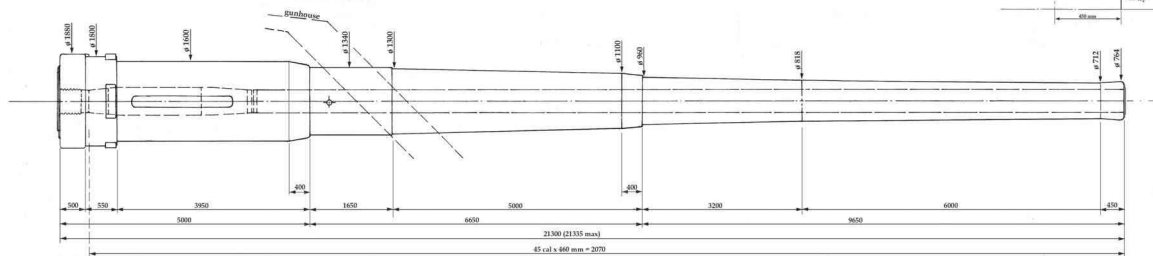
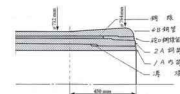
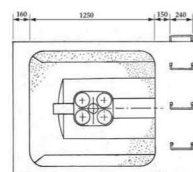
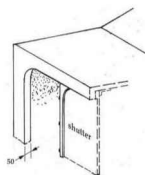
E1/27 Section

E1/28 Plan

E1/29 Blast bag mounting



E1/35 Muzzle detail



E Armament – 46cm Guns

E1/36 Barbette of turret no.1 (1/150 scale)

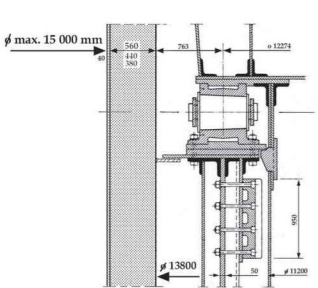
E1/37 Roller bearing of 46cm gun turret

E1/38 Detail of barbette armour

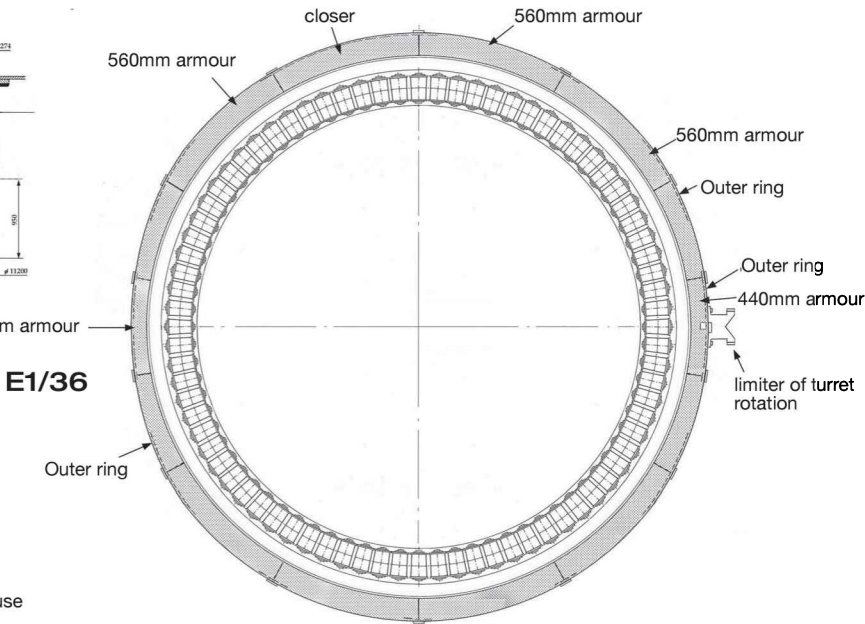
E1/39 Water insulation

E1/40 Barbette of turret no.3 (1/150 scale)

E1/41 Barbette of turret no.2

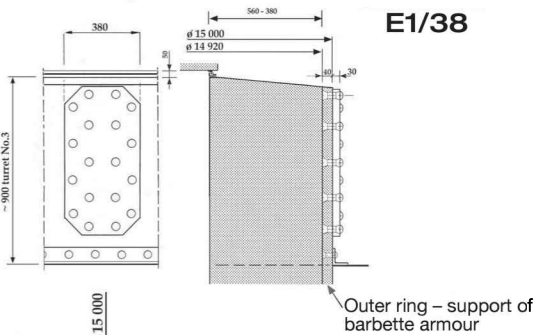
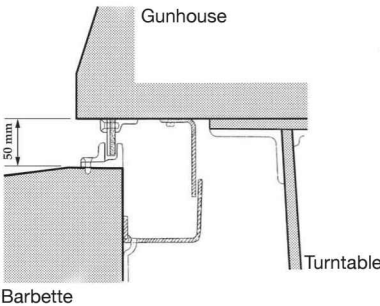


E1/37



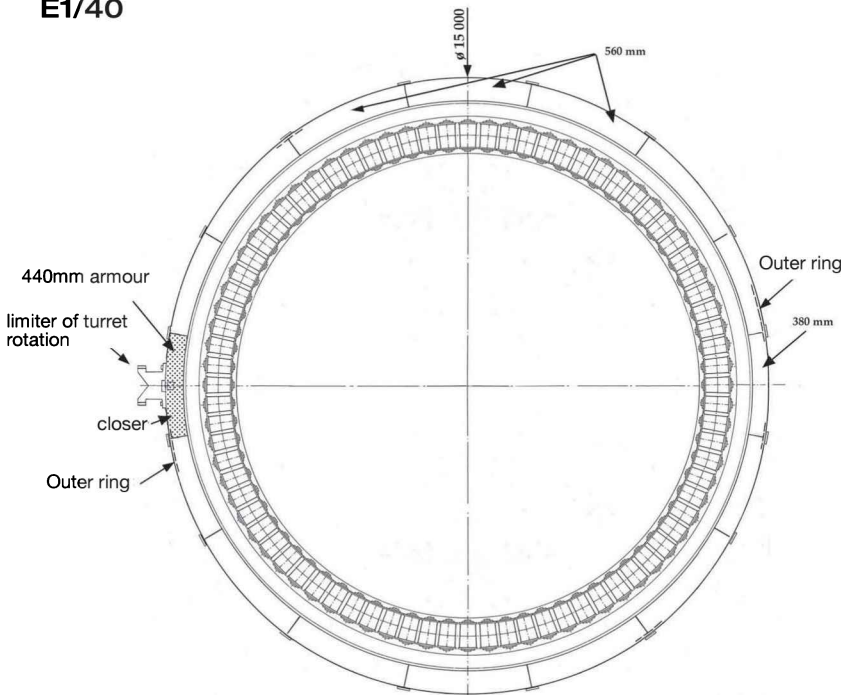
E1/36

E1/39

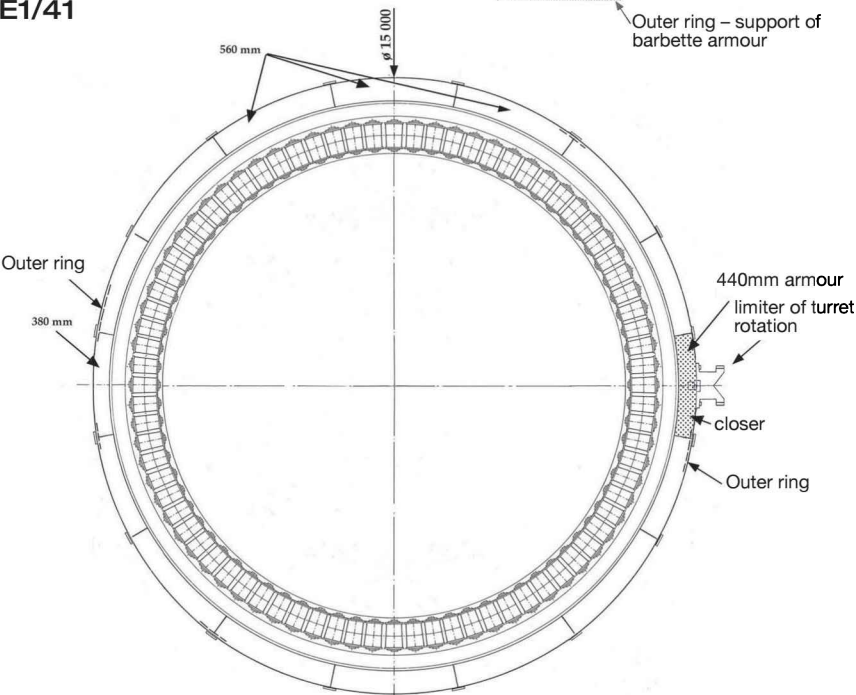


E1/38

E1/40



E1/41



E1/42 Base of guard rails (no scale)

E1/43 Base of awning stanchions

E1/44 Bases of guard rails and awning stanchions
(1/150 scale)

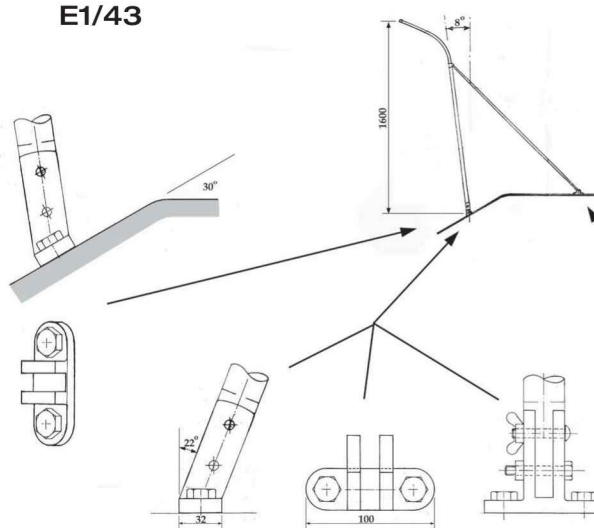
E1/44a Turret no.1

E1/44b Turret no.2

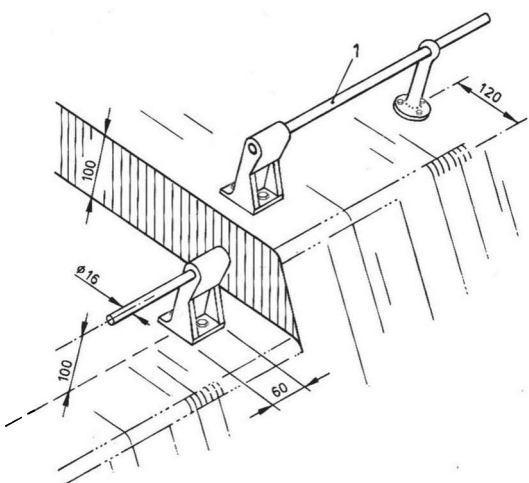
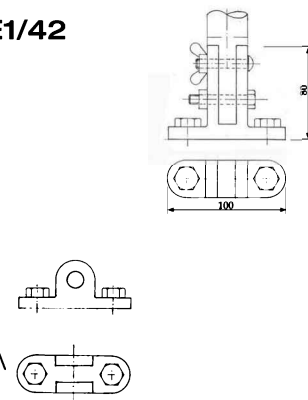
E1/44c Turret no.3

E1/45 Guard of turret edge (no scale)

E1/43

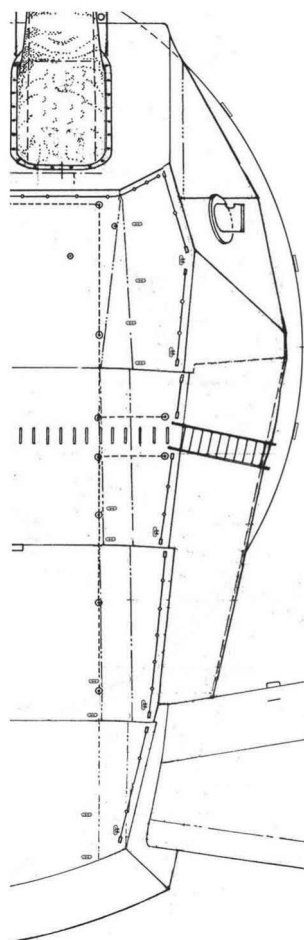


E1/42

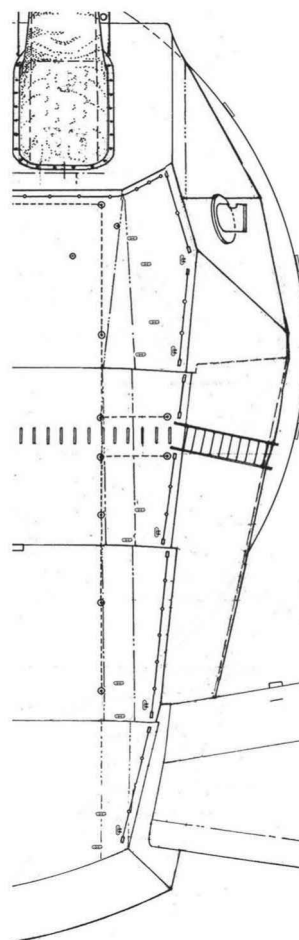


E1/45

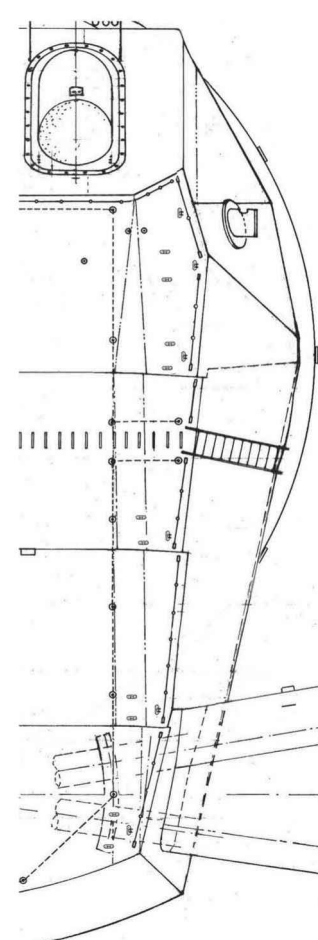
E1/44c



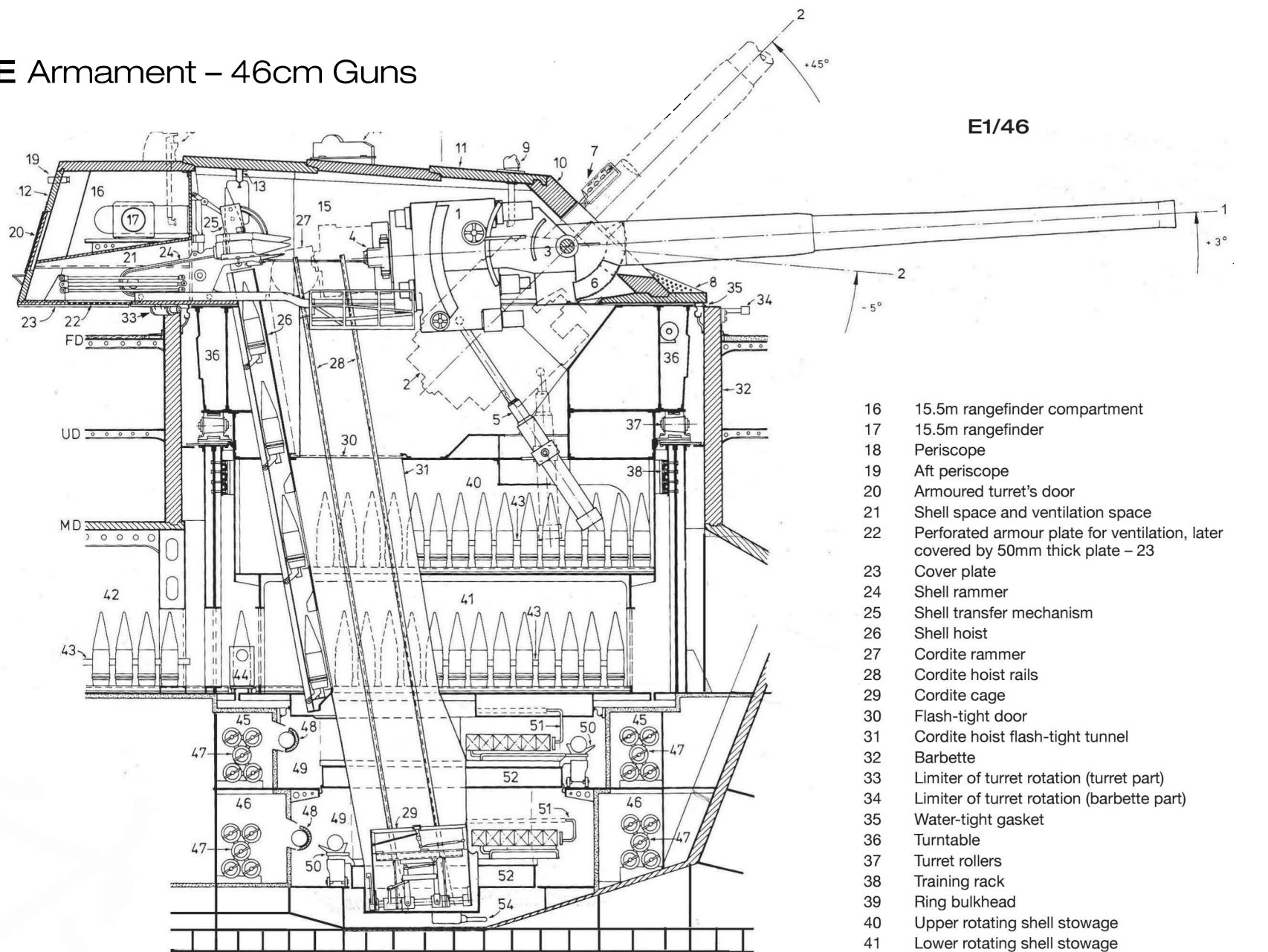
E1/44b



E1/44a



E Armament – 46cm Guns



**E1/46 Section of turret no.3 46cm
gun mounting – profile
(1/150 scale)**

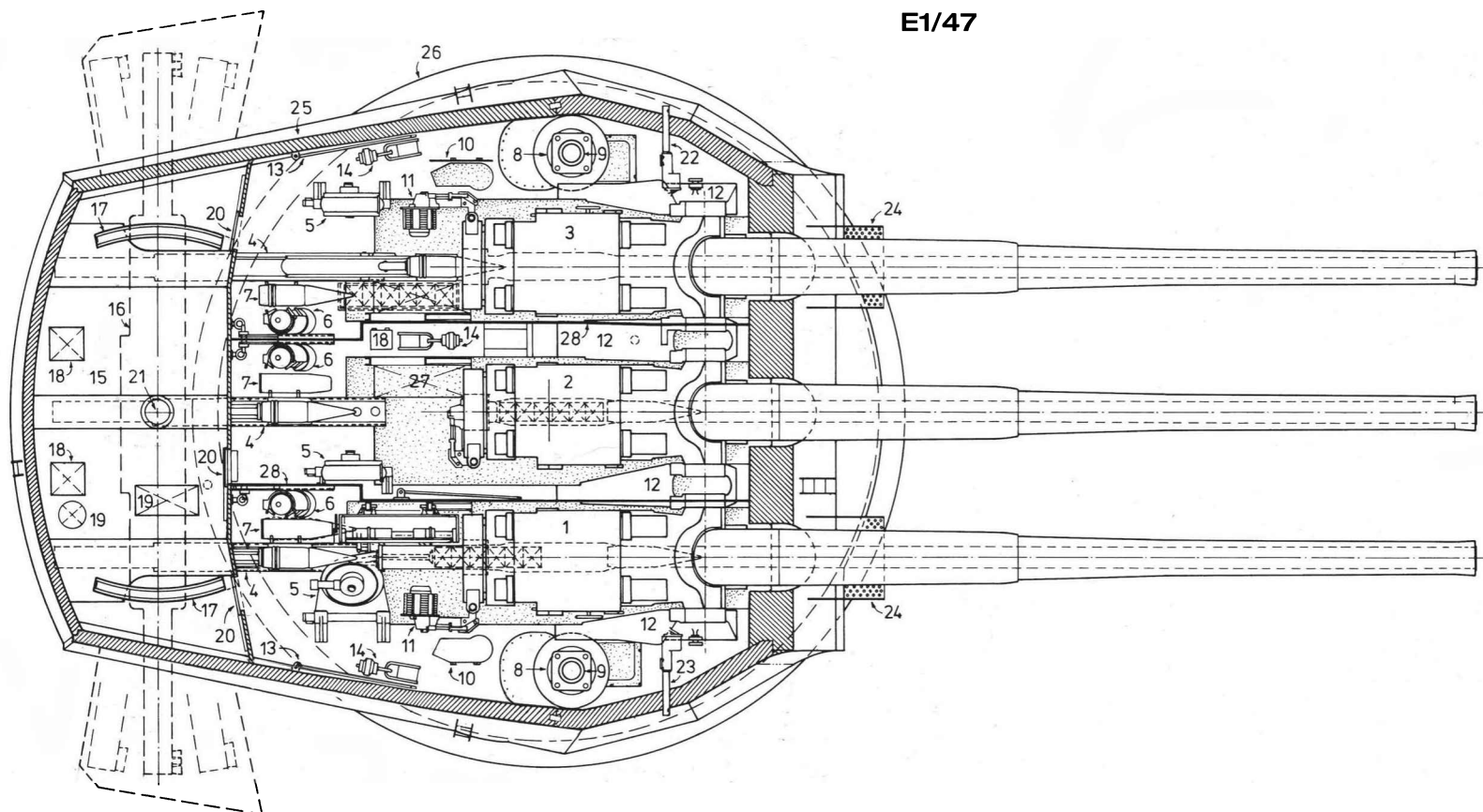
- 1 Gun cradle, rest position +3 degrees, max. length of recoil 1430mm
- 2 Maximum elevation +45 degrees, depression -5 degrees
- 3 Trunnion bearing
- 4 Breech mechanism
- 5 Elevating cylinder

- 6 Armour – splinter protection
- 7 Upper support for canvas blast cover
- 8 Basket for canvas blast cover (only for right and left barrel)
- 9 Centre gun periscope
- 10 Fore 650mm armour plate
- 11 270mm armour plate
- 12 190mm armour plate
- 13 Radial service crane and door for crane between gun compartments
- 14 Exercise aiming device
- 15 Gunhouse – middle gun compartment

- 16 15.5m rangefinder compartment
- 17 15.5m rangefinder
- 18 Periscope
- 19 Aft periscope
- 20 Armoured turret's door
- 21 Shell space and ventilation space
- 22 Perforated armour plate for ventilation, later covered by 50mm thick plate – 23
- 23 Cover plate
- 24 Shell rammer
- 25 Shell transfer mechanism
- 26 Shell hoist
- 27 Cordite rammer
- 28 Cordite hoist rails
- 29 Cordite cage
- 30 Flash-tight door
- 31 Cordite hoist flash-tight tunnel
- 32 Barbette
- 33 Limiter of turret rotation (turret part)
- 34 Limiter of turret rotation (barbette part)
- 35 Water-tight gasket
- 36 Turntable
- 37 Turret rollers
- 38 Training rack
- 39 Ring bulkhead
- 40 Upper rotating shell stowage
- 41 Lower rotating shell stowage
- 42 Shell magazine
- 43 Shell 'push-pull' gear
- 44 Shell bogie
- 45 Upper cordite magazine
- 46 Lower cordite magazine
- 47 Cordite stowage – canisters for two 55kg charges
- 48 Flash-tight scuttle
- 49 Powder (cordite) handling room
- 50 Cordite transfer bogie
- 51 Cordite swinging rammer – moved 330kg charge into the hoist cage
- 52 Rotating platform of revolving turret structure
- 53 50–80mm thick armour
- 54 Cable lead in

E1/47 Main Gun Turret - Plan (1/150 scale)

- | | | | |
|----|---|----|--|
| 1 | Right gun – at moment of cordite charge 330kg loading | 15 | 15.5m rangefinder compartment |
| 2 | Centre gun – ready to fire | 16 | 15.5m rangefinder |
| 3 | Left gun – at moment of shell loading | 17 | Rangefinder rotating rails |
| 4 | Shell rammer | 18 | Hatch |
| 5 | Cordite rammer | 19 | Ventilation hole |
| 6 | Shell transfer mechanism and shell hoist | 20 | Inner door |
| 7 | Shell waiting tray | 21 | Rangefinder axis of rotation |
| 8 | Hydraulic training engine | 22 | Left gun periscope |
| 9 | Training clutch handwheel | 23 | Right gun periscope |
| 10 | Auxiliary hoist | 24 | Basket for canvas blast cover |
| 11 | Breech block | 25 | 250mm side armour |
| 12 | Trunnion bearing | 26 | Barbette |
| 13 | Side crane arm | 27 | Flash-tight door for cordite hoist – lower part of turntable |
| 14 | Hydraulic engine of crane | 28 | Steel bulkheads – separate gunhouse for three gun compartments |

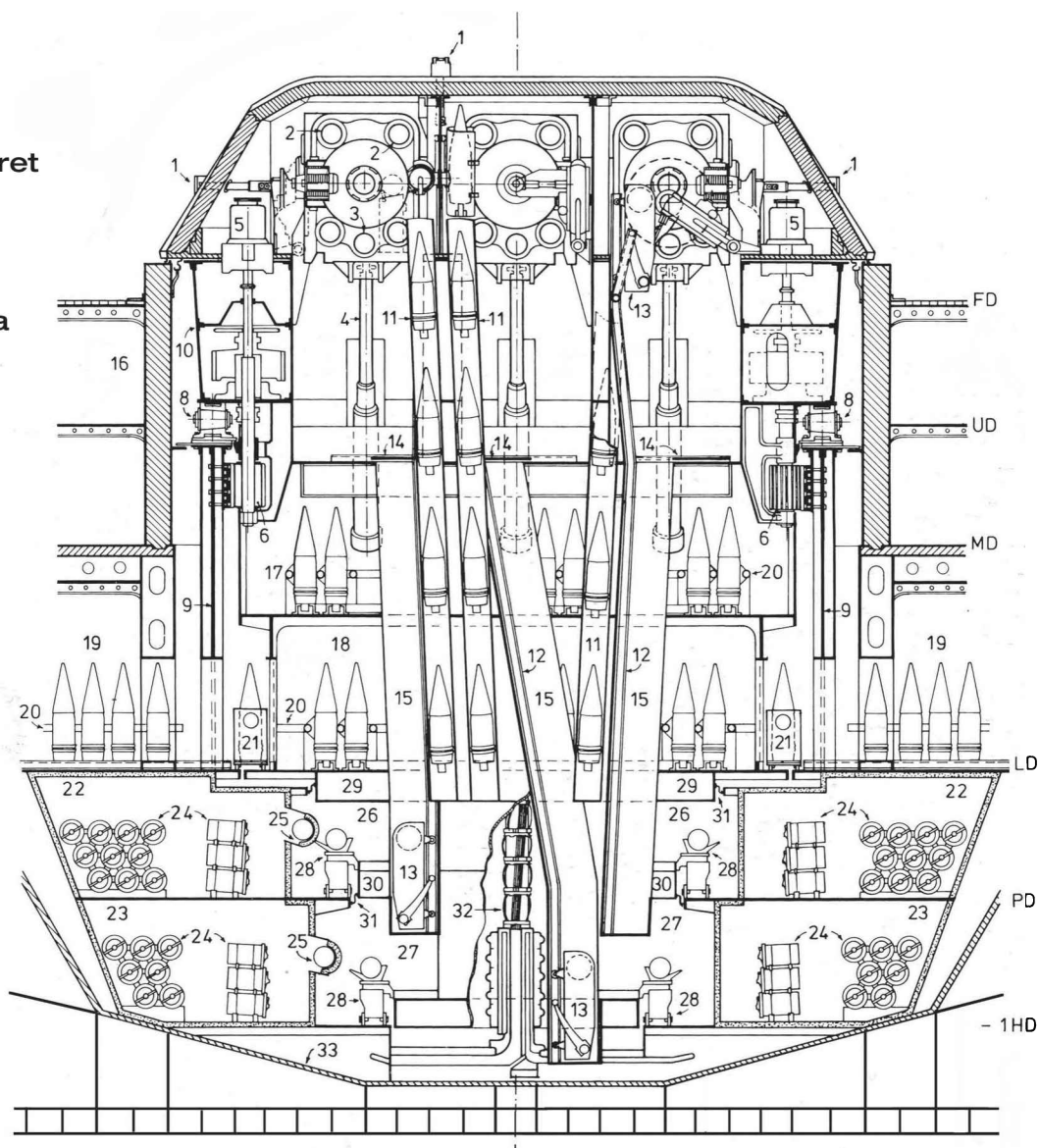


E Armament – 46cm Guns

E1/47a Section rear view of central part of turret (1/150 scale)

- 1 Middle gun periscope
- 2 Recoil cylinder
- 3 Run-out cylinder
- 4 Elevating cylinder
- 5 Training hydraulic engine
- 6 Training pinion
- 7 Training rack
- 8 Turret rollers
- 9 Ring bulkhead
- 10 Turntable
- 11 Shell hoist
- 12 Cordite hoist rails
- 13 Cordite cage
- 14 Flash-tight door
- 15 Cordite hoist flash-tight tunnel
- 16 Barbette
- 17 Upper rotating shell stowage
- 18 Lower rotating shell stowage
- 19 Shell magazine
- 20 Shell 'push-pull' gear
- 21 Shell bogie
- 22 Upper cordite magazine
- 23 Lower cordite magazine
- 24 Cordite stowage – canisters for two 55kg charges
- 25 Flash-tight scuttle
- 26 Cordite handling room – upper
- 27 Cordite handling room – lower
- 28 Cordite transfer bogie
- 29 Revolving platform – upper
- 30 Revolving platform – lower
- 31 Apron
- 32 Cable lead in
- 33 50mm-80mm thick armour

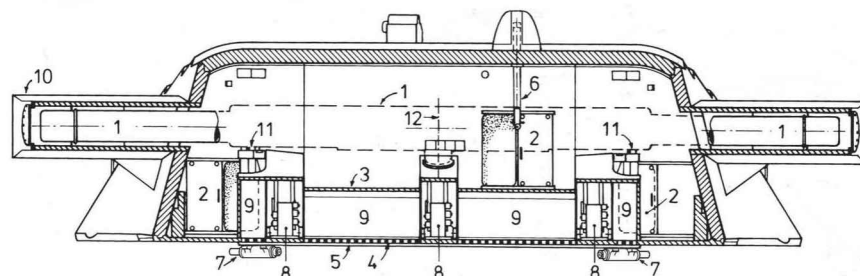
E1/47a



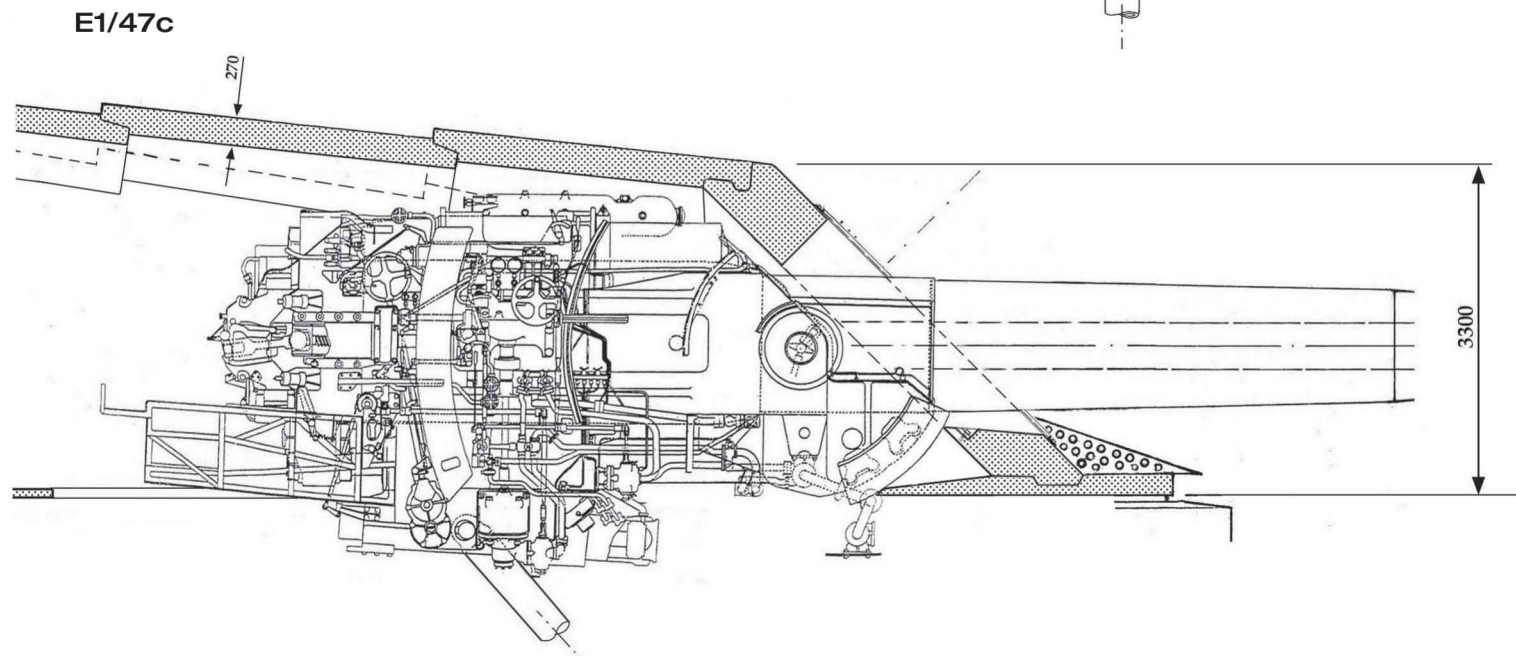
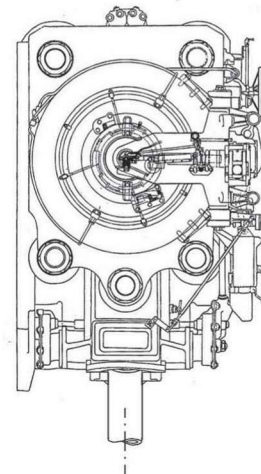
E1/47b Section of 15.5M rangefinder compartment (1/150 scale)

- 1 15.5m rangefinder
- 2 Inner door (sliding)
- 3 Inner deck of compartment
- 4 Perforated armour plate
- 5 Shield plate
- 6 Periscope
- 7 Limiter of turret rotation
- 8 Shell rammer
- 9 Ventilation space
- 10 Rangefinder cover
- 11 Rangefinder rotation rails
- 12 Axis of rotation

E1/47b



E1/48 Rear view and plan of gun cradle and breech mechanism

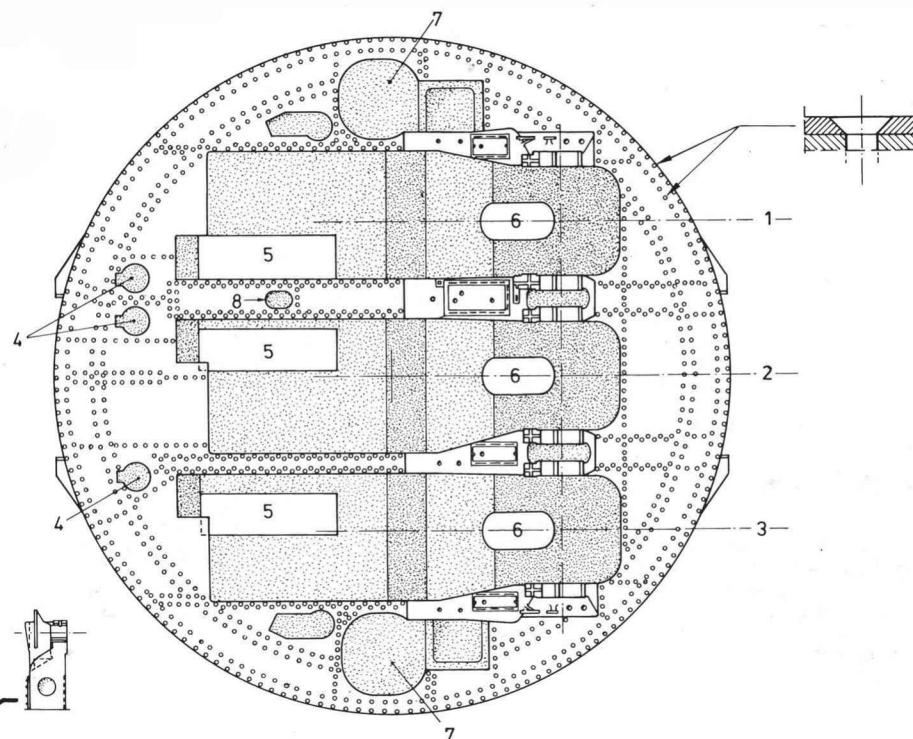
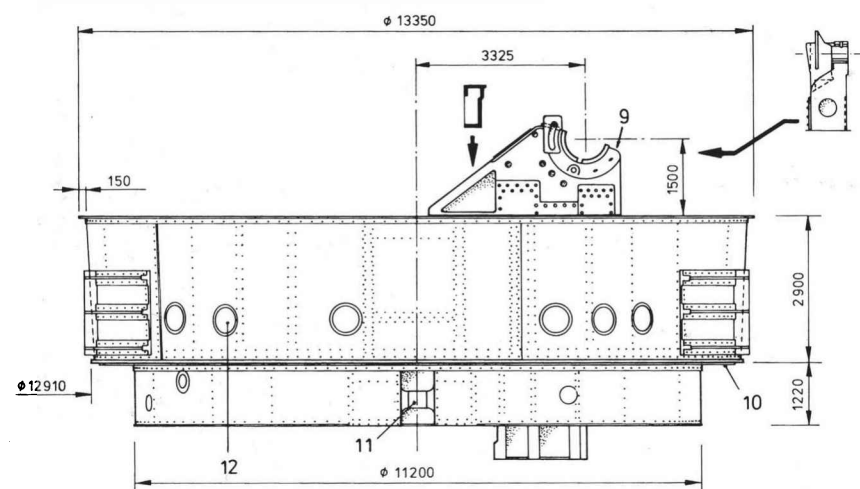


E Armament – 46cm Guns

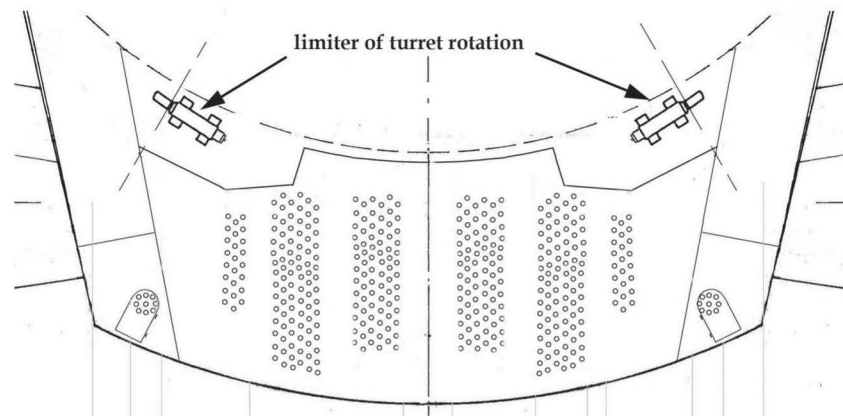
E1/48a Turntable of 46cm gun mounting profile and plan (1/150 scale)

- 1 Left gun axis
- 2 Centre gun axis
- 3 Right gun axis
- 4 Shell hoist
- 5 Cordite hoist
- 6 Holes of elevating cylinder
- 7 Holes of training shaft
- 8 Hatch
- 9 Trunnion bearing
- 10 Roller path seating
- 11 Hole for training pinion
- 12 Manhole

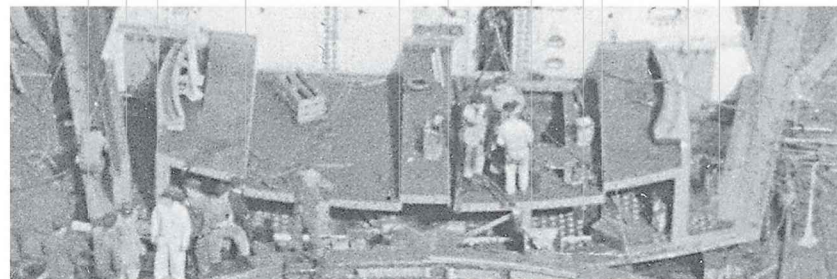
E1/48a



E1/49



E1/49 Perforated armour plate (for ventilation covered later [1944] by steel plates)



46cm gun ammunition (1/20 scale)

E1/50 Type 91, 46cm armour piercing projectiles –
weight 1460kg

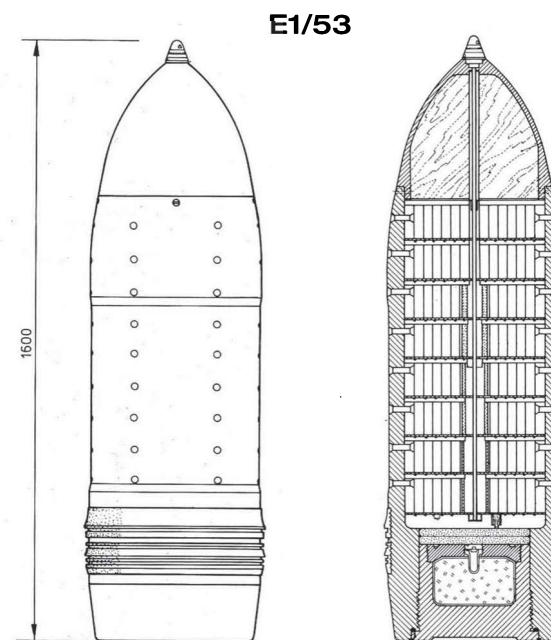
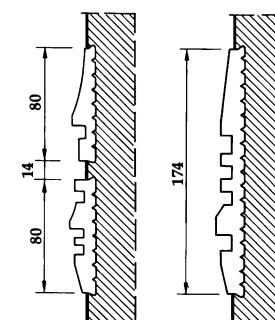
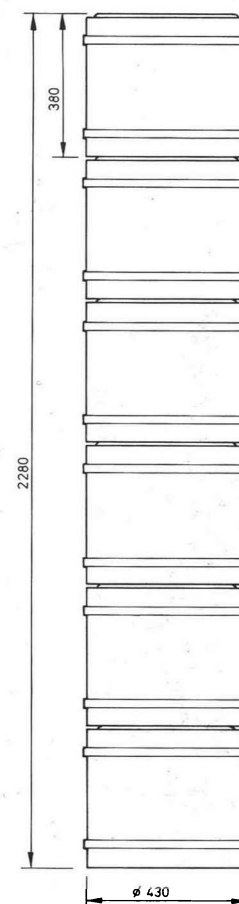
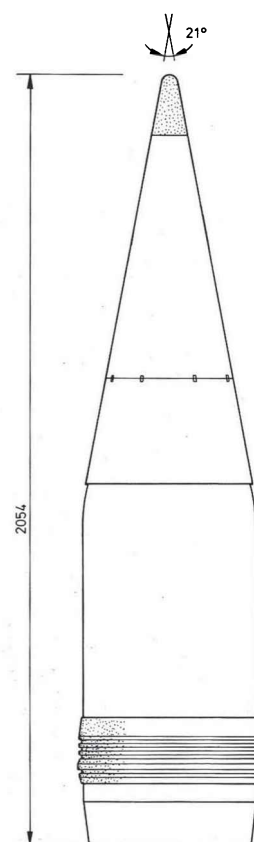
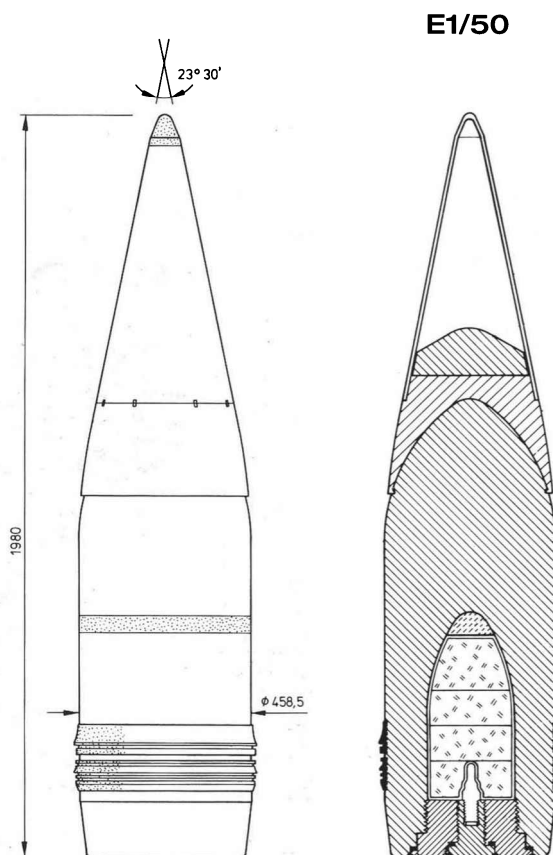
E1/51 Cordite charge (weight 330 kg)

E1/52 Copper rotating bands

E1/53 AA common projectile ‘san-shiki’ weight
1360kg

E1/51

E1/52



E Armament – 15.5cm Gun turrets

15.5cm/60cal 'Nendo shiki' gun (1/100 scale)

E2/1 Turret no.1 profile view

E2/2 Plan

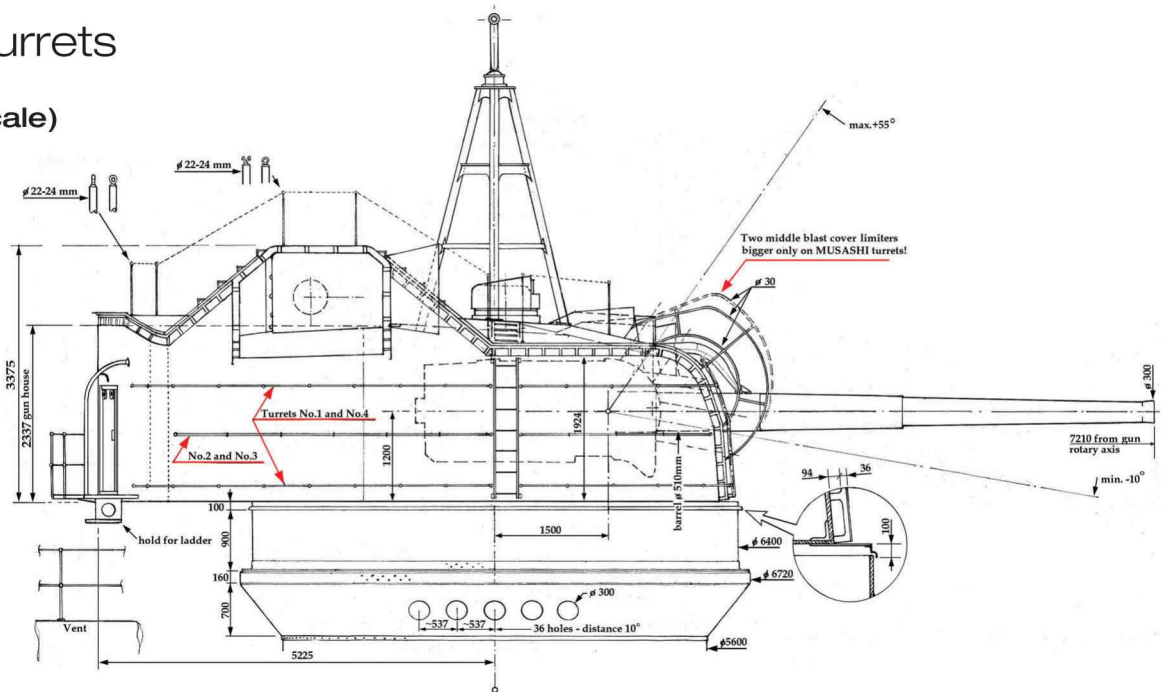
E2/3 Detail of canvas blast cover support

E2/4 Section 'C'

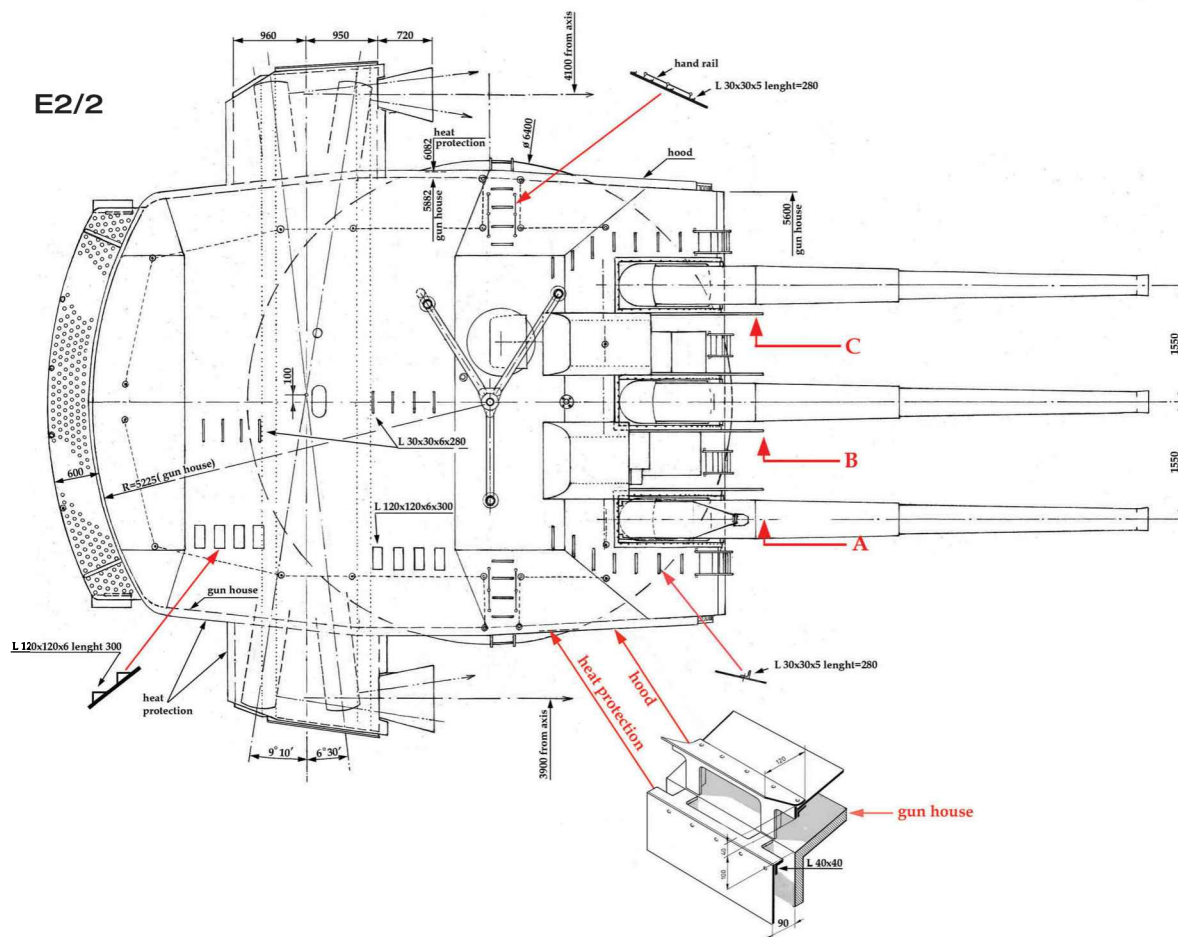
E2/5 Section 'B'

E2/6 Section 'A'

E2/1

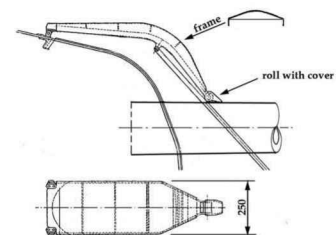


E2/2

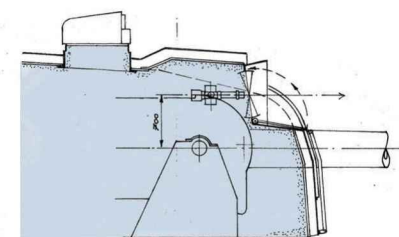


E2/3

Support for canvas blast cover



E2/4



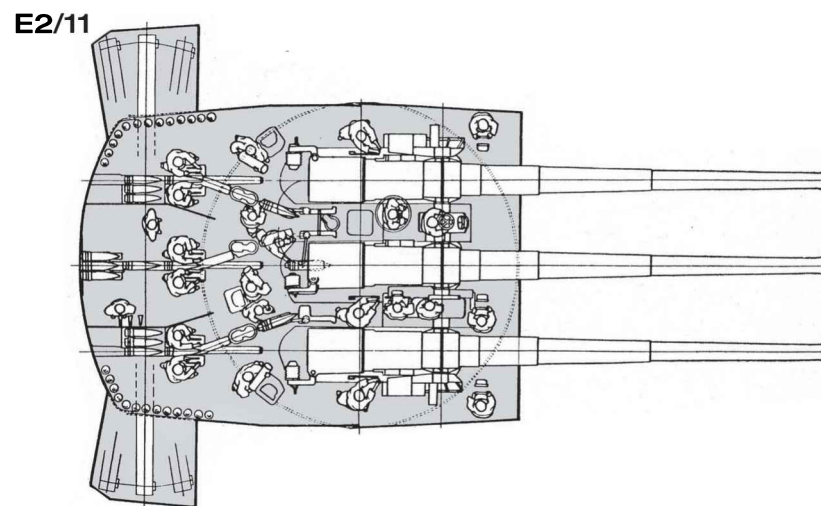
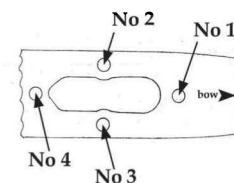
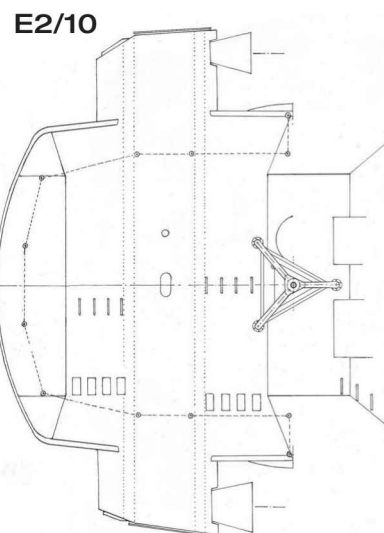
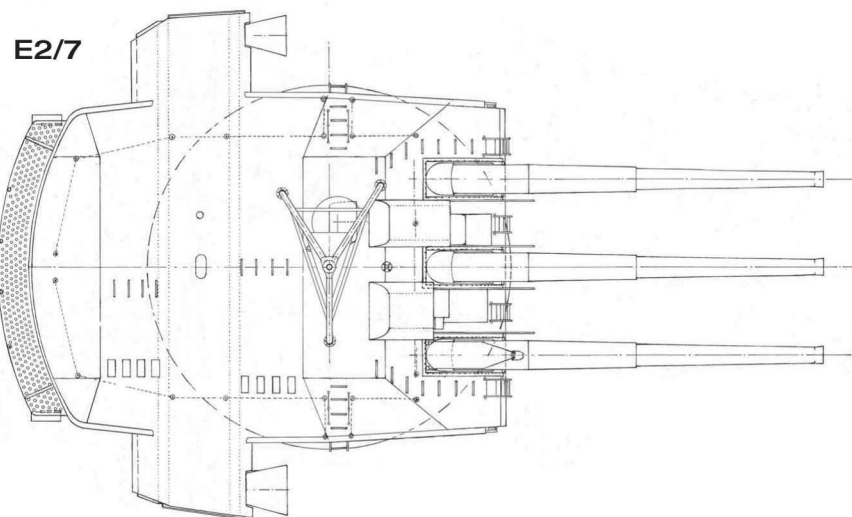
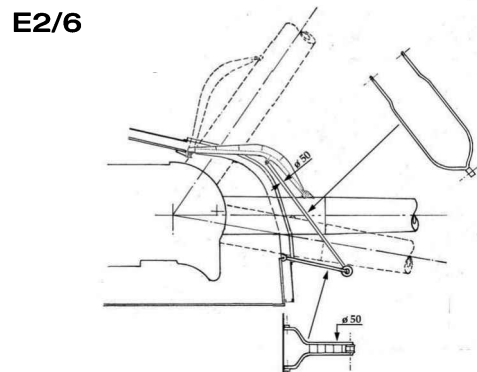
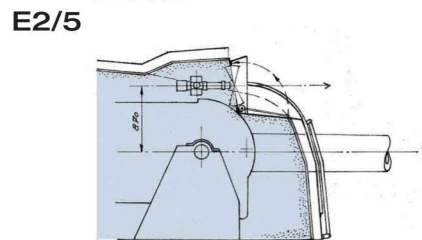
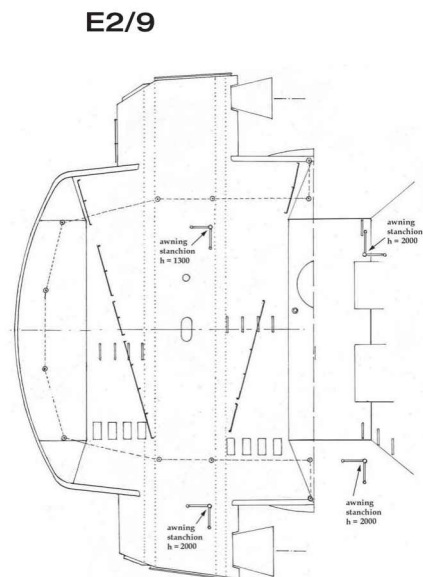
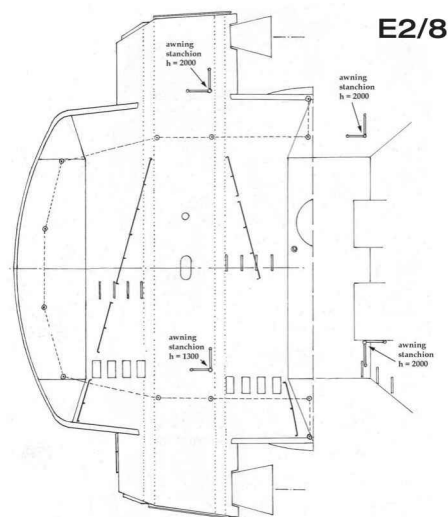
E2/7 15.5cm gun turret no.1 plan (1/150 scale)

E2/8 Turret no.2 plan

E2/9 Turret no.3 plan

E2/10 Turret no.4 plan

E2/11 Scheme of crew positions



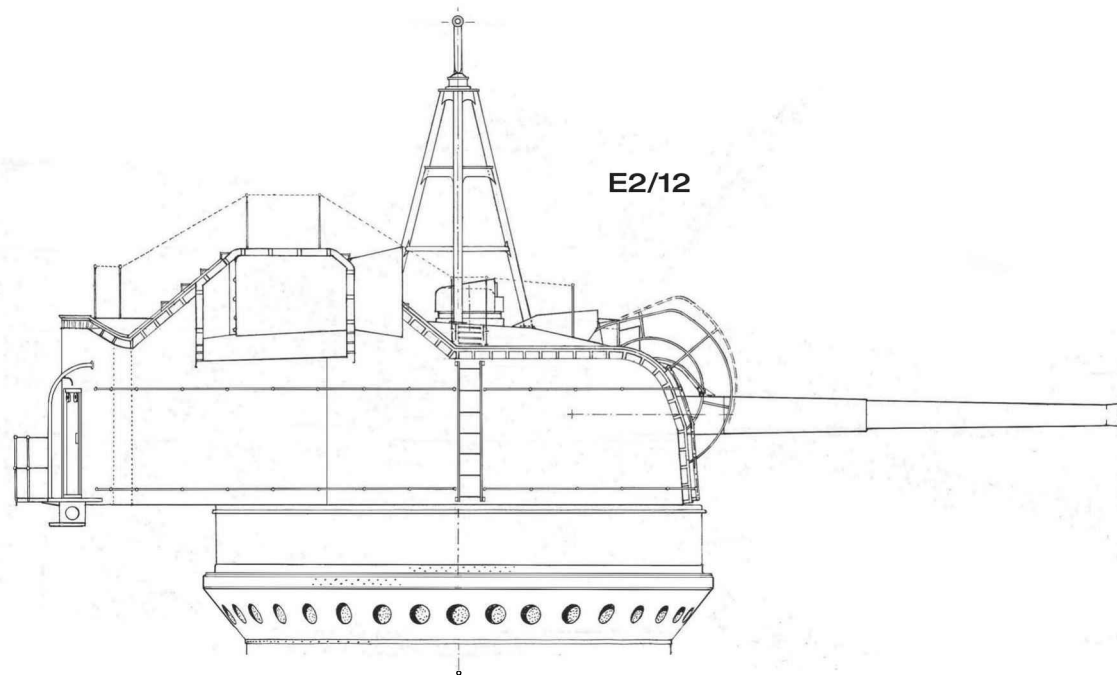
E Armament – 15.5cm Gun turrets

15.5cm gun turret no.1 (1/100 scale)

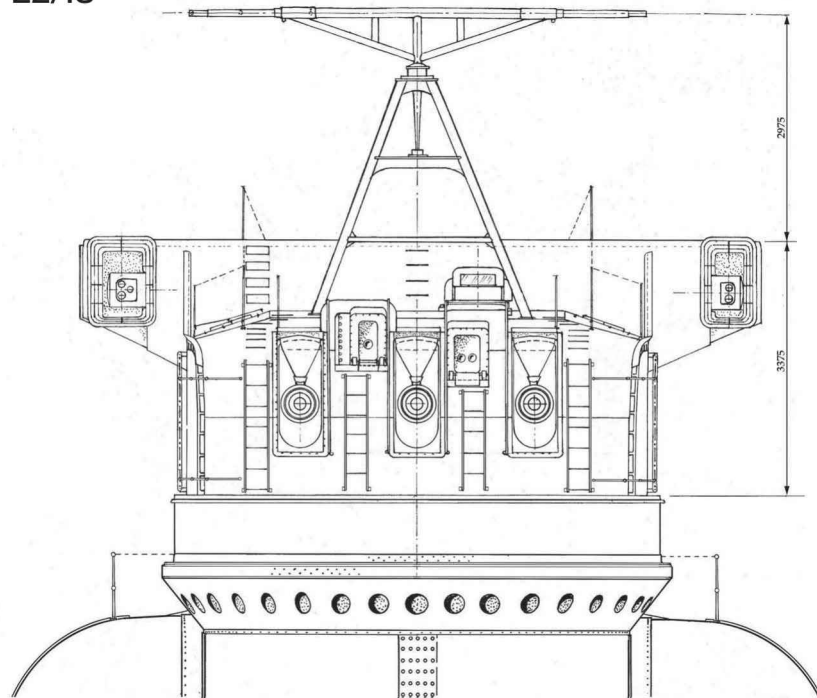
E2/12 Profile view

E2/13 Front view

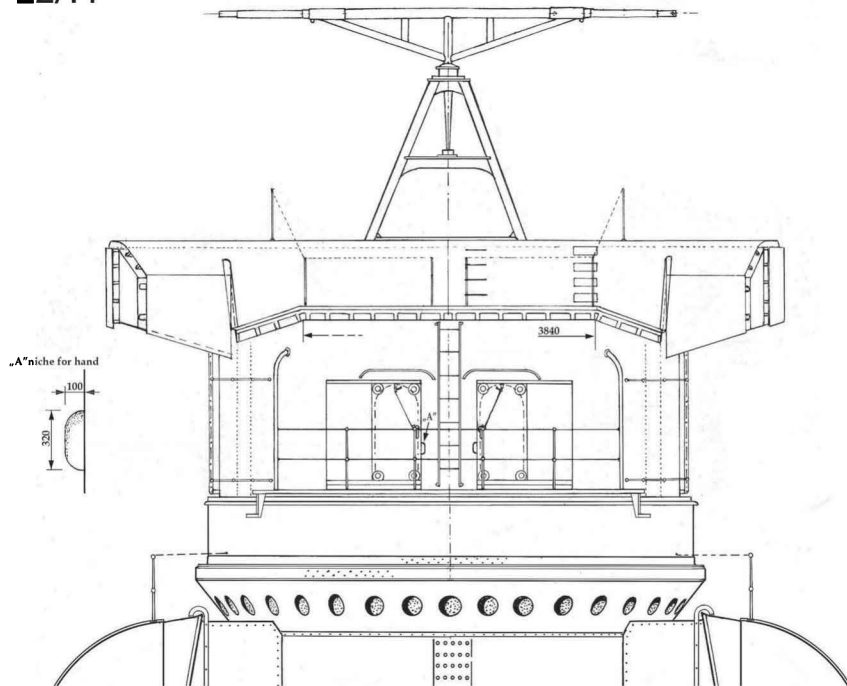
E2/14 Rear view



E2/13



E2/14

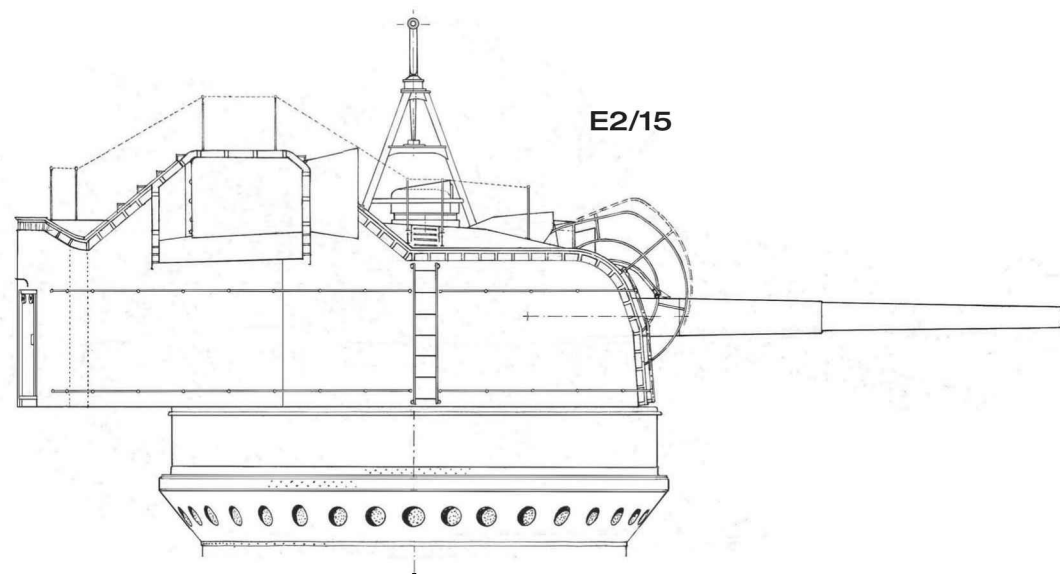


15.5cm gun turret no.4 (1/100 scale)

E2/15 Profile view

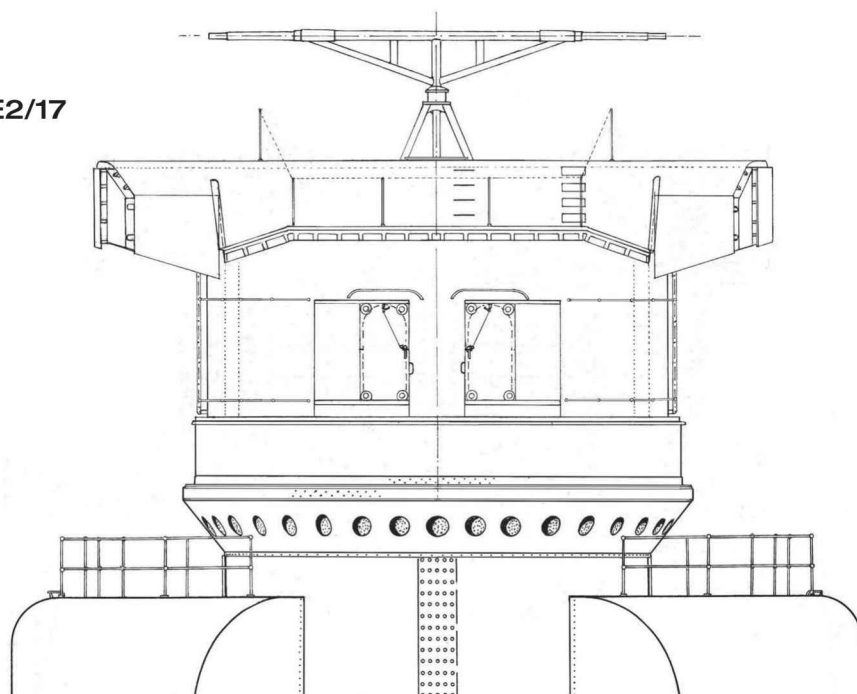
E2/16 Front view

E2/17 Rear view

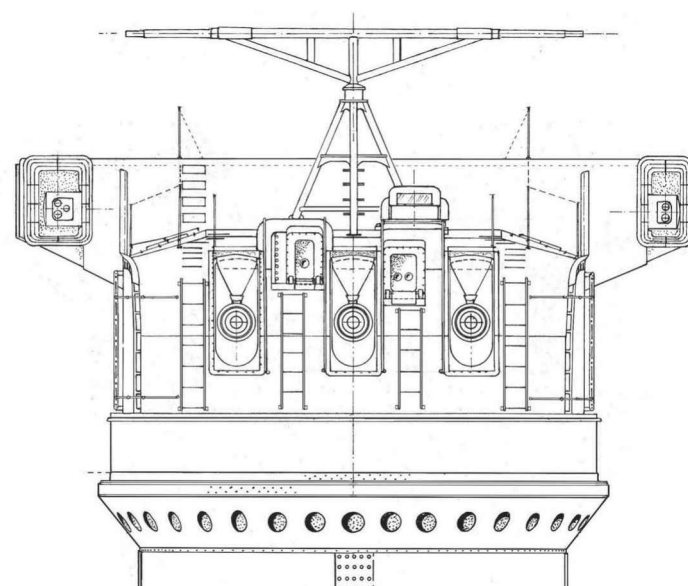


E2/15

E2/17



E2/16



E Armament – 15.5cm Gun turrets

E2/18 Profile view of turrets no.2 and no.3
(1/100 scale)

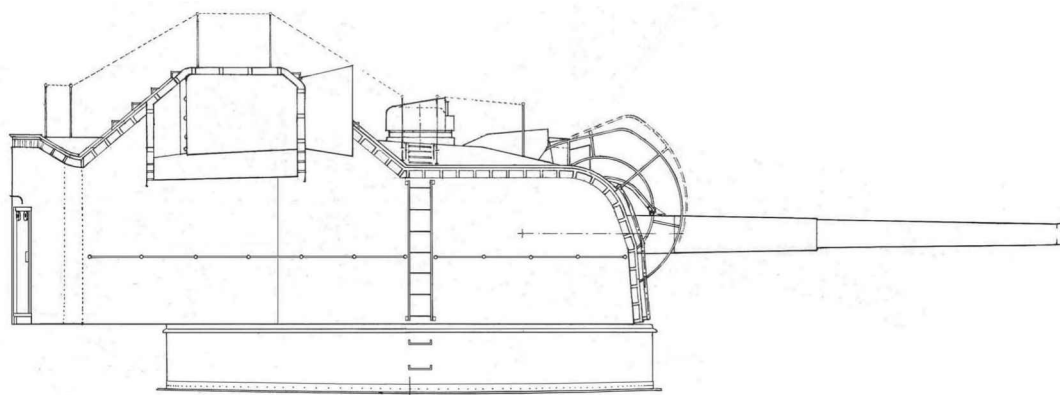
E2/19 Turret no.2 front view

E2/20 Turret no.2 rear view

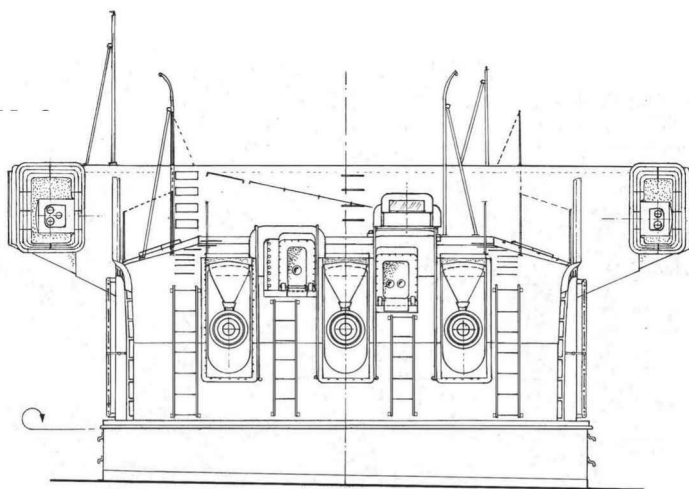
E2/21 Turret no.3 front view

E2/22 Turret no.3 rear view

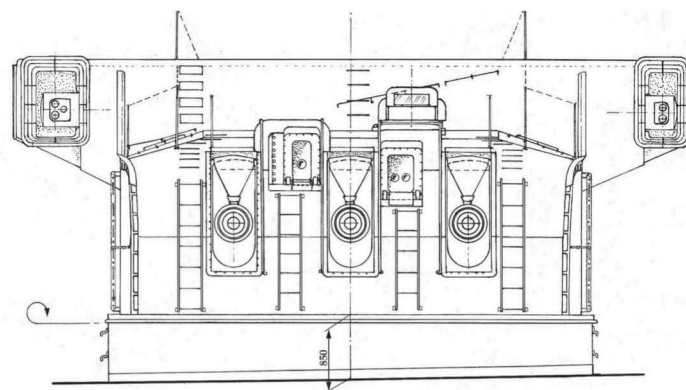
E2/18



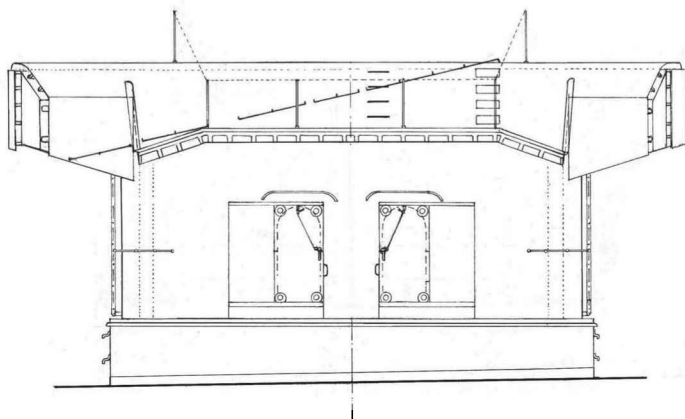
E2/19



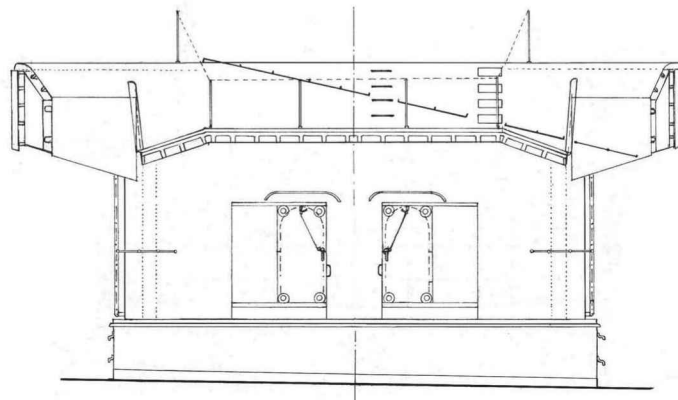
E2/21

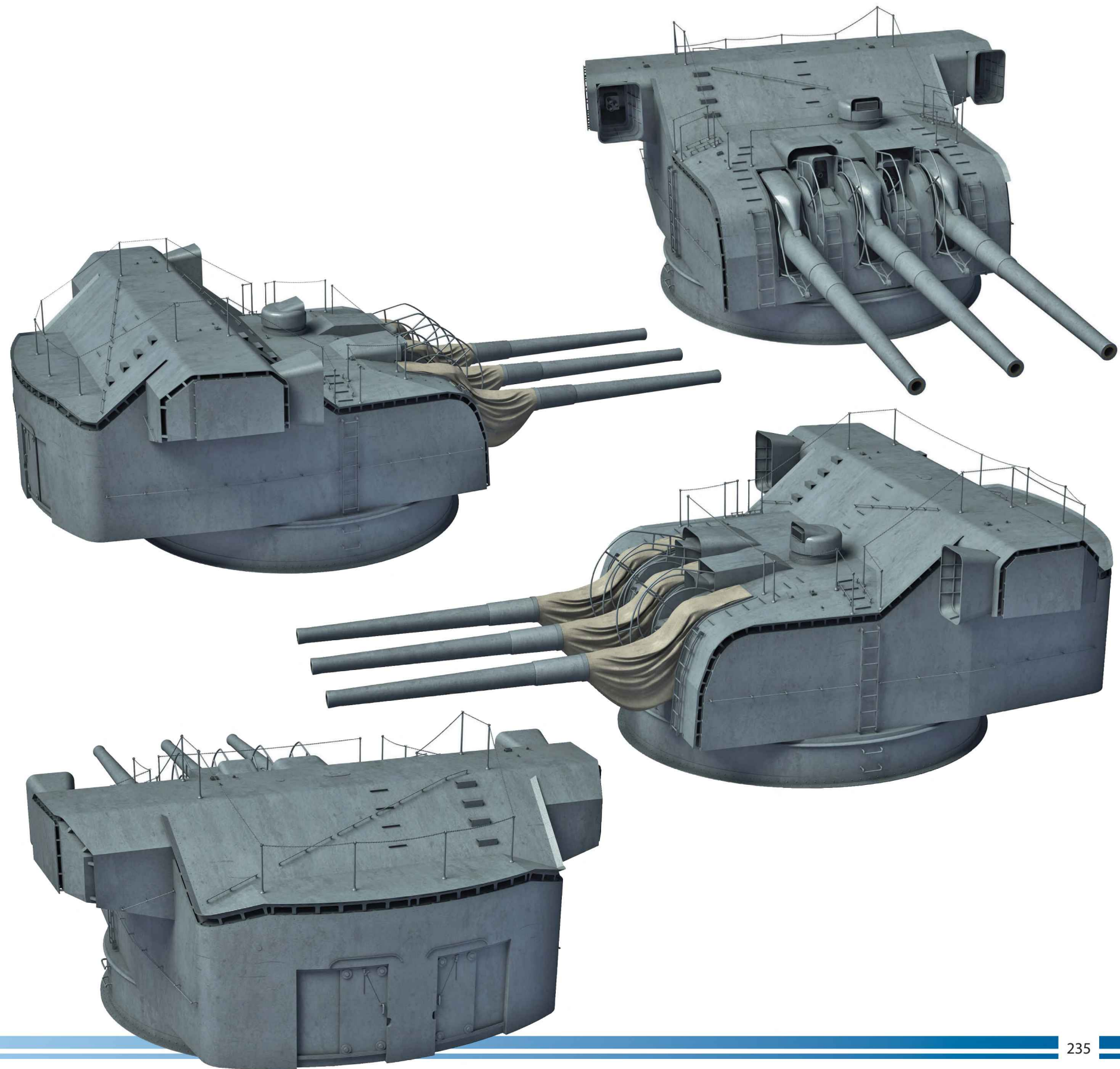


E2/20



E2/22





E Armament – 15.5cm Gun turrets

Tripod aerial mast on turret no.1 (1/100 scale)

E2/23 Plan

E2/24 Tripod details

E2/25 Side view

E2/26 Front elevation

Tripod aerial mast on turret no.4

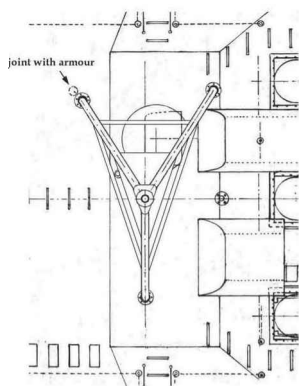
E2/27 Plan

E2/28 Tripod details

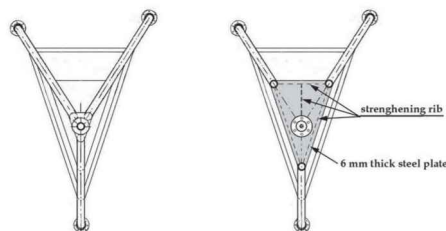
E2/29 Side view

E2/30 Front elevation

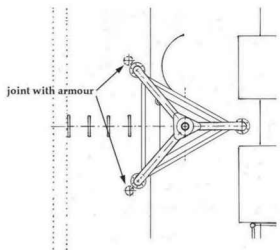
E2/23



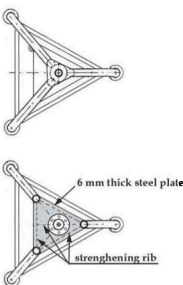
E2/24



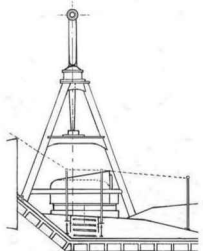
E2/27



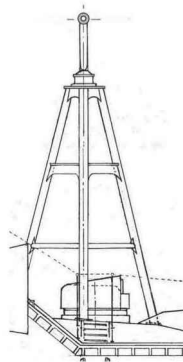
E2/28



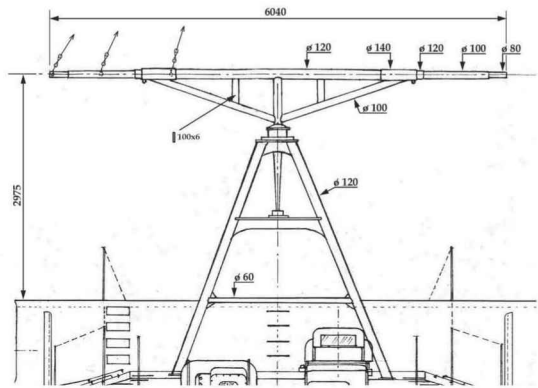
E2/29



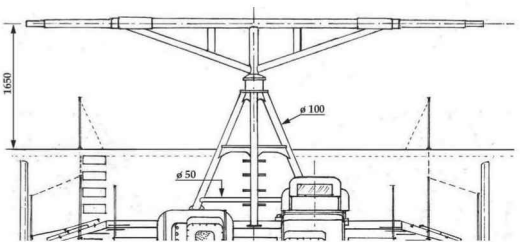
E2/25



E2/26



E2/30



Details of 8m rangefinder (1/50 scale)

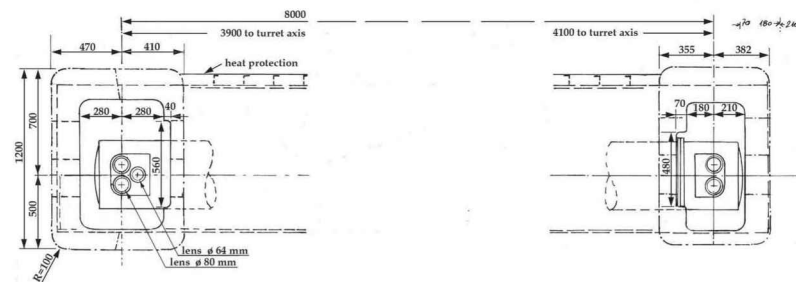
E2/31 Front elevation (*Yamato*)

E2/32 Plan (*Yamato*)

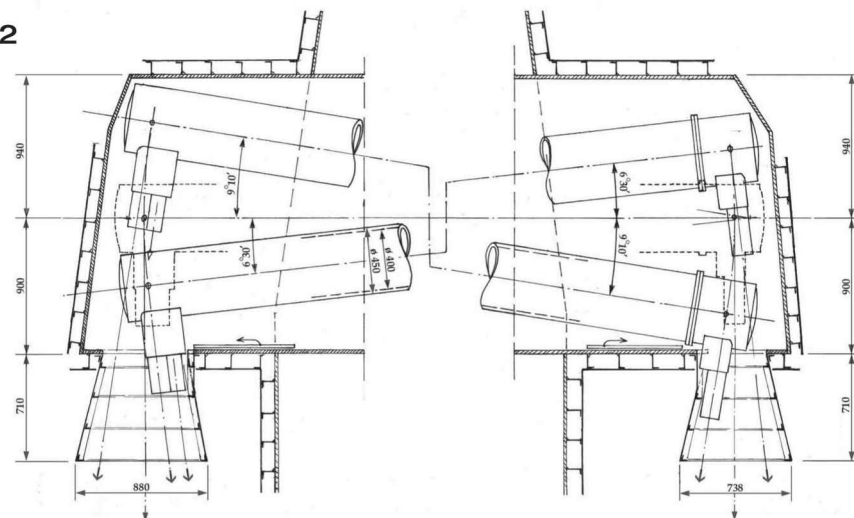
E2/33 Plan (*Musashi*)

E2/34 Edge rangefinder arms -
front view (*Musashi*)

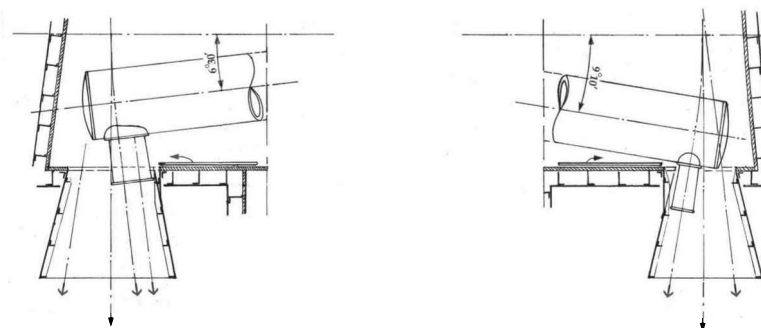
E2/31



E2/32



E2/33



E2/34



E Armament – 15.5cm Gun turrets

Ventilators at barbette no.1 15.5cm gun turret
(1/150 scale)

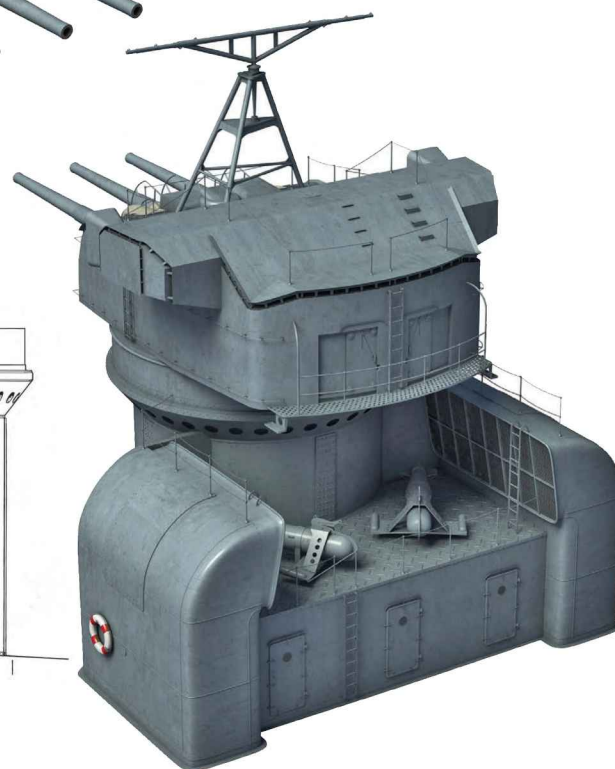
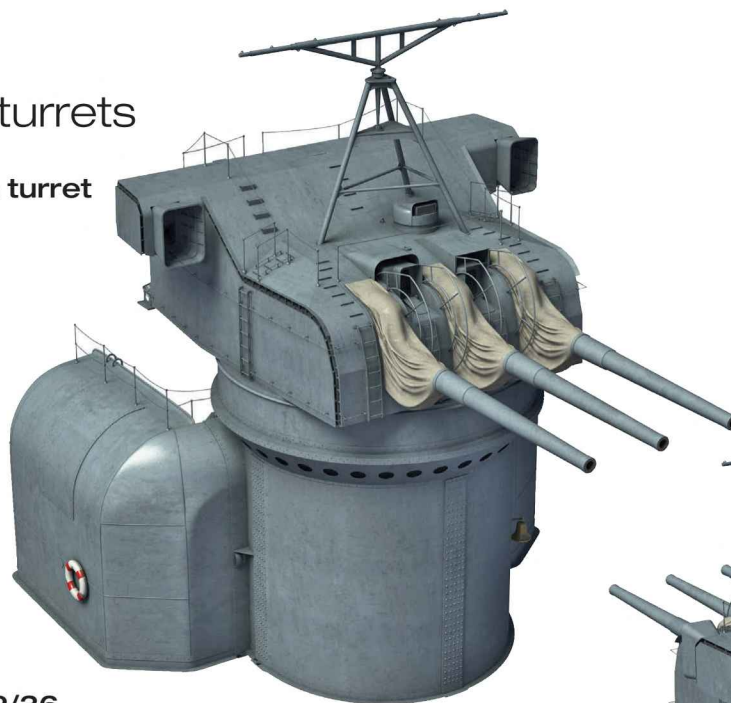
E2/35 Front elevation

E2/36 Side elevation

E2/37 Rear elevation

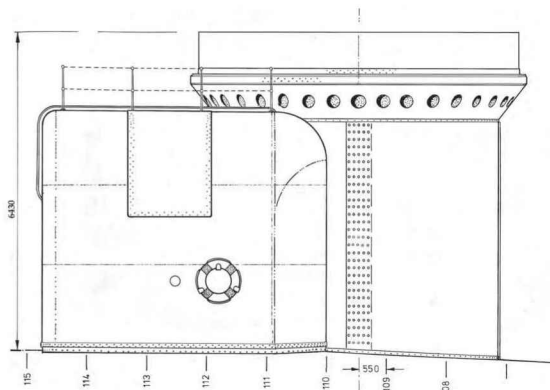
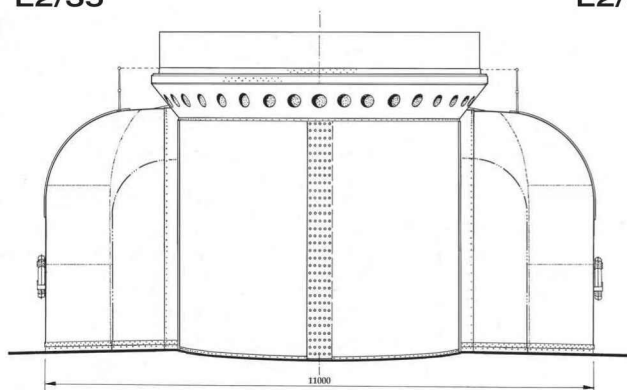
E2/38 Plan

E2/39 Section



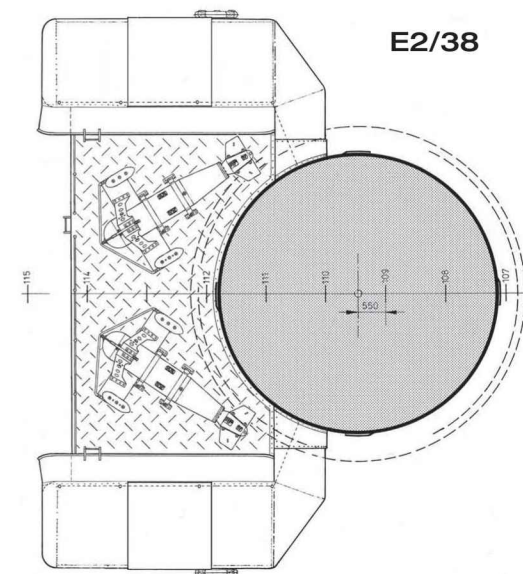
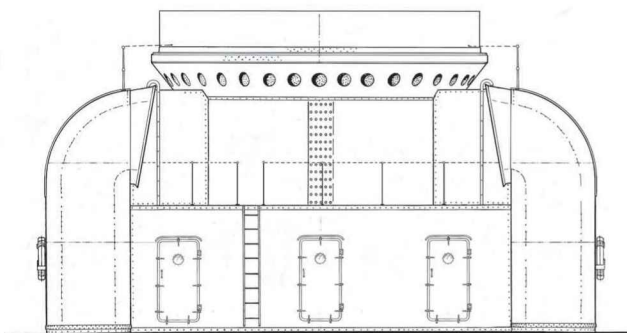
E2/35

E2/36

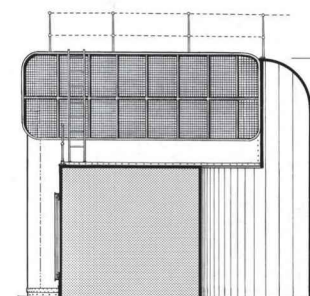


E2/37

E2/38



E2/39



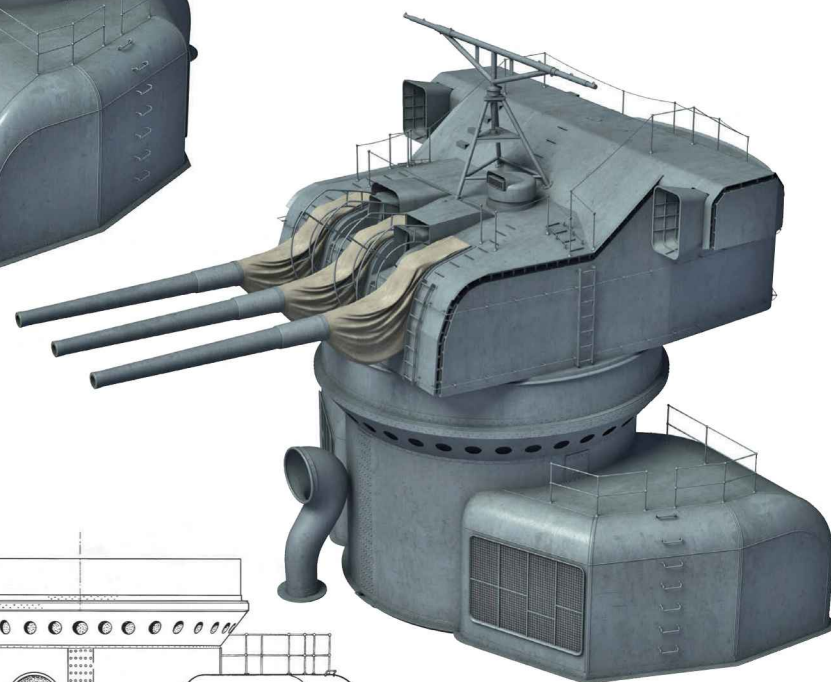
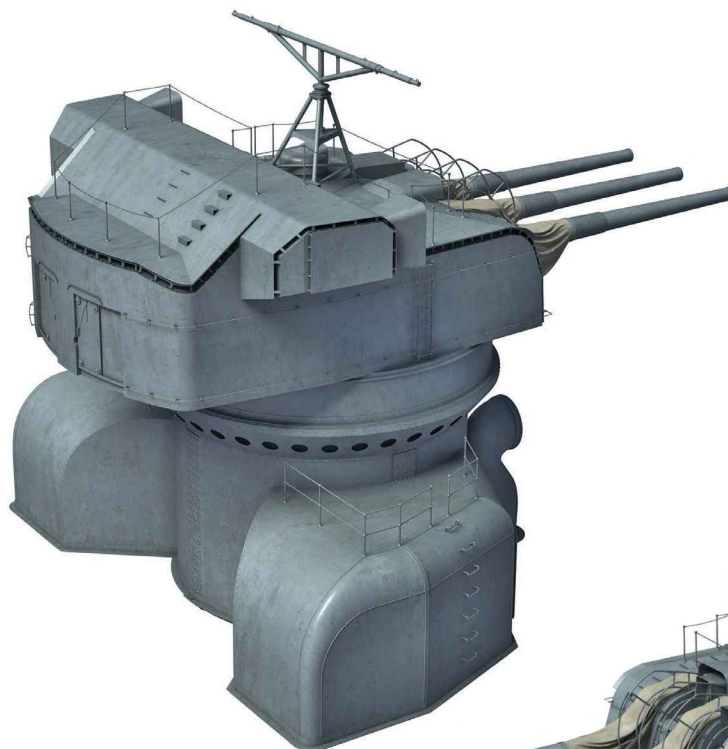
Ventilators at barbette no.4 15.5cm
gun turret (1/150 scale)

E2/40 Side elevation

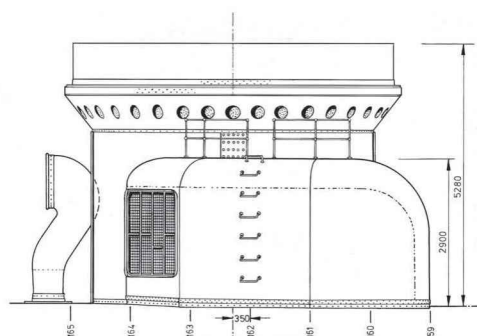
E2/41 View from ship's stern

E2/42 Plan

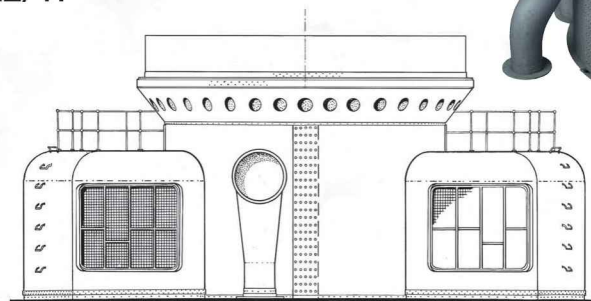
E2/43 View from bow direction



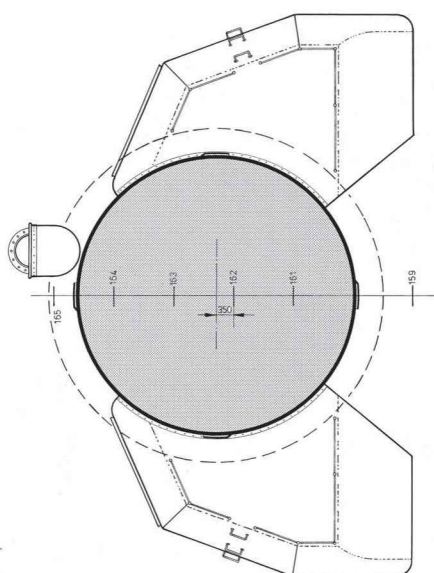
E2/40



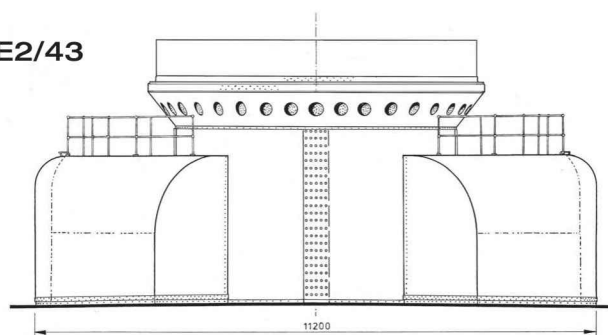
E2/41



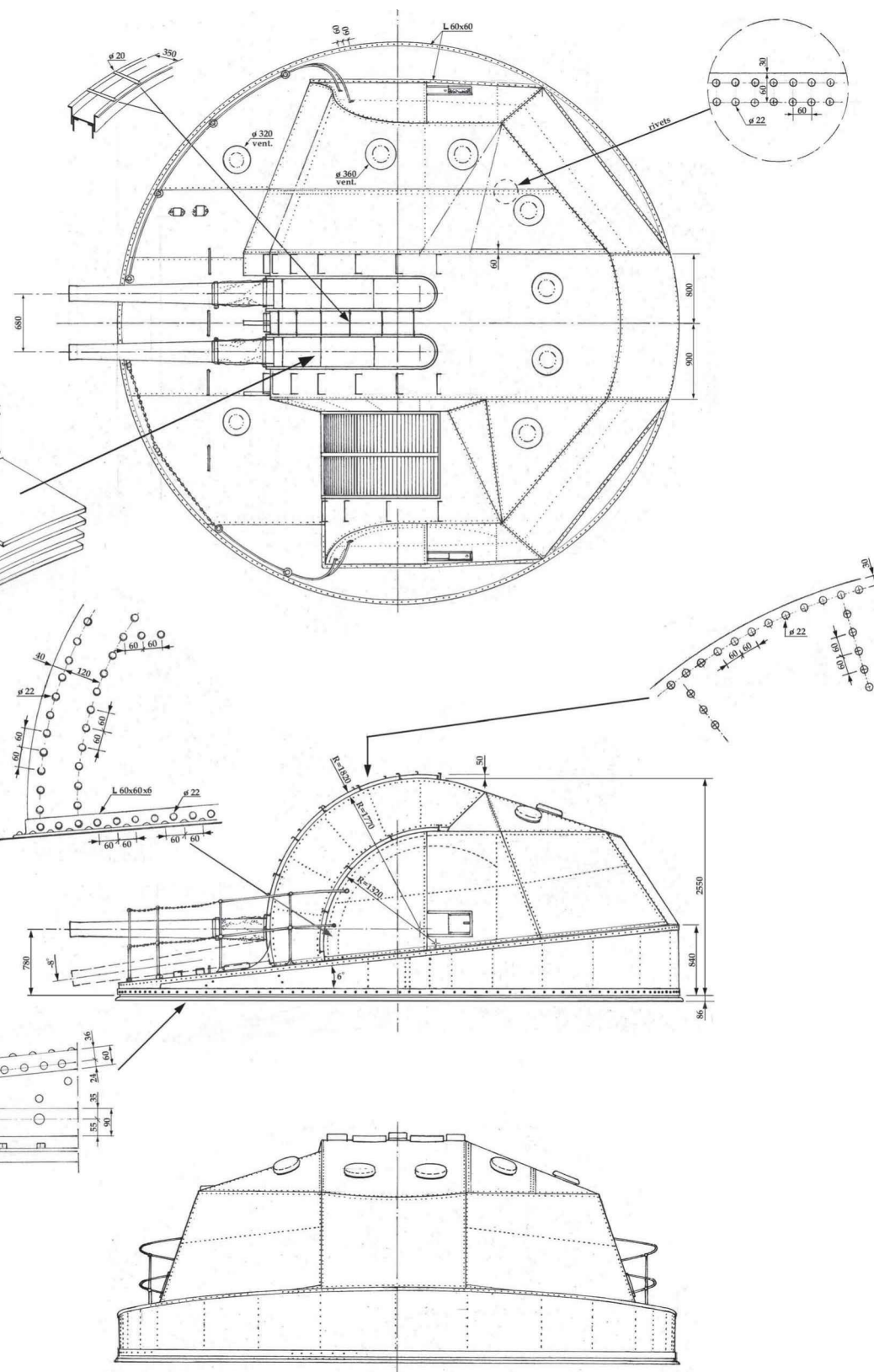
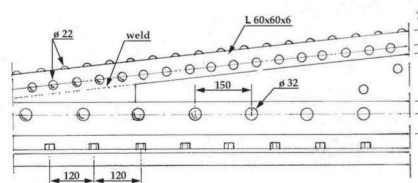
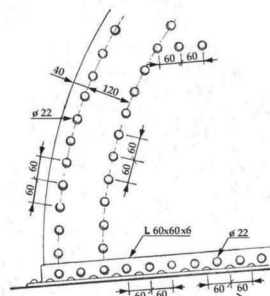
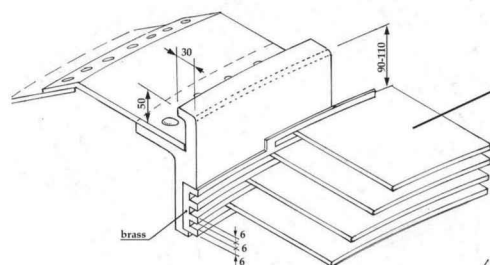
E2/42

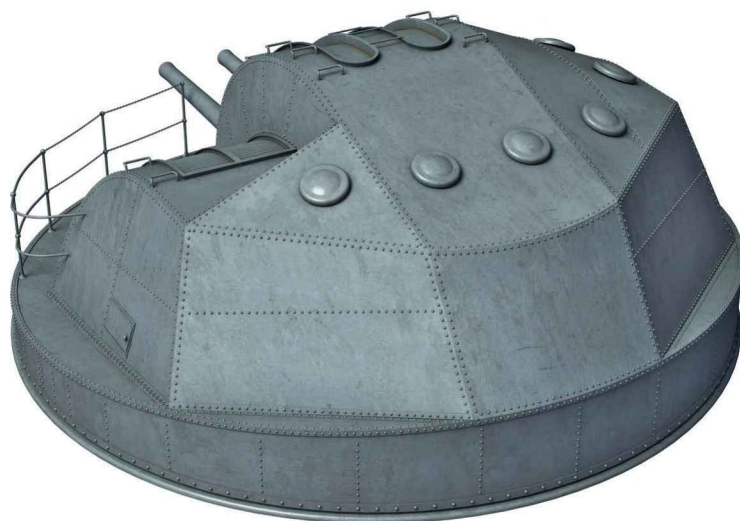
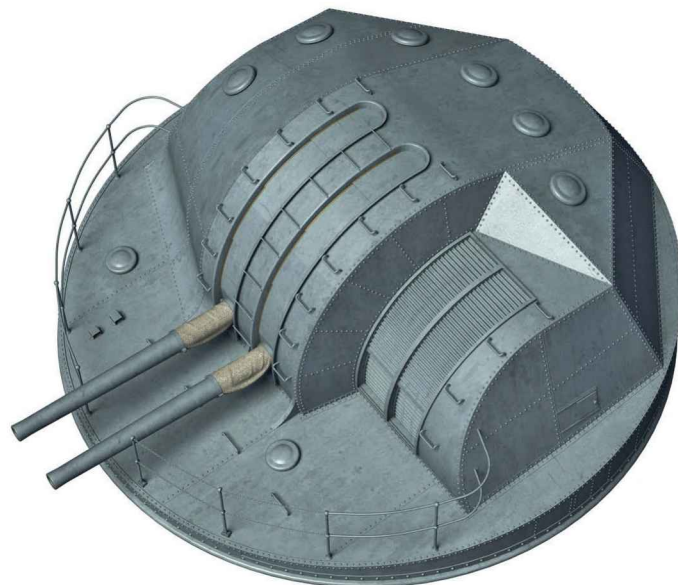


E2/43



E3/3 Rear elevation





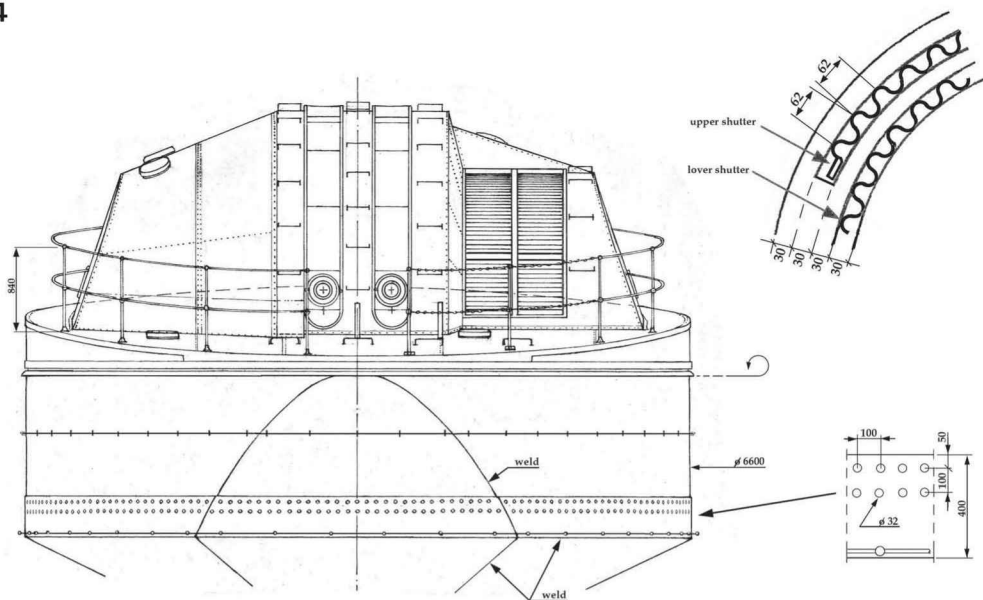
E Armament – Type 89 12.7cm 40 calibre Anti-aircraft Guns

12.7cm gun turret with *Yamato* base
(1/75 scale)

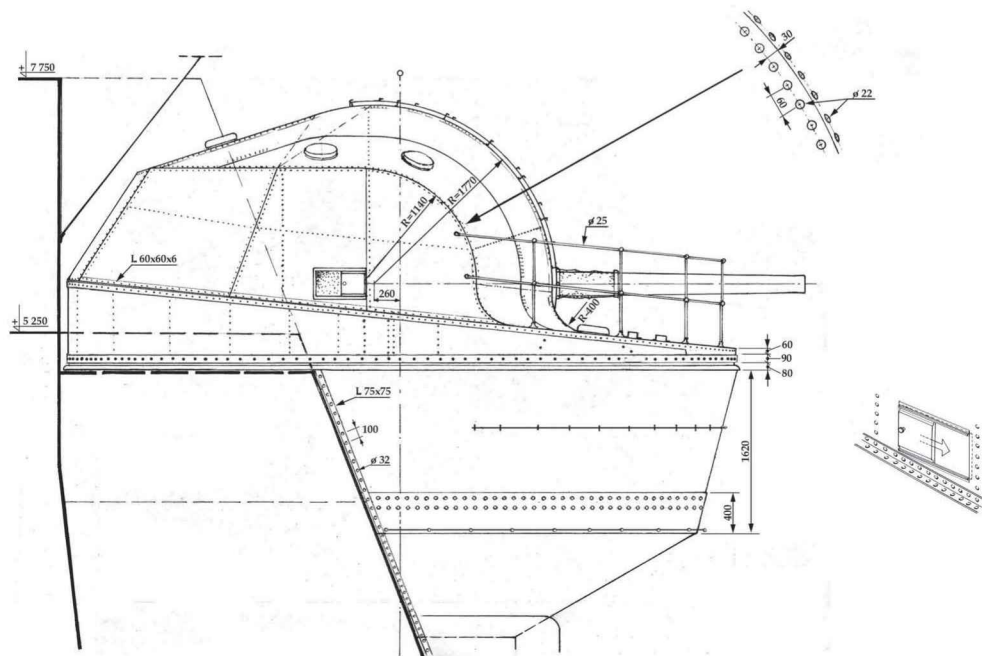
E3/4 Front elevation

E3/5 Right profile

E3/4



E3/5

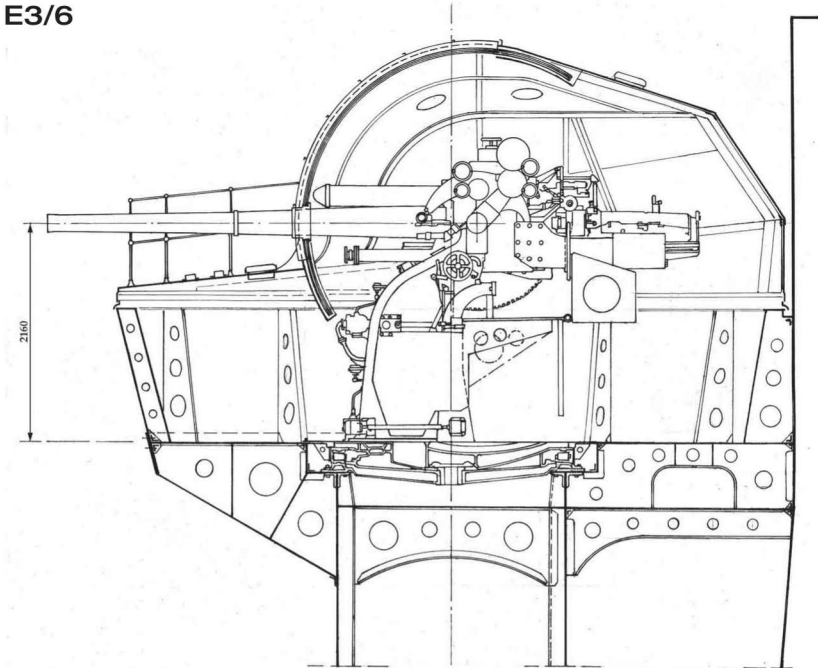


E3/6 Section of turret

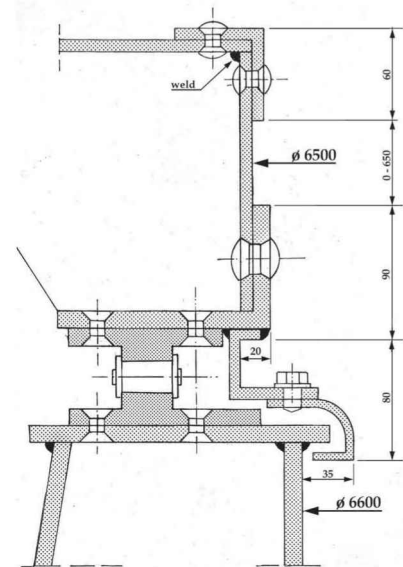
E3/7 Roller bearing F turret

E3/8 Typical clamp (from 12.7cm gun turrets
and 25mm MG towers)

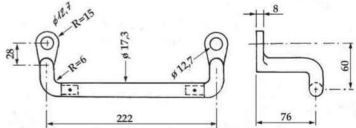
E3/6



E3/7



E3/8



E Armament – Type 89 12.7cm 40 calibre Anti-aircraft Guns

Type 89 12.7cm AA gun model A-1 fitted only on *Yamato* in 1944 (1/75 scale)

E3/9 Right profile

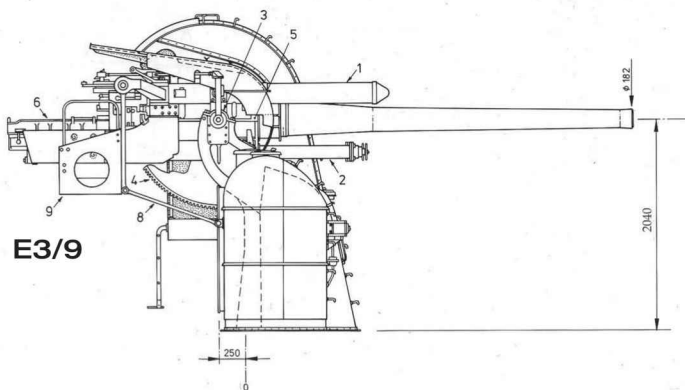
E3/10 Front elevation

E3/11 Left profile

E3/12 Plan

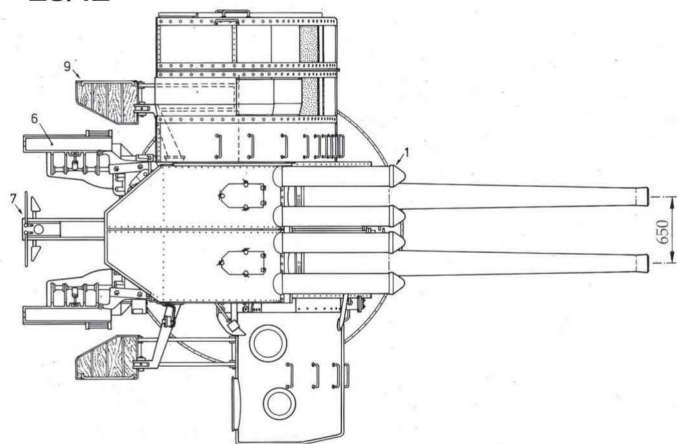
E3/13 Rear elevation

E3/14 Details under cover



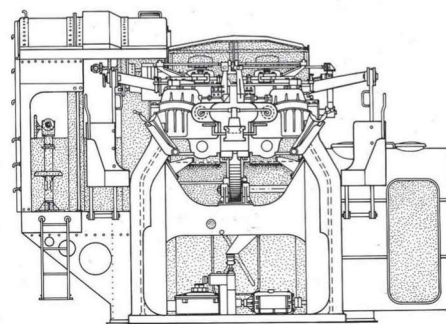
E3/9

E3/10

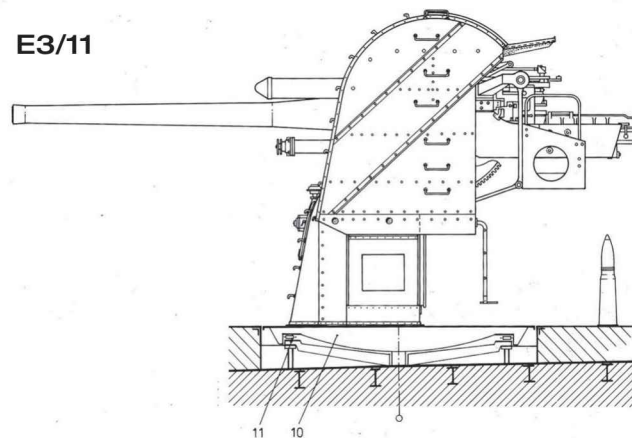


E3/12

E3/13



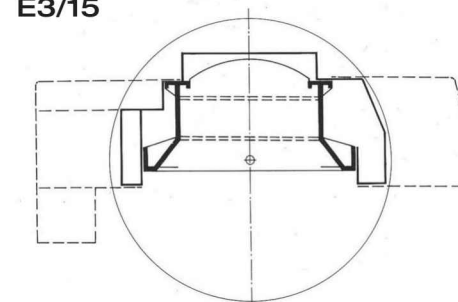
E3/11



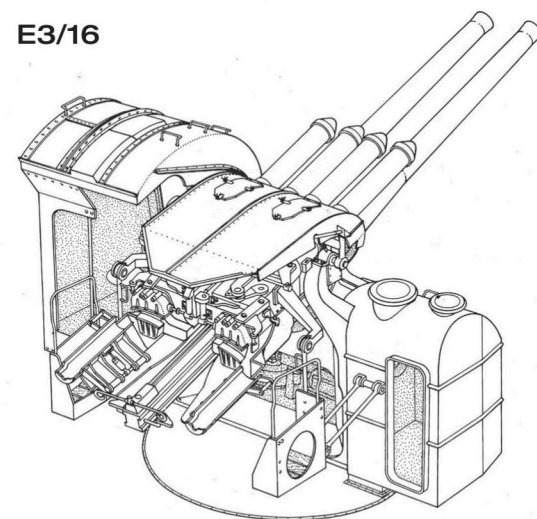
E3/15 Scheme of mounting base ring

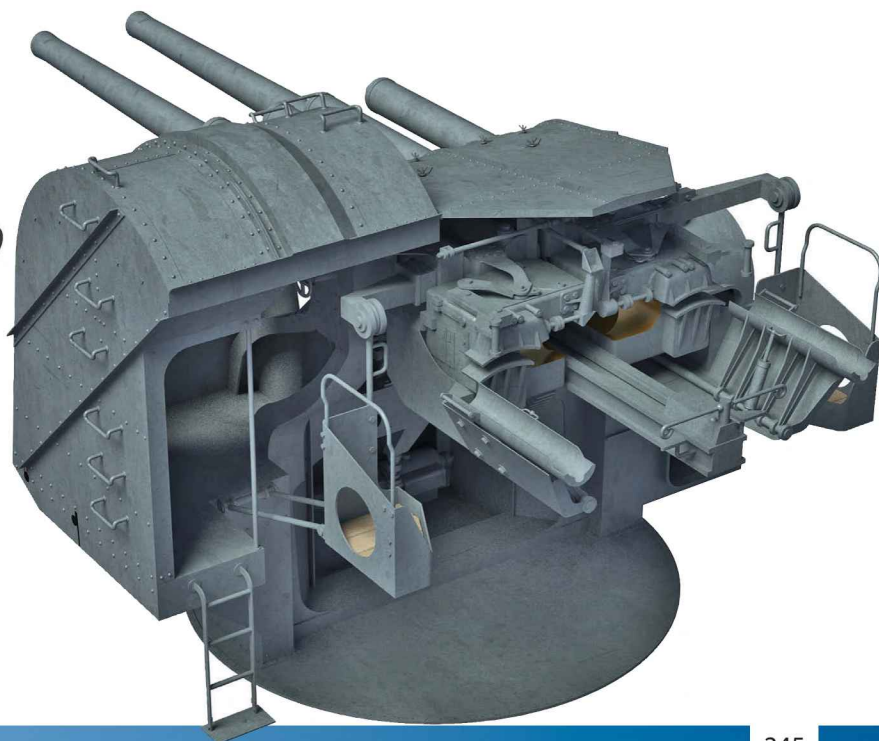
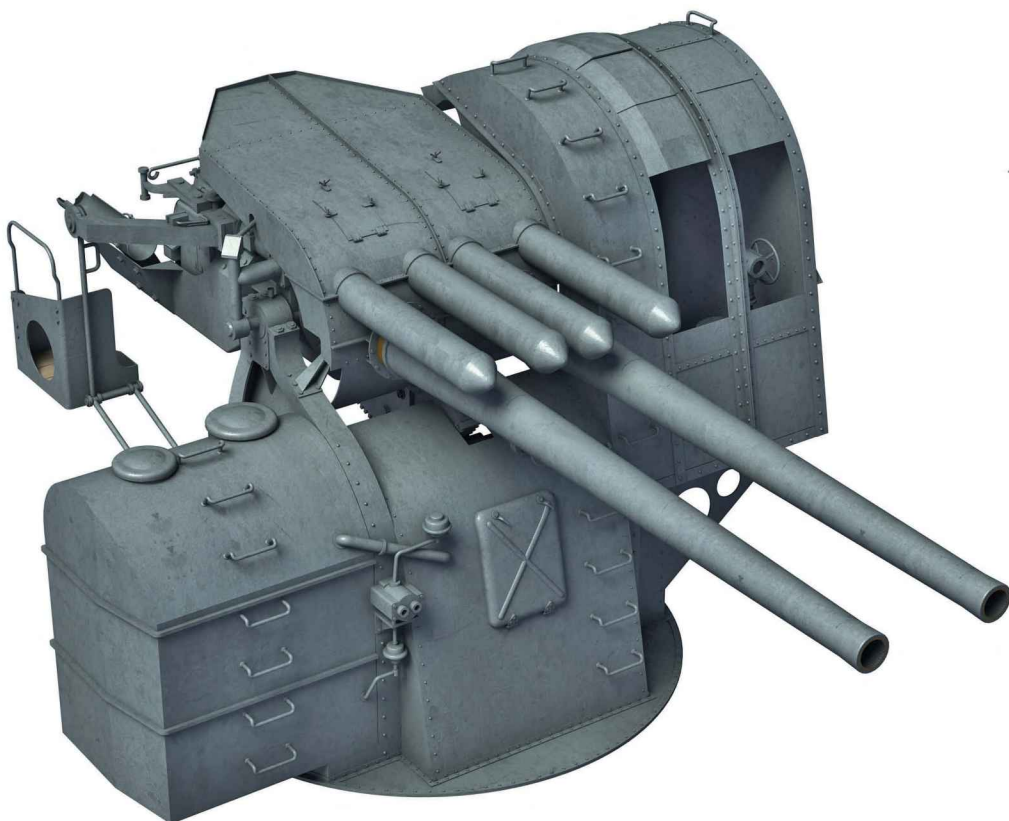
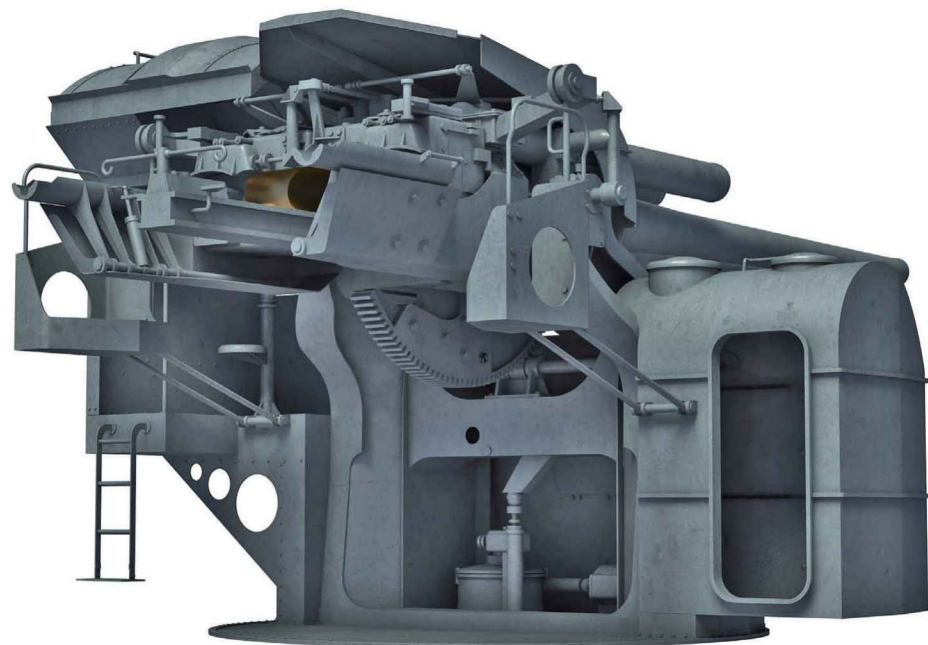
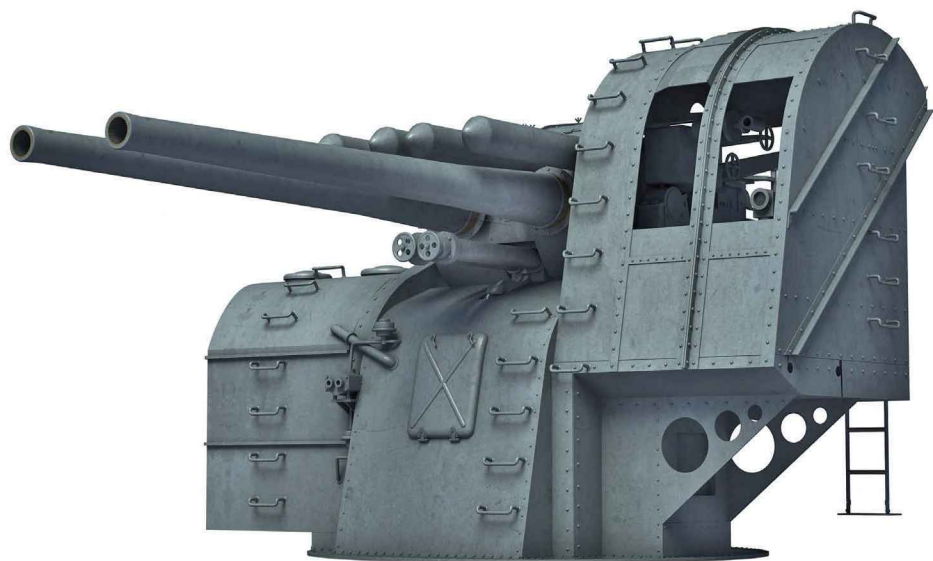
E3/16 General view

E3/15



E3/16





E Armament – Type 89 12.7cm 40 calibre Anti-aircraft Guns

12.7cm Gun crew loading exercise machine – used only in the first months after ship's commissioning and later removed

E3/17 Right elevation

E3/18 Plan

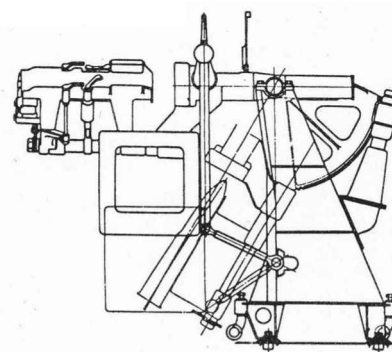
12cm rocket launcher fitted only on *Musashi* in 1944
(1/20 scale)

E3/19 Front elevation

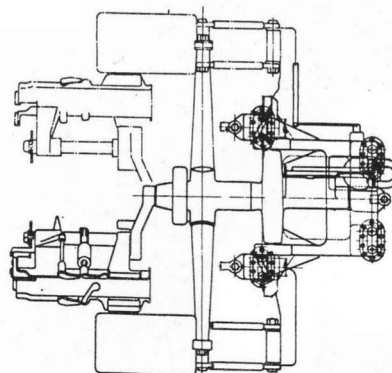
E3/20 Left profile

E3/21 12cm Common AA rocket – profile and section

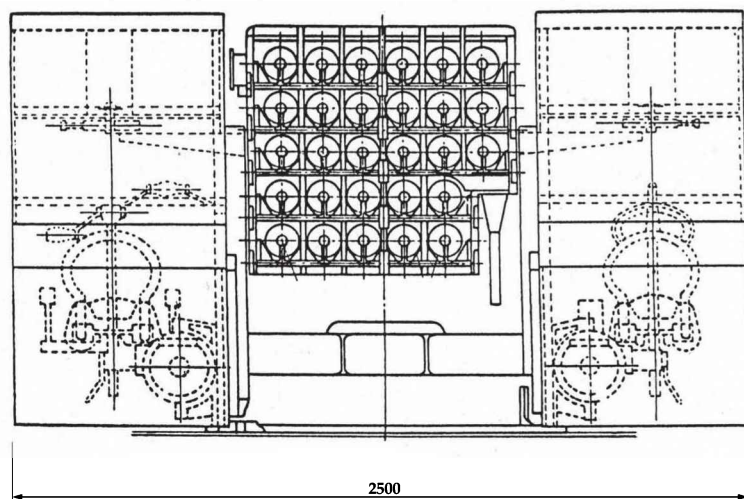
E3/17



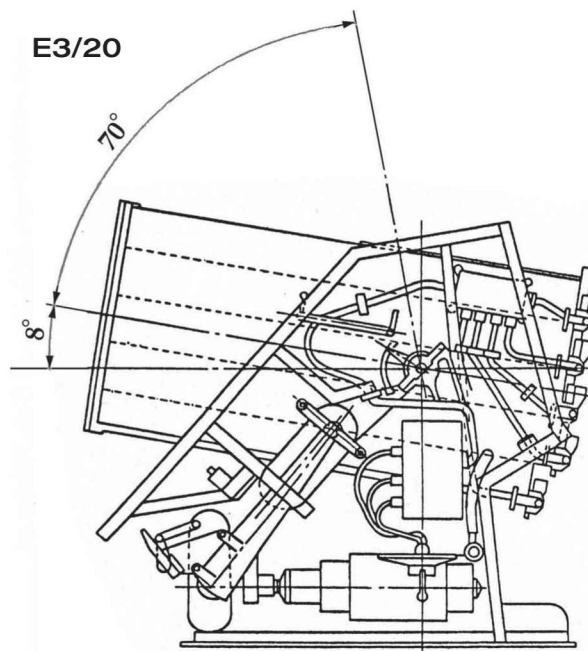
E3/18



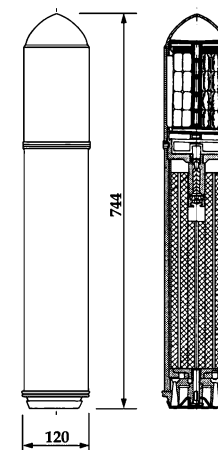
E3/19

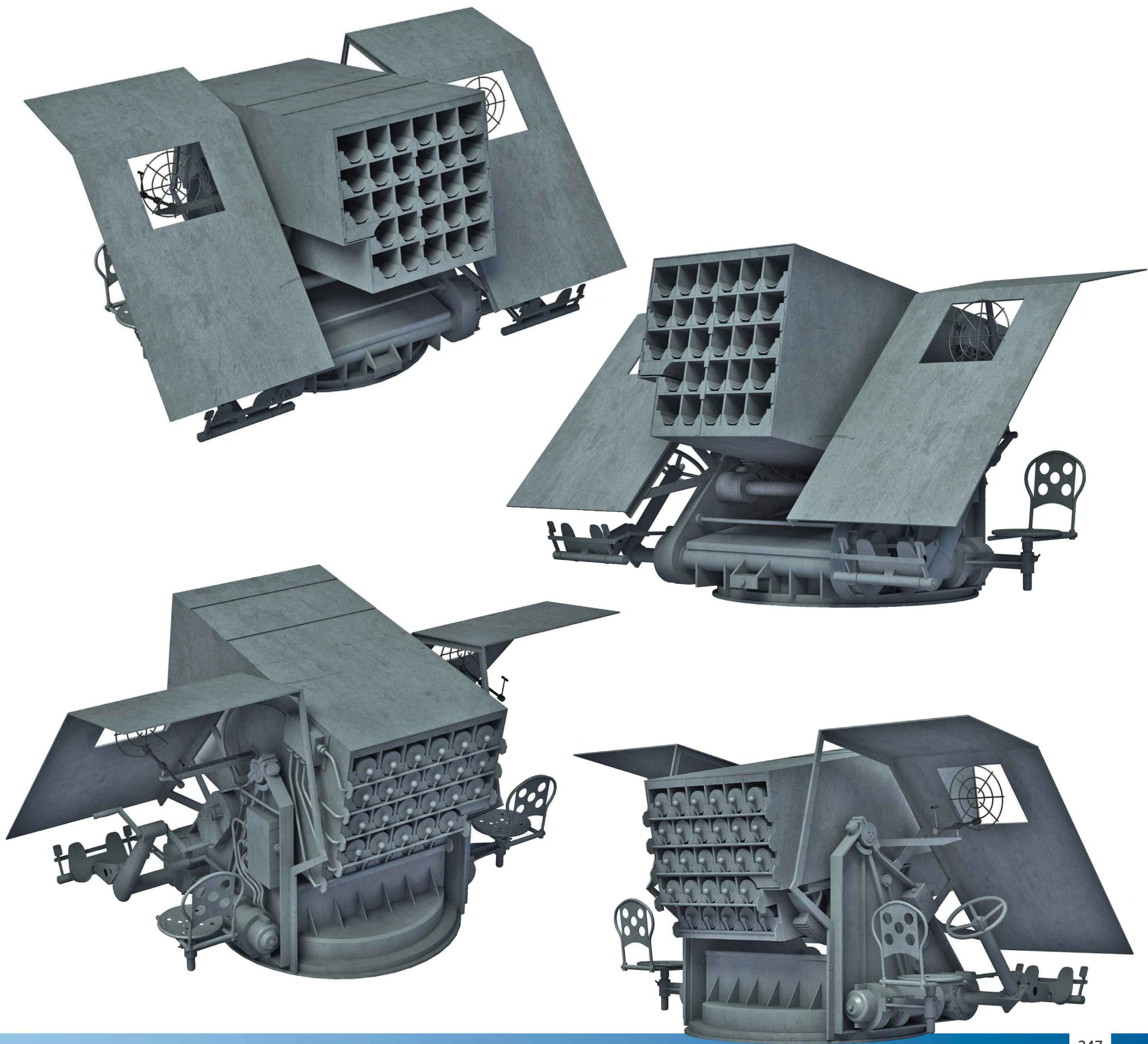


E3/20



E3/21





E Armament – 25 and 13.2mm Machine Guns

Type 'A' 25mm MG turret from *Yamato* (1/50 scale)

E4/1 Front elevation

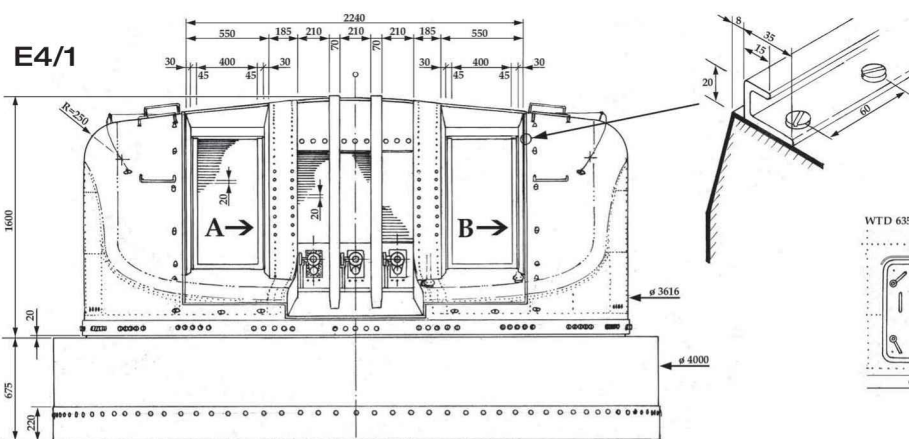
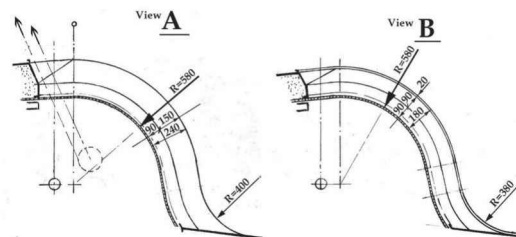
E4/2 Right elevation

E4/3 Plan

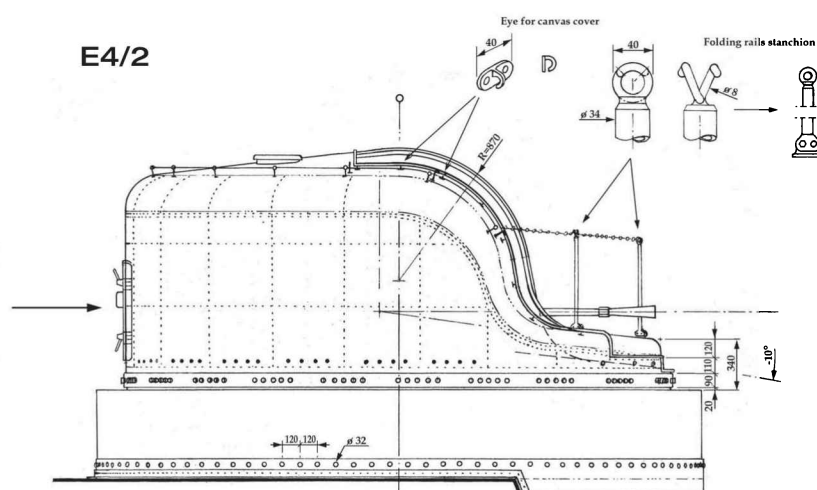
E4/4 Section

E4/5 Details of windows (shutter)

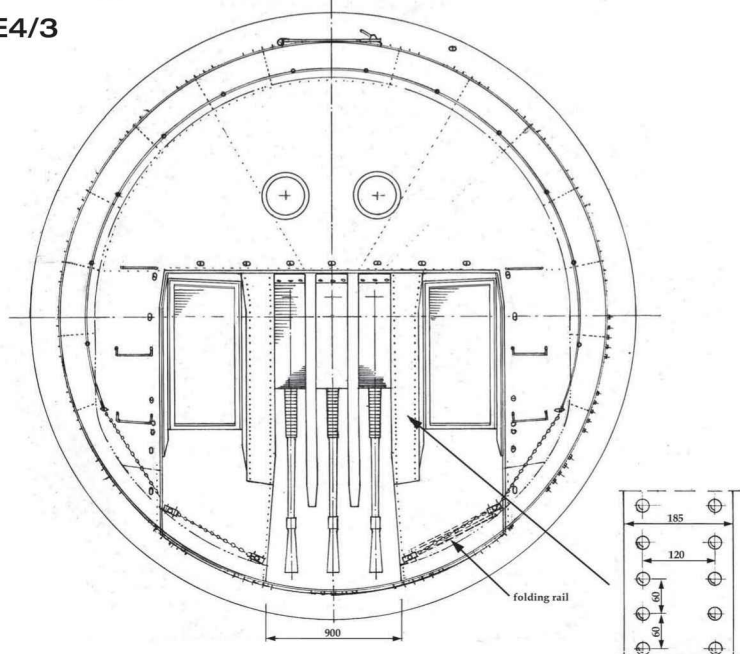
E4/5



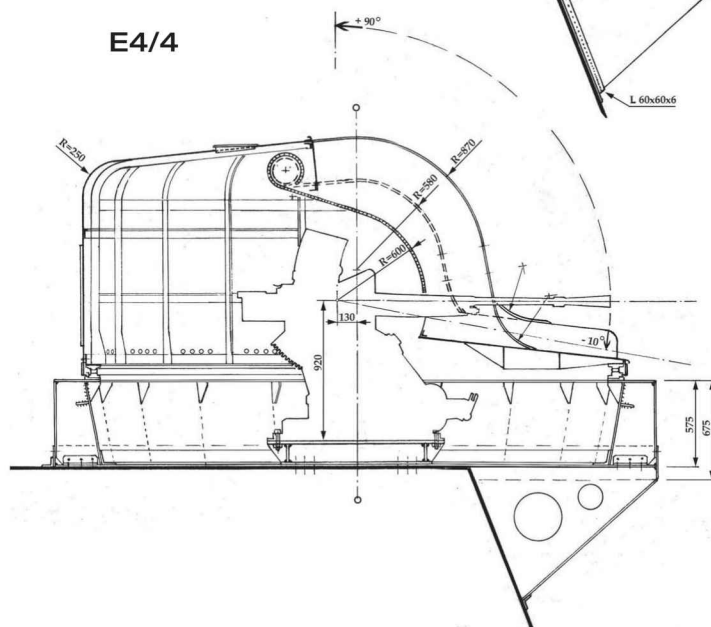
E4/2

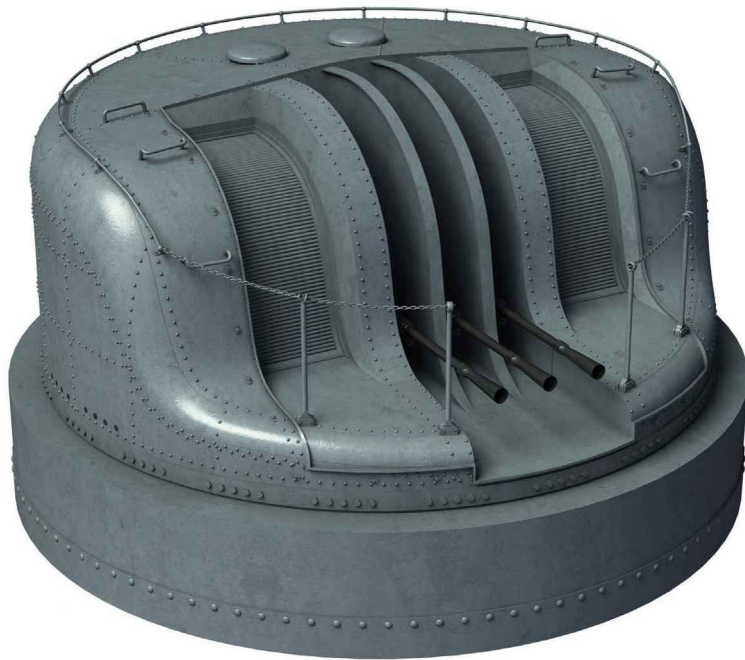


E4/3



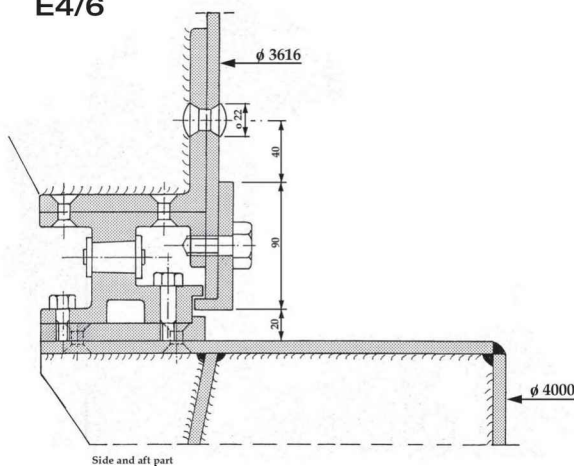
E4/4



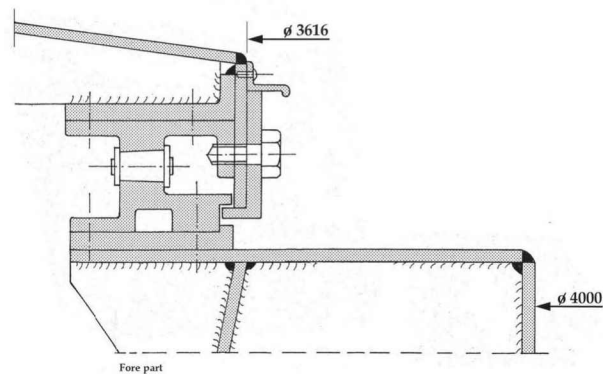


E4/6 Detail of roller bearing – side and aft part
 E4/7 Detail of roller bearing – fore part of tower
 E4/8 Detail of lower part of shield

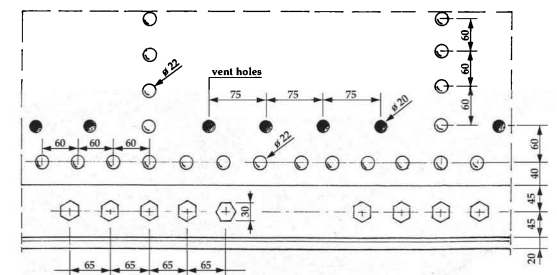
E4/6



E4/7



E4/8



E Armament – 25 and 13.2mm Machine Guns

Type 'B' 25mm MG turret fitted only on *Musashi*
(1/50 scale)

Changes in comparison to *Yamato* in lower fore part indicated by dimensions

E4/9 Front elevation

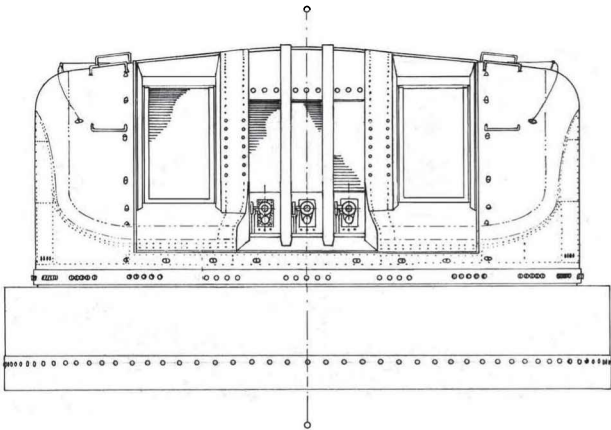
E4/10 Profile

E4/11 Arrangement of covered triple 25mm towers on
Yamato forecastle deck in 1945

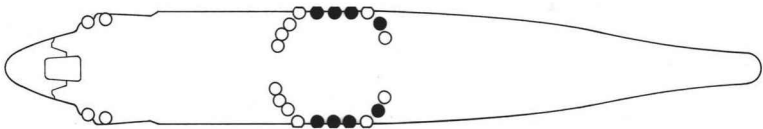
Type 'A' towers – white circles

Type 'B' towers – black circles

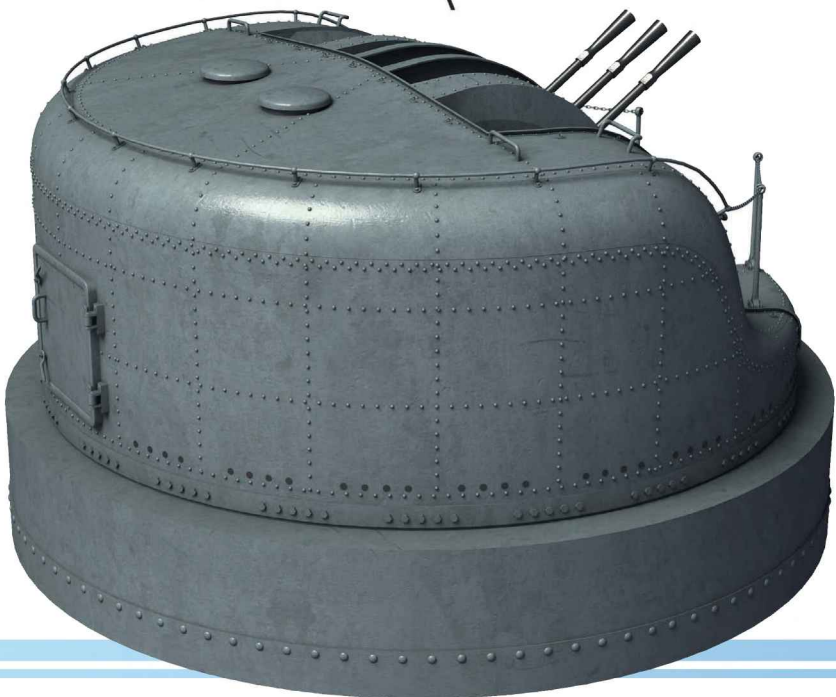
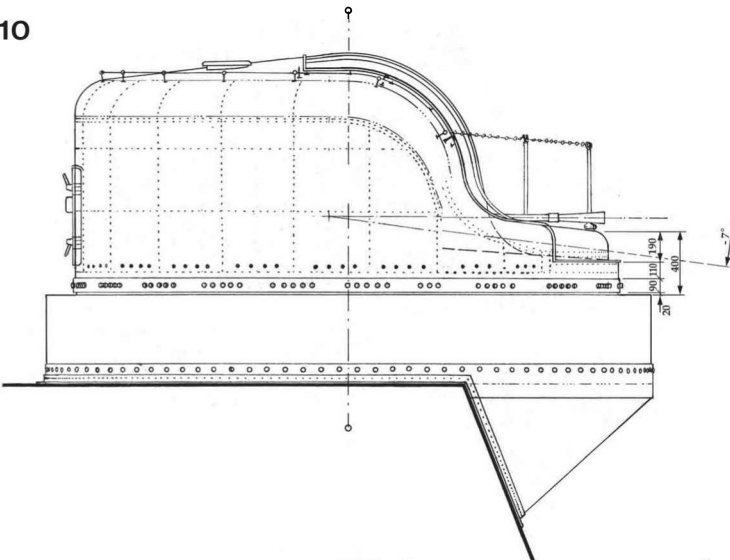
E4/9



E4/11



E4/10



Type 'C' 25mm MG tower fitted only on
Yamato in 1945 (1/50 scale)

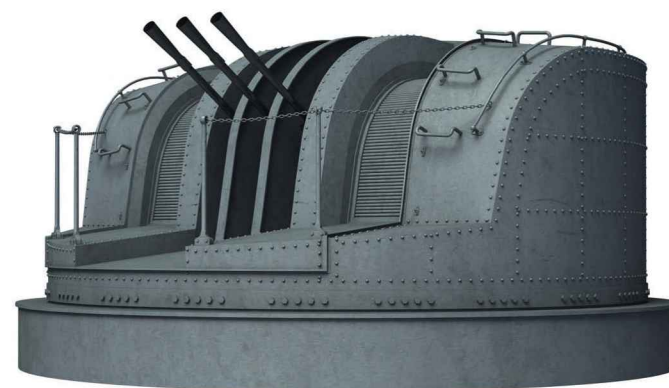
E4/12 Front elevation

E4/13 Profile

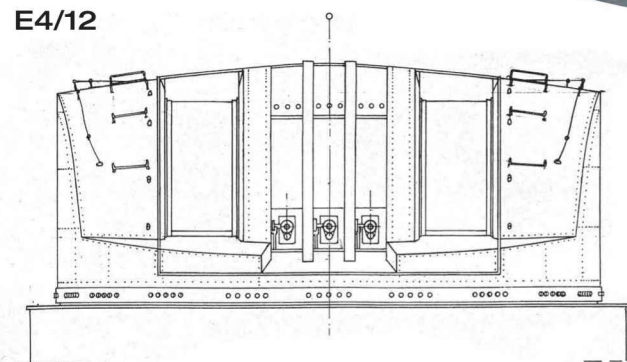
E4/14 WT door

E4/15 Plan

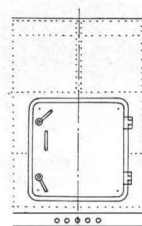
E4/16 Detail of shutter



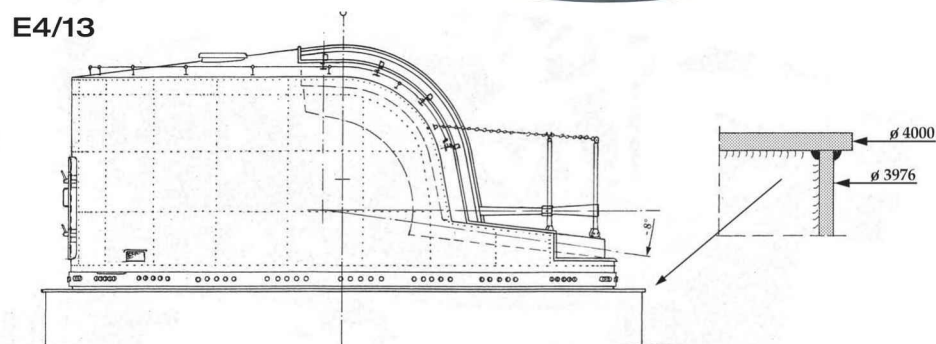
E4/12



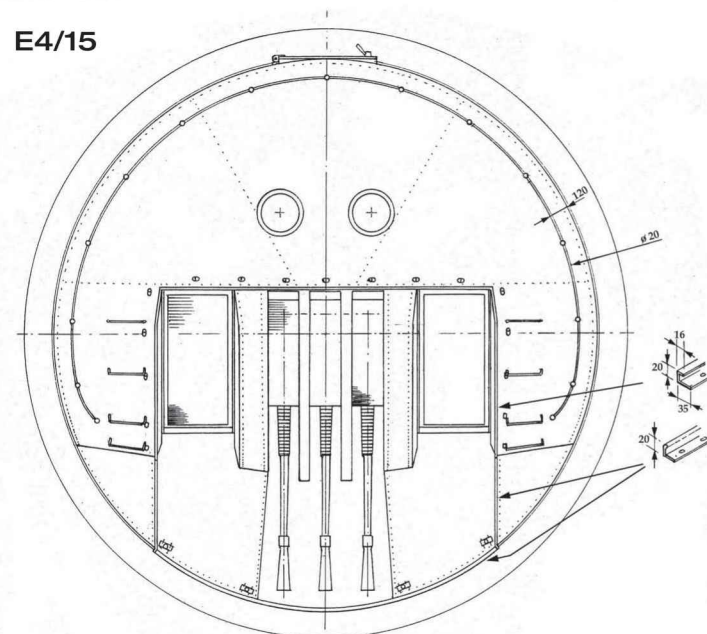
E4/14



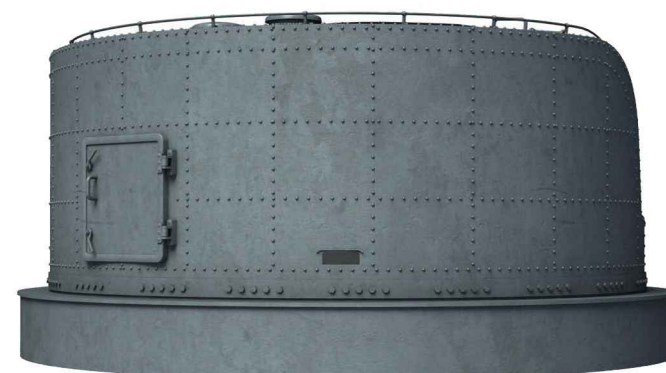
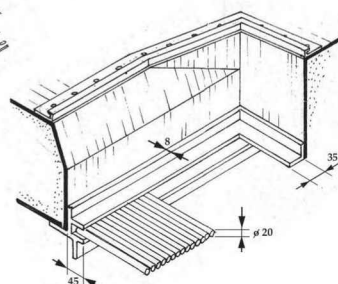
E4/13



E4/15



E4/16



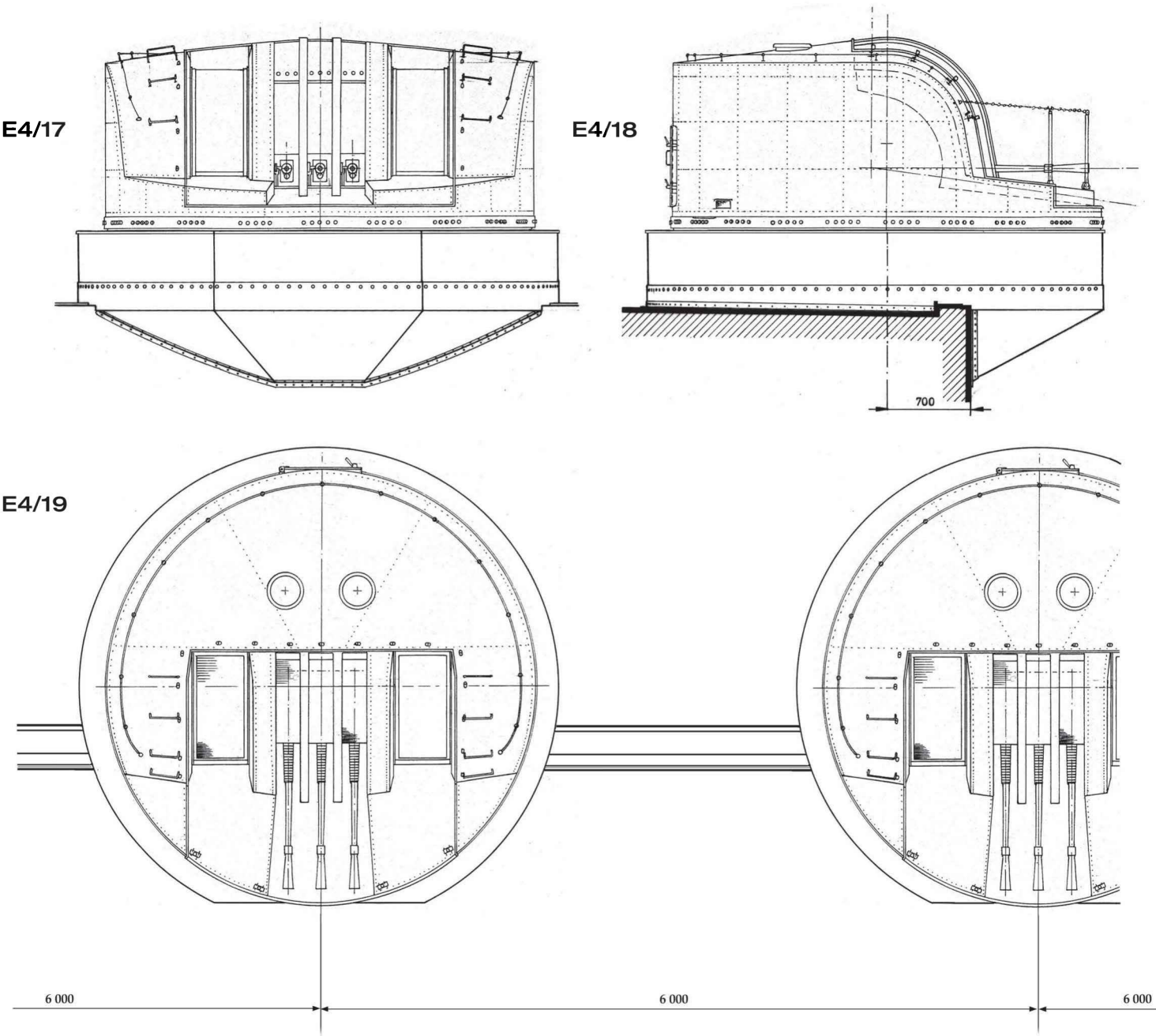
E Armament – 25 and 13.2mm Machine Guns

Ship's side 25mm MG towers fitted on *Yamato*
(1/50 scale)

E4/17 Front elevation

E4/18 Profile

E4/19 Plan



25mm MG triple mounts used in shielded stands
(1/35 scale)

E4/20 Cross section of trunnion bracket

E4/21 Right profile

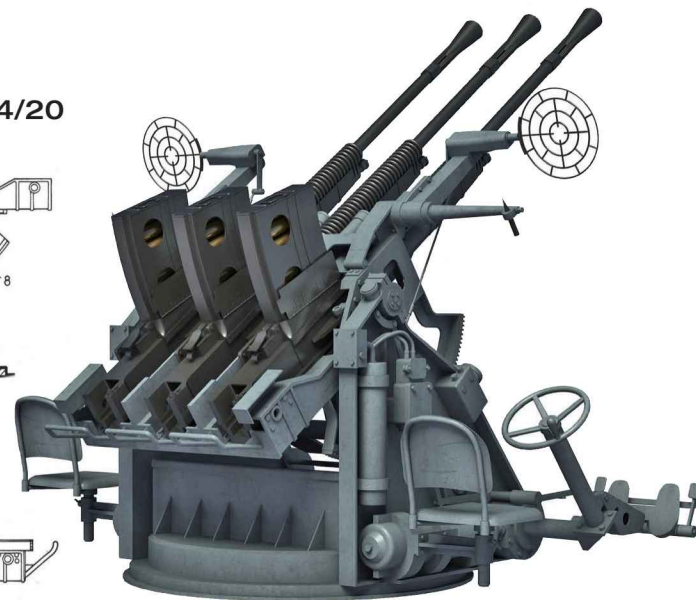
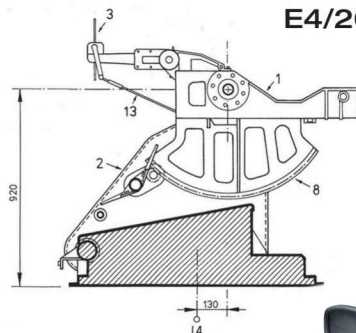
E4/22 Left profile

E4/23 Plan

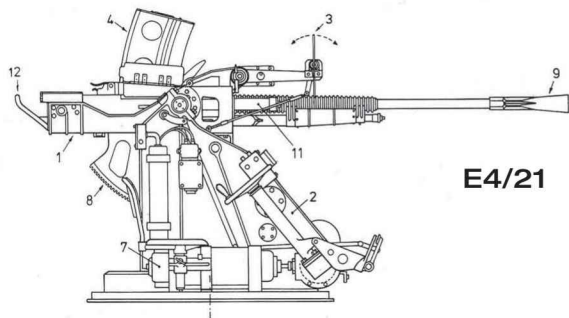
E4/24 Front view

E4/25 Perspective - gun sight and barrel

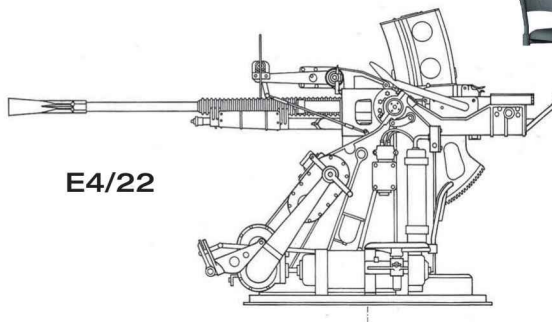
E4/20



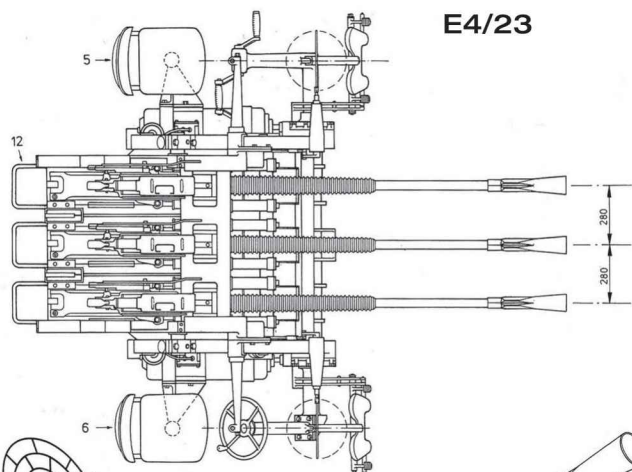
E4/21



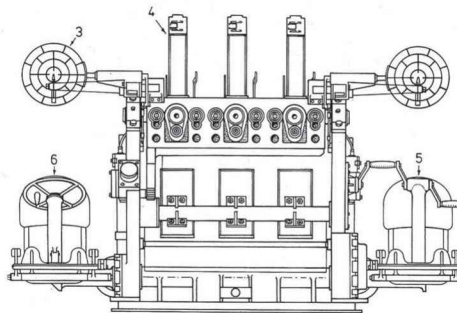
E4/22



E4/23



E4/24



E4/25



E Armament – 25 and 13.2mm Machine Guns

25mm MG mounting fitted in open stands in second half of 1944 (1/35 scale)

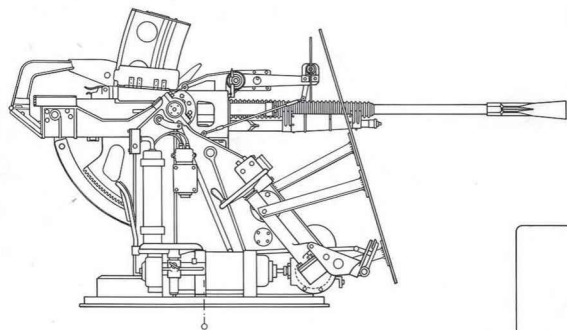
E4/26 Right profile

E4/27 Front elevation

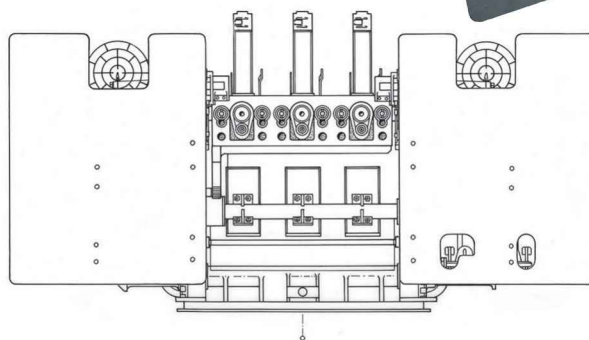
E4/28 Plan

E4/29 25mm x III MG platform after removing shield

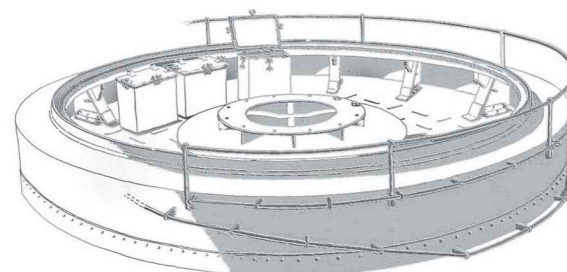
E4/26



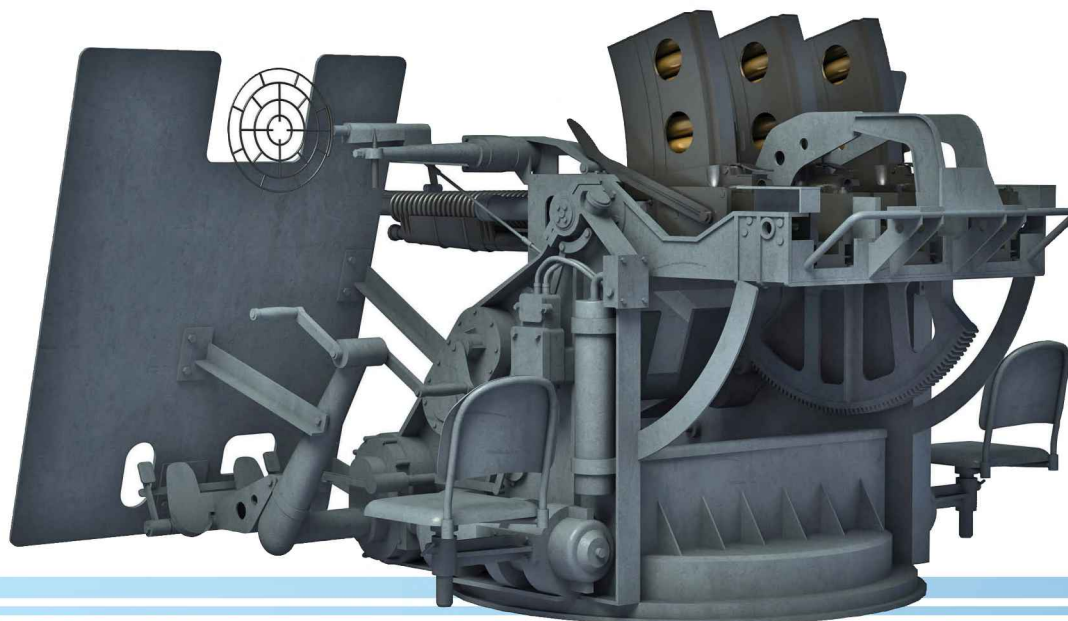
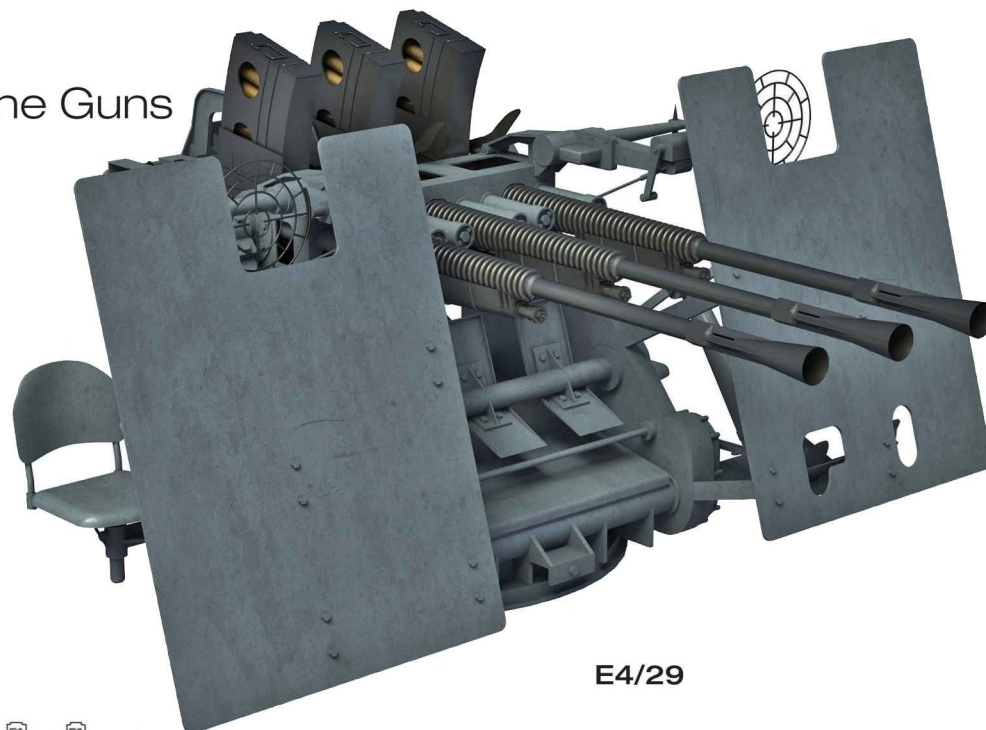
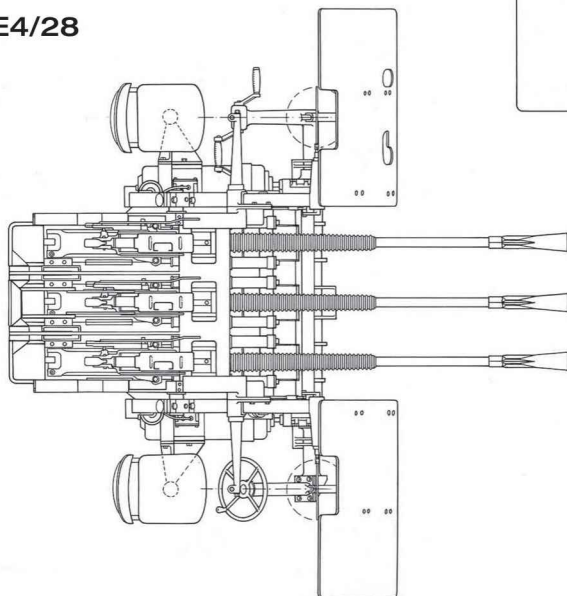
E4/27



E4/29



E4/28



Type 96 25mm gun barrel (1/20 scale)

E4/30 Profile

E4/31 Plan

E4/32 Sections

E4/30-32 Type 96 25mm MG

- 1 Muzzle flash eliminator (first model)
- 2 Radiator
- 3 Breech block and reloading gas cylinder
- 4 Pressure regulator for gas cylinder (gas plug)
- 5 Gas pipe (in shield)
- 6 Breech block housing
- 7 Grip – manual operating lever
- 8 Counter-recoil piston rod lug
- 9 Slide rail
- 10 Magazine insert

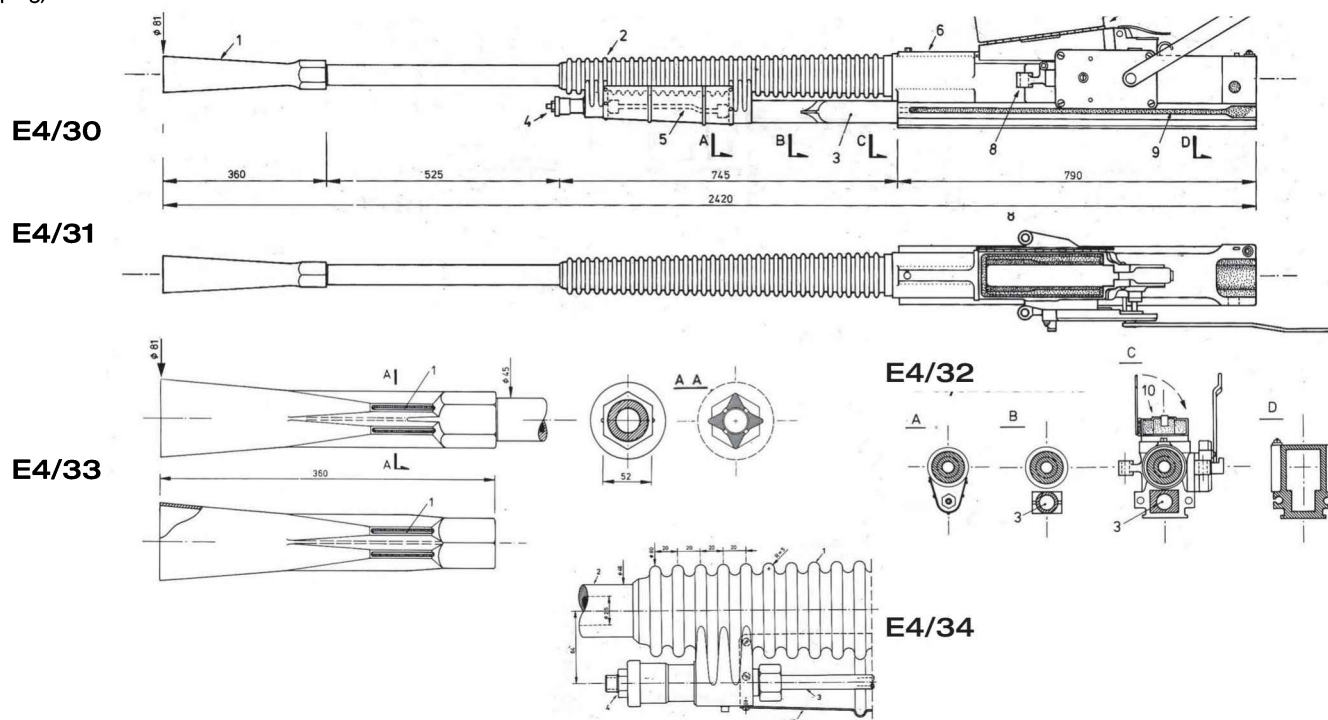


E4/33 Muzzle flash eliminator used in guns fitted since April 1944

E4/34 Detail of barrel cooling fins

E4/33-34 Flash eliminator, barrel cooling fins

- 1 Exhaust ports
- 2 Barrel
- 3 Cooling fins
- 4 Gas pressure regulator (gas plug)
- 5 Gas pipe for gas cylinder
- 6 Shield



E Armament – 25 and 13.2mm Machine Guns

Single 25mm MG mount fitted in 1944-45
(1/35 scale)

E4/35 Left profile

E4/36 Front view

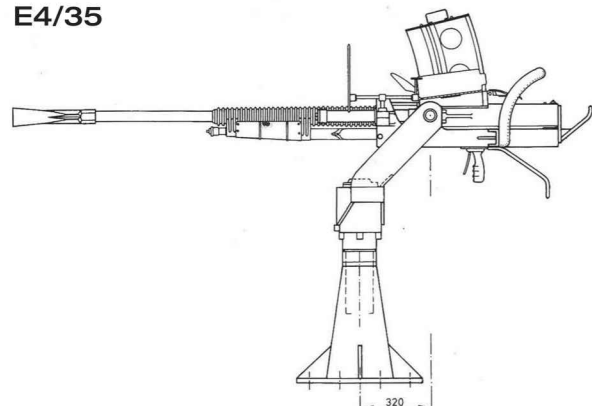
E4/37 Plan of movable pedestal

E4/38 Right profile

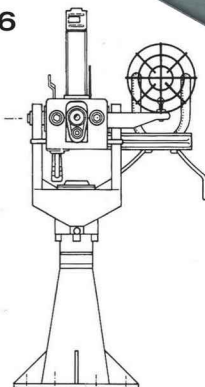
E4/39 Profile of pedestal

E4/40 Plan

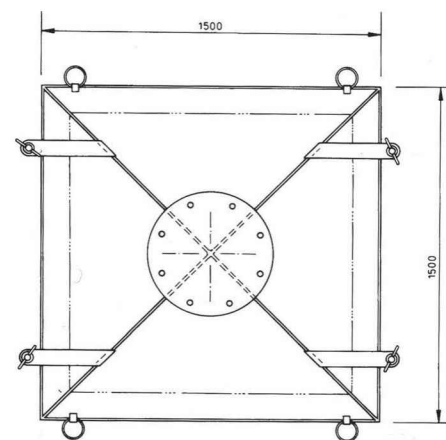
E4/35



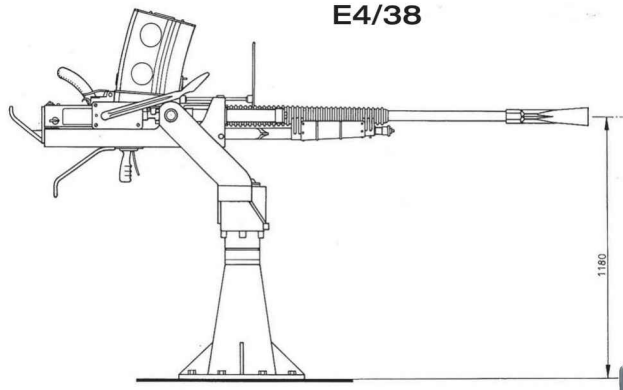
E4/36



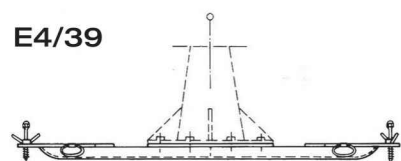
E4/37



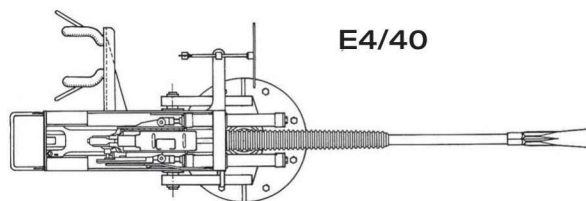
E4/38



E4/39



E4/40



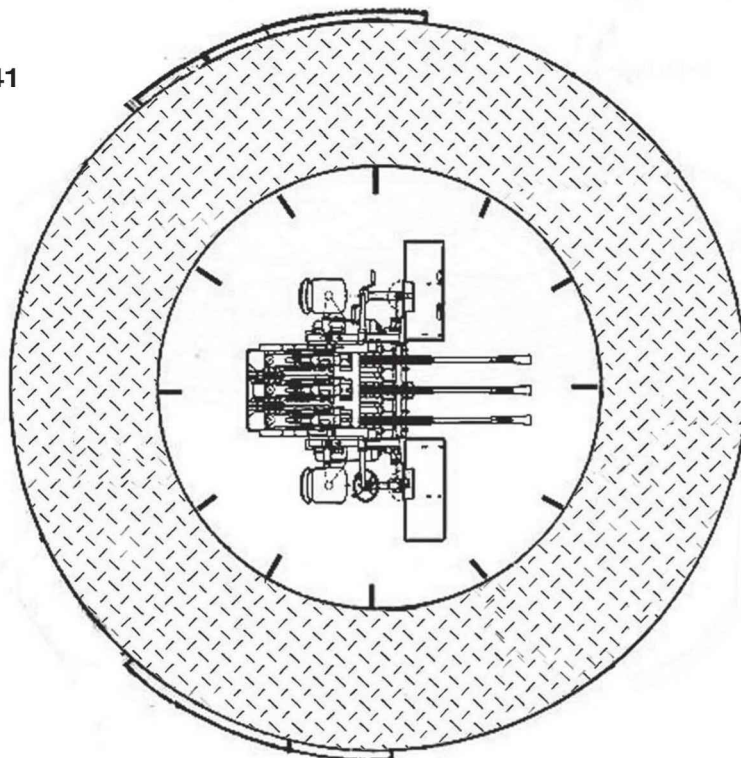
E Armament – 25 and 13.2 Machine Guns

Musashi 1944 25mm MG triple mount fitted on base of
not installed 12.7cm HA guns (no scale)

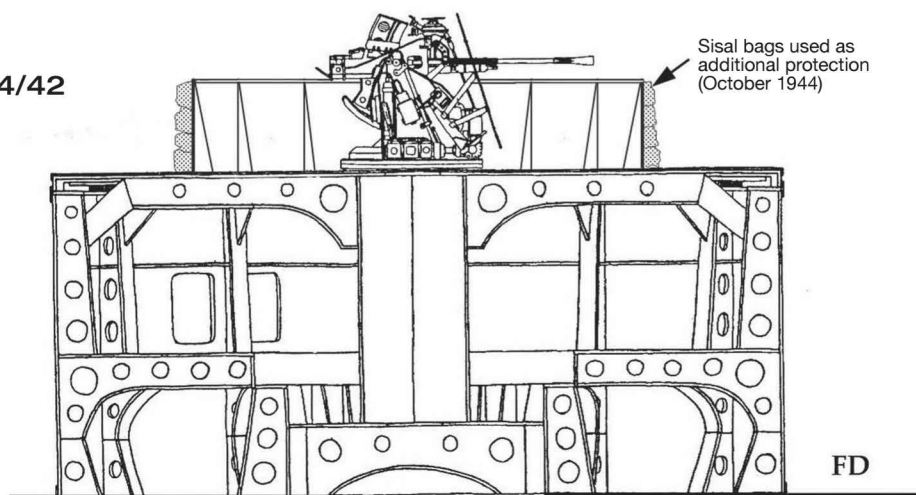
E4/41 Plan

E4/42 Profile

E4/41



E4/42



FD

E Armament – 25 and 13.2mm Machine Guns

13,2mm MG fitted on both sides of tower bridge level
+16 755 (1/20 scale)

E4/43 Right profile

E4/44 Front view

E4/45 Left profile

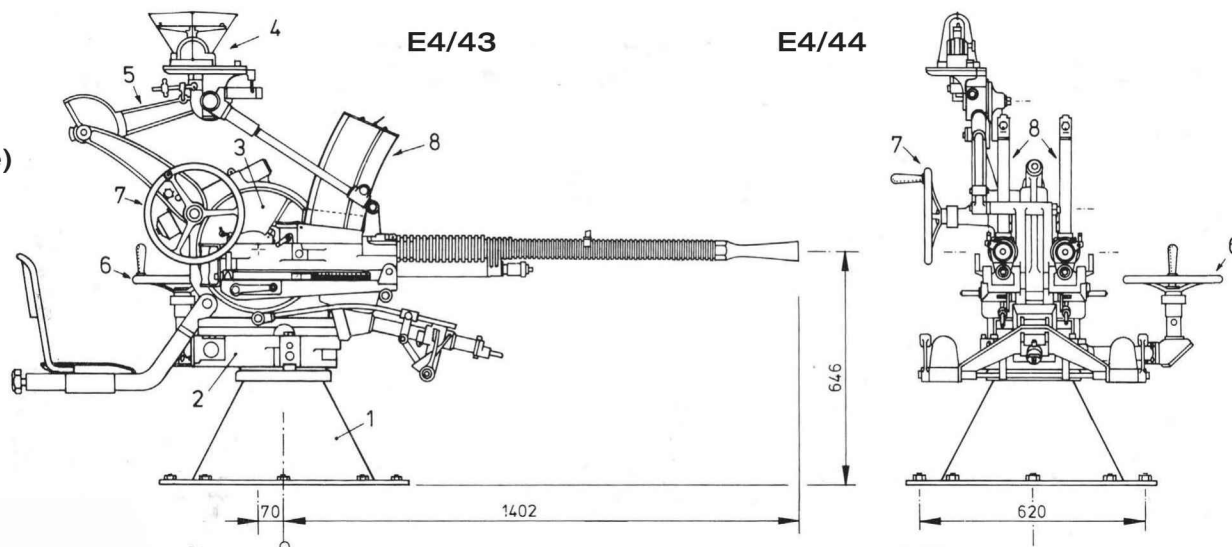
E4/46 Plan

E4/47 Detail of assembly (no scale)

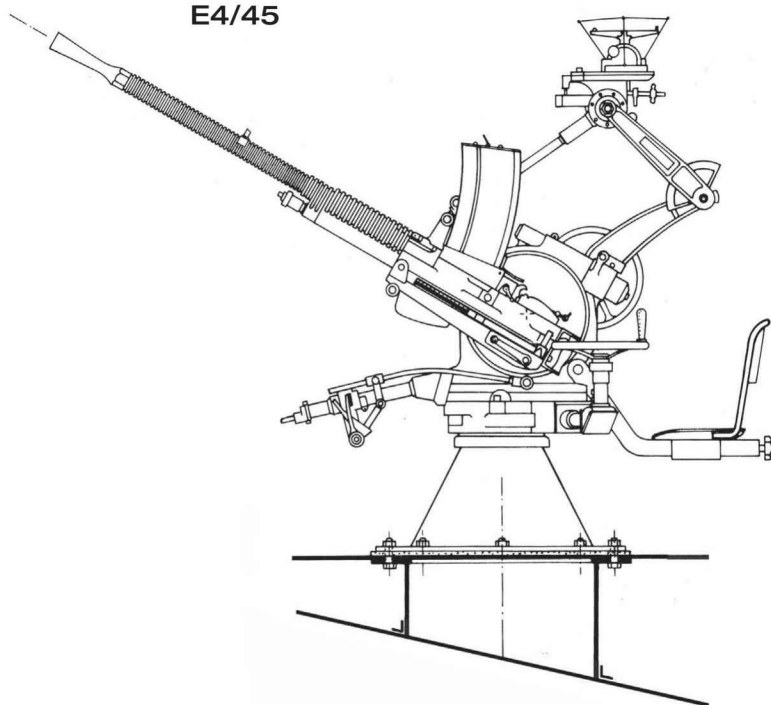
E4/48 Detail of barrel (no scale)

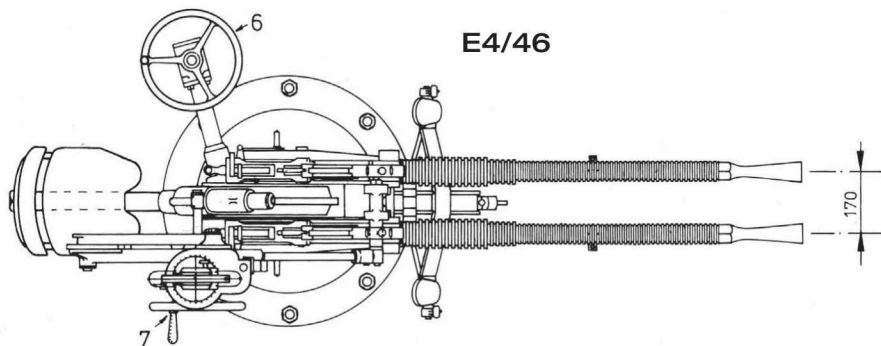
E4/43-48 13mm Twin mounting

- 1 Mounting
- 2 Turnnion bracket
- 3 Top carriage
- 4 Sight
- 5 Pantograph
- 6 Training wheel
- 7 Elevation wheel
- 8 Magazine for 30 rounds

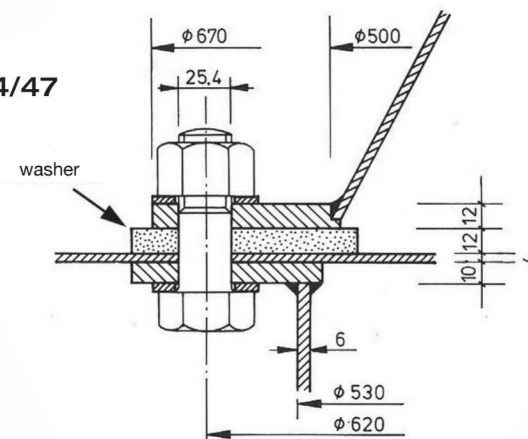


E4/45

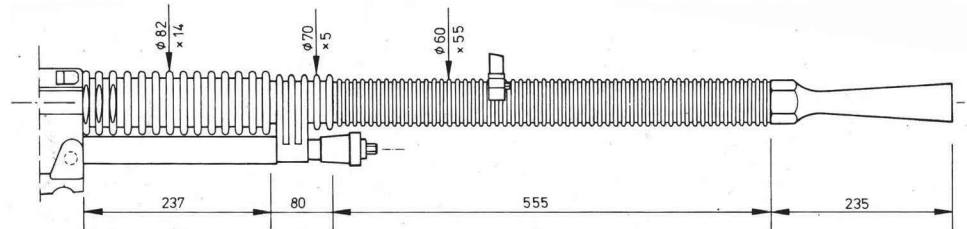




E4/47



E4/48



F Fire Control – 15.5m Rangefinder

Yamato 1941 main low angle director 'Hoiban'
type and 15.5m rangefinder (1/75 scale)

F1/1 Front elevation

F1/2 Plan

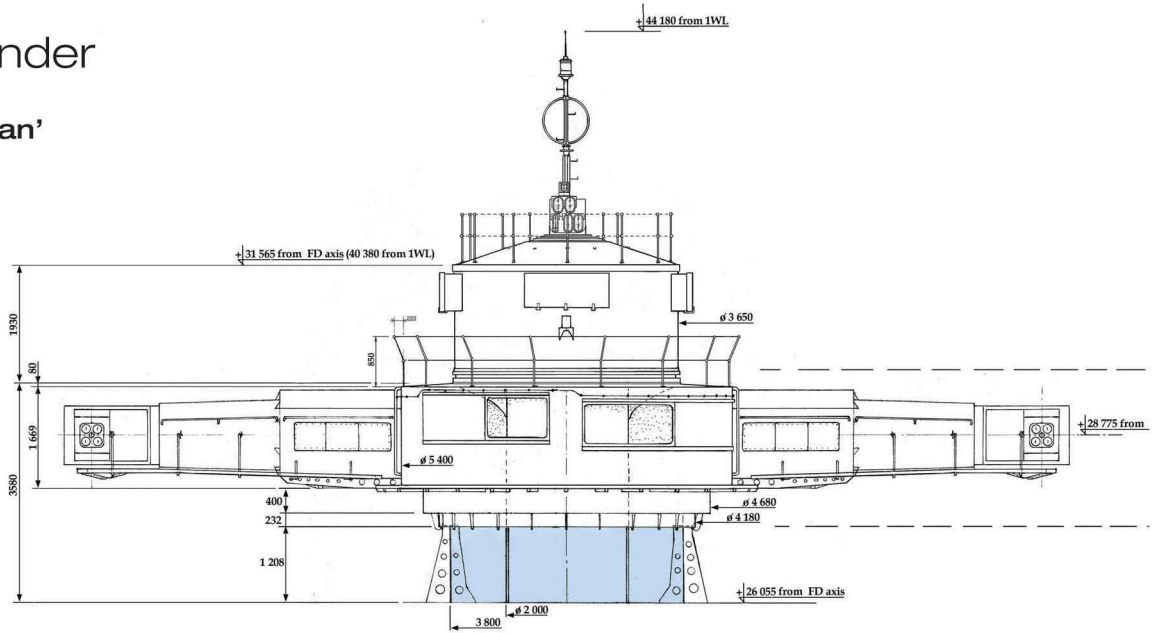
F1/3 Right elevation

F1/4 Rear elevation

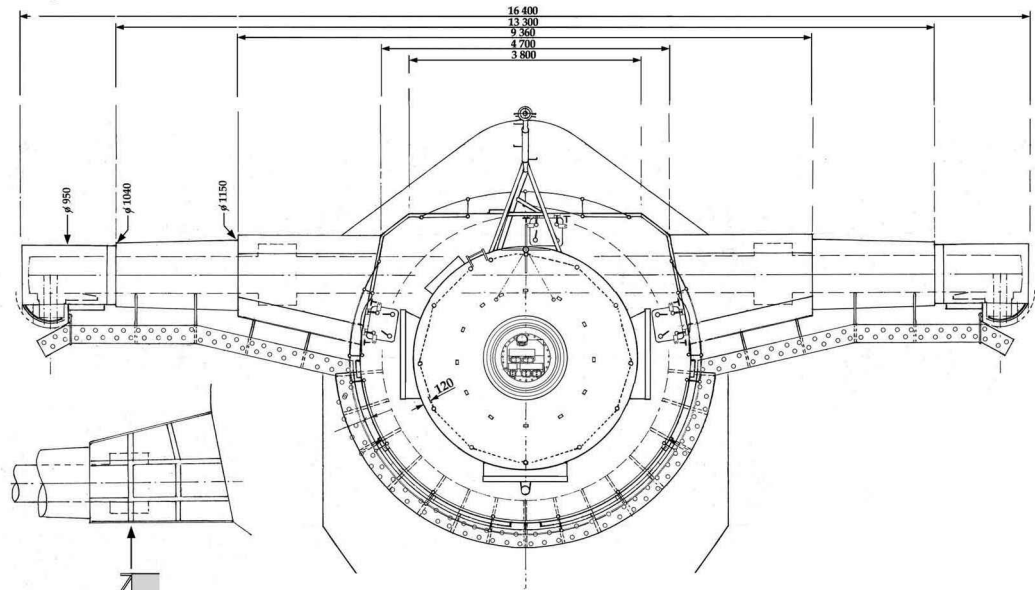
F1/5 Front view of map cabin

F1/6 LA Director 'Hoiban' – rear view

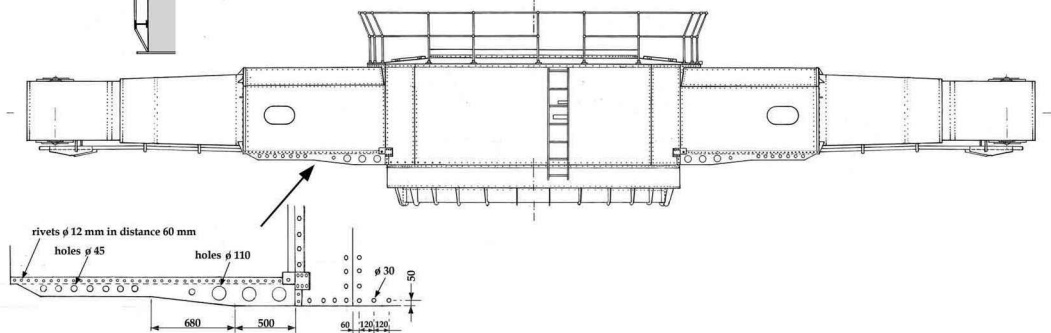
F1/1



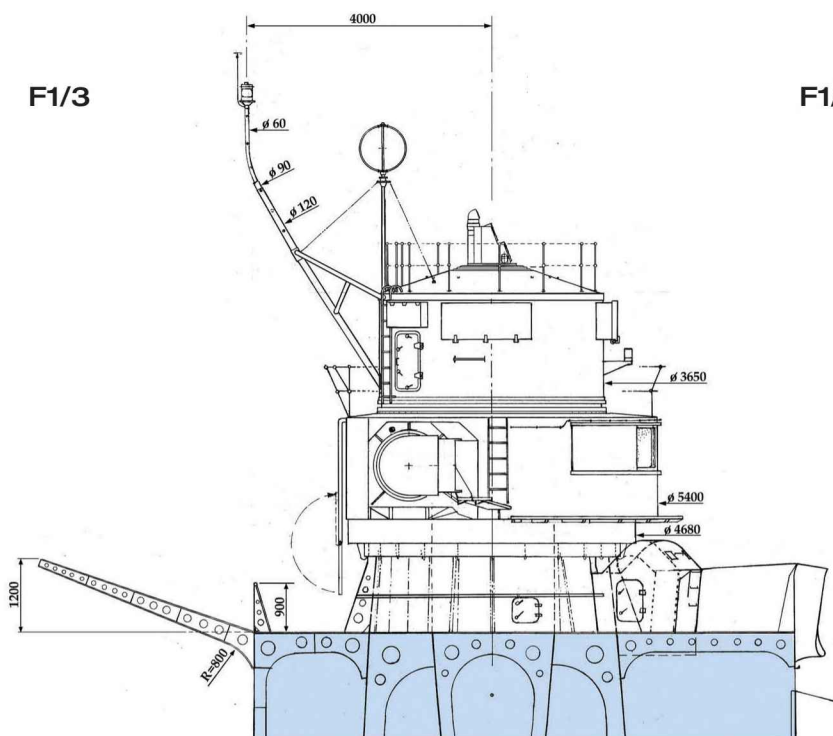
F1/2



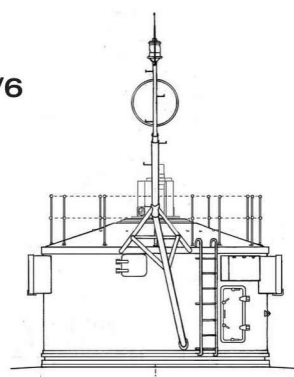
F1/4



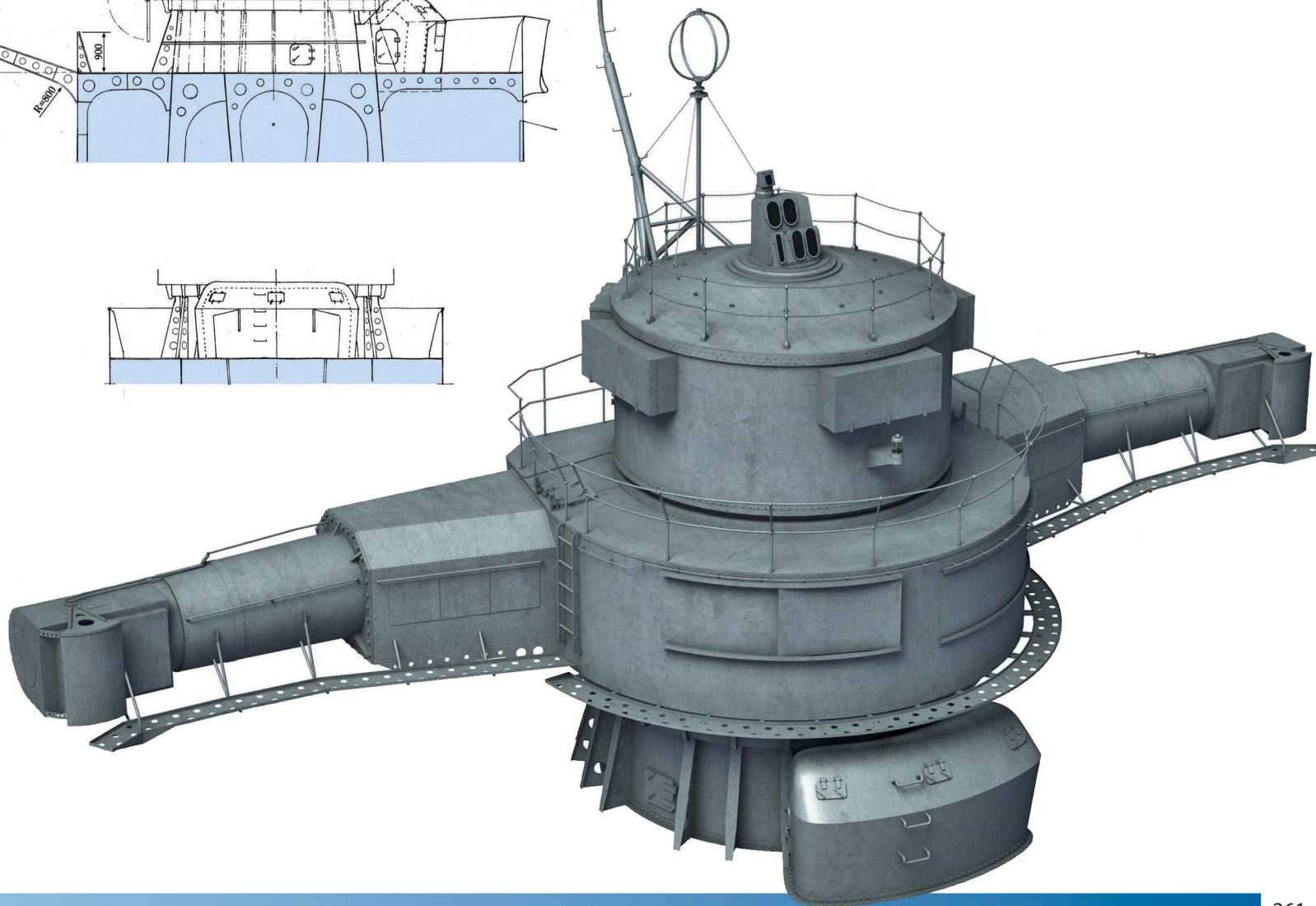
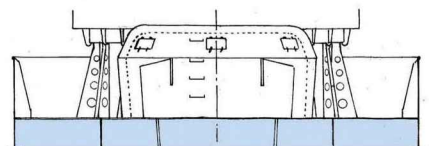
F1/3



F1/6



F1/5



F Fire Control – 15.5m Rangefinder

Rangefinder arm details (no scale)

F1/7 Plan of edge of left arm

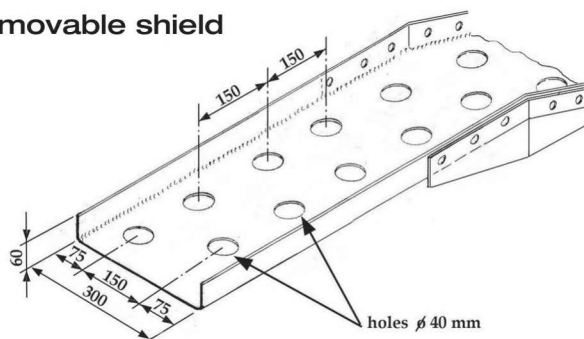
F1/8 Plan of open rangefinder window

F1/9 Front view of left arm

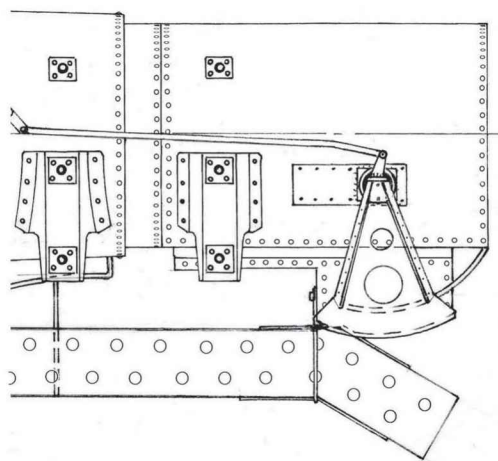
F1/10 Platform details

F1/11 Details of movable shield

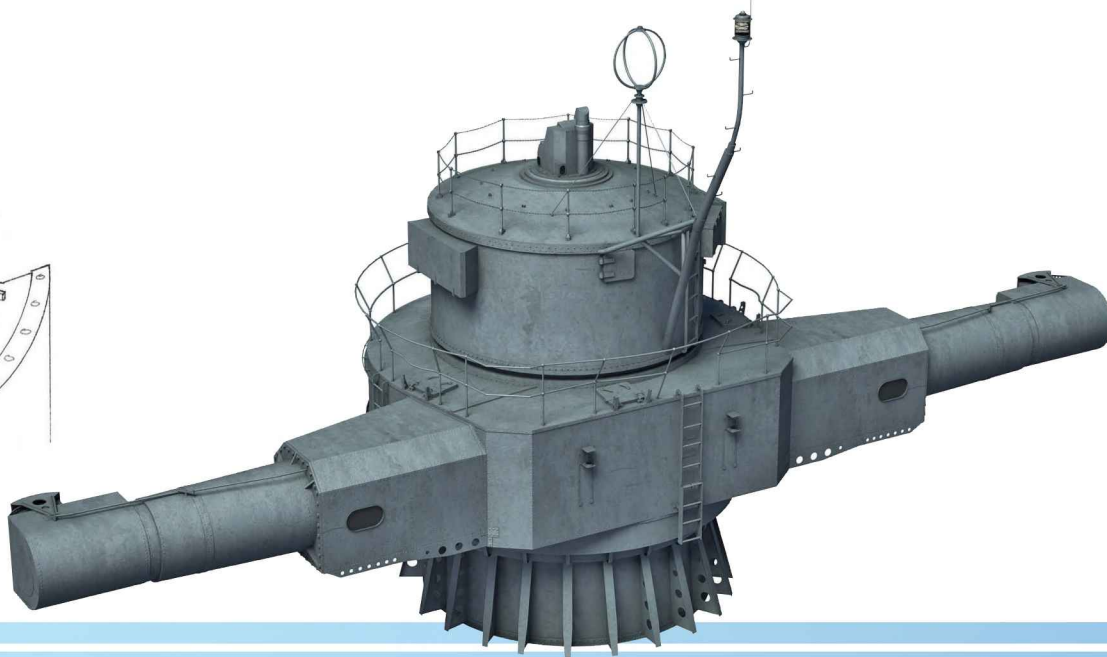
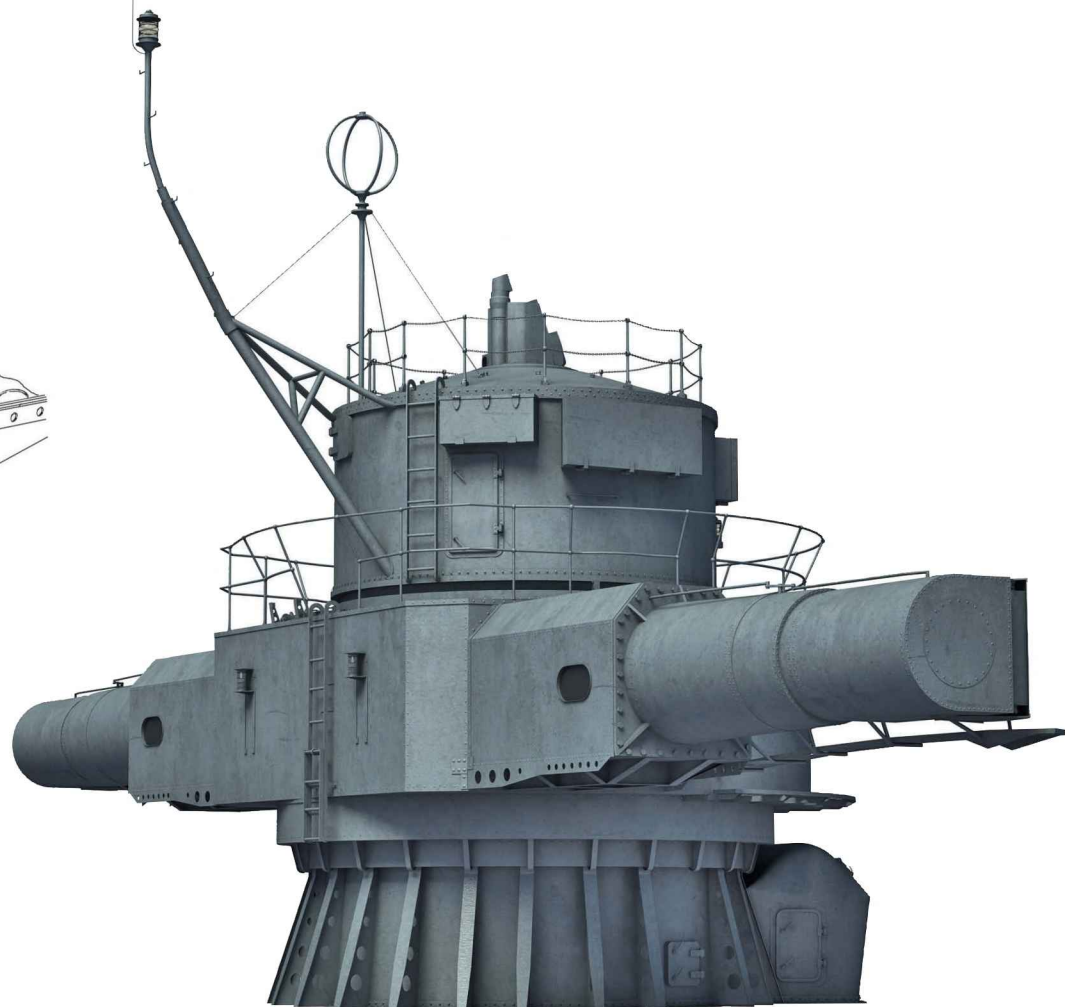
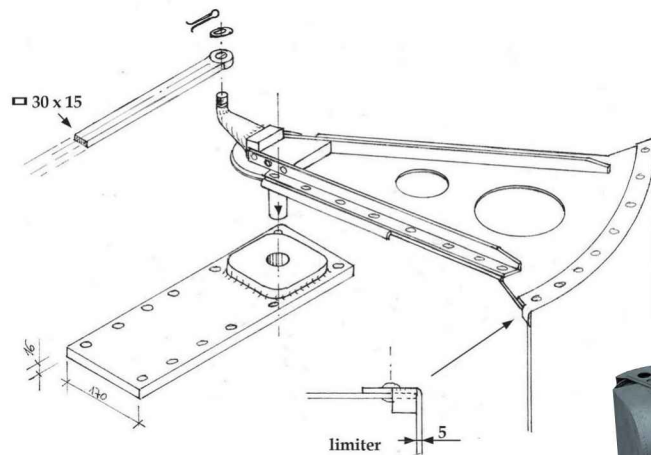
F1/10

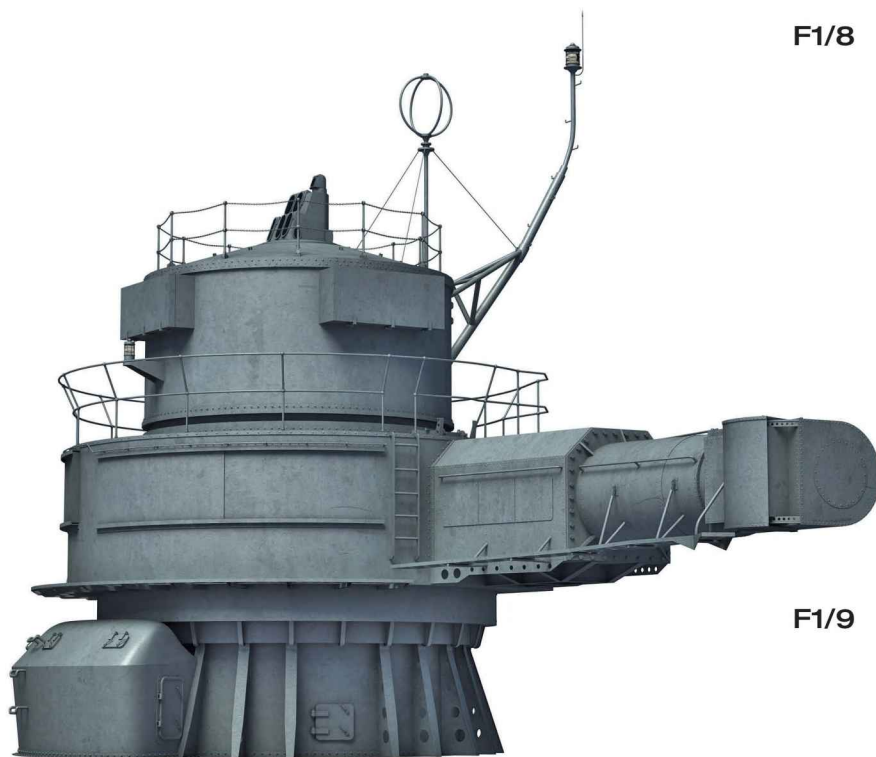


F1/7

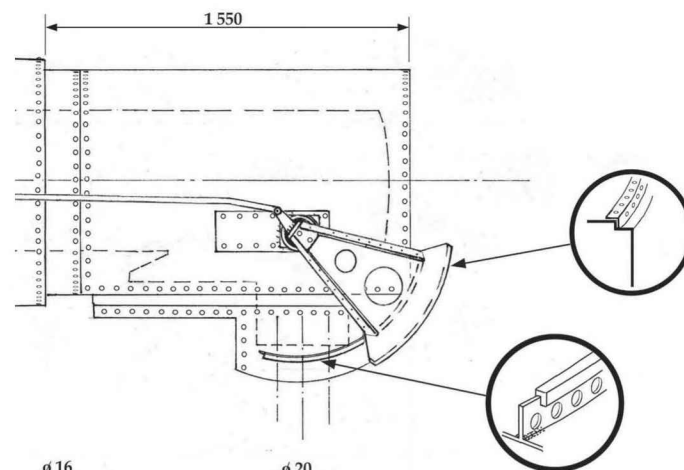


F1/11

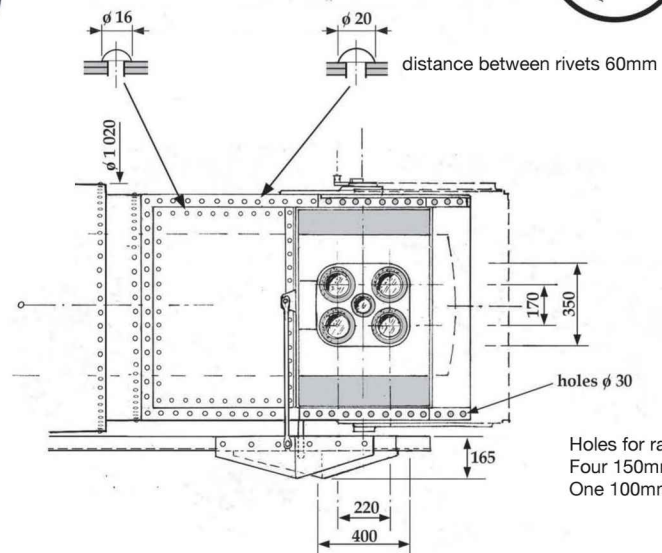




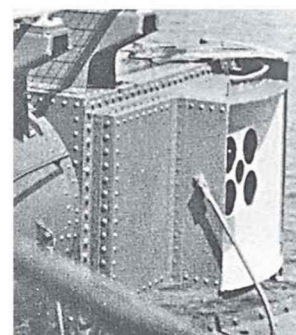
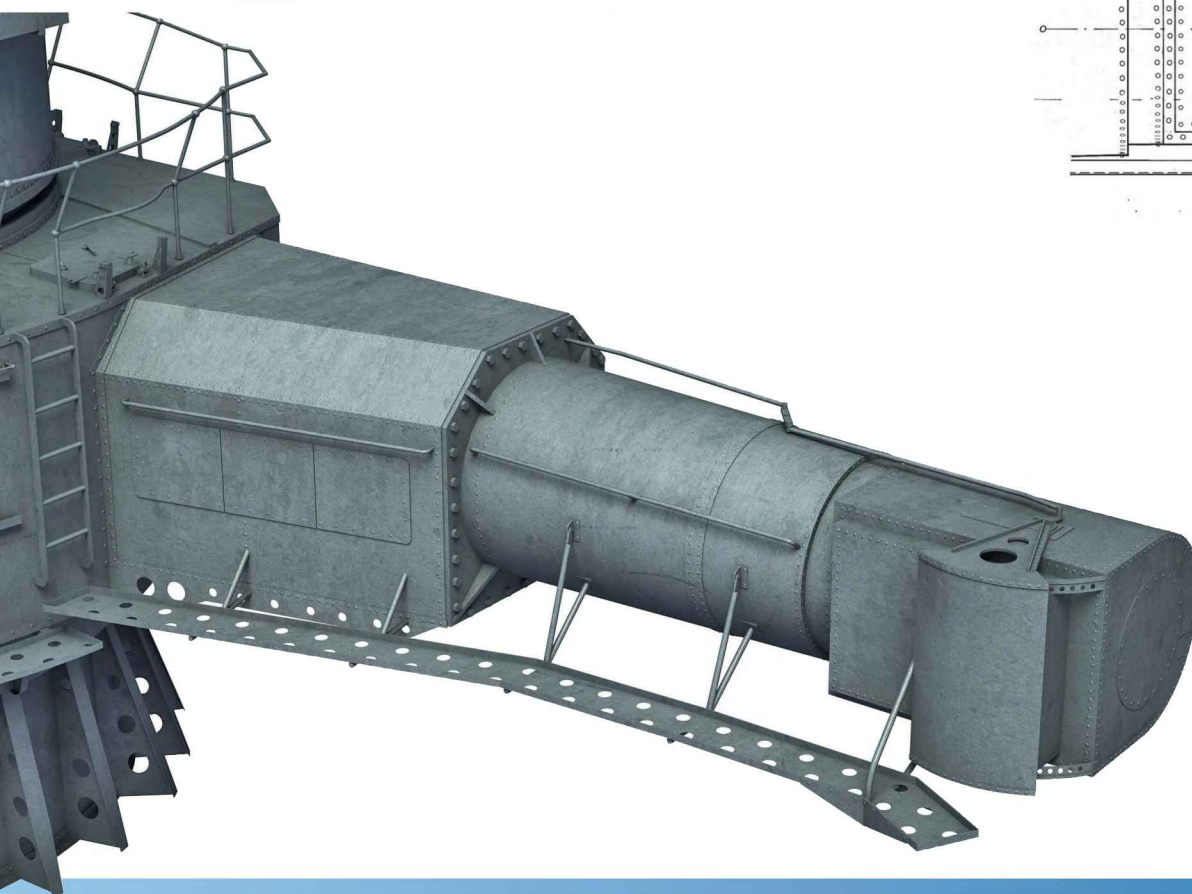
F1/8



F1/9



Holes for rangefinder's lenses:
Four 150mm diameter
One 100mm diameter



F Fire Control – 15.5m Rangefinder

Yamato 1945 – 15.5m rangefinder
with 'Hoiban' and type 21 radar
antenna (1/75 scale)

F1/12 Front elevation

F1/13 Plan

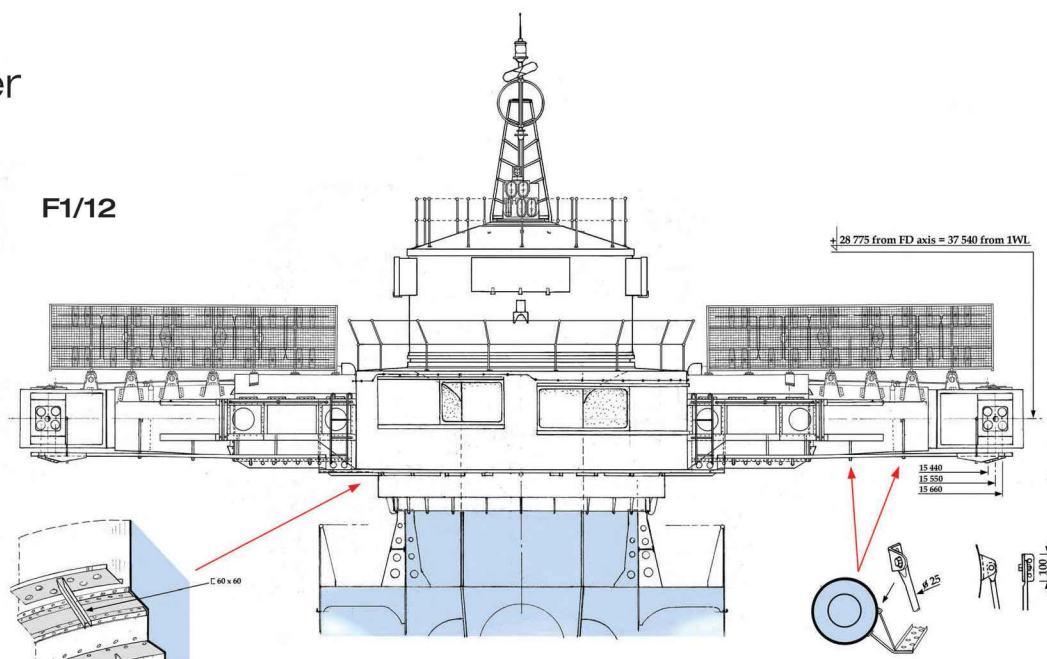
F1/14 Rear elevation

F1/15 Right profile

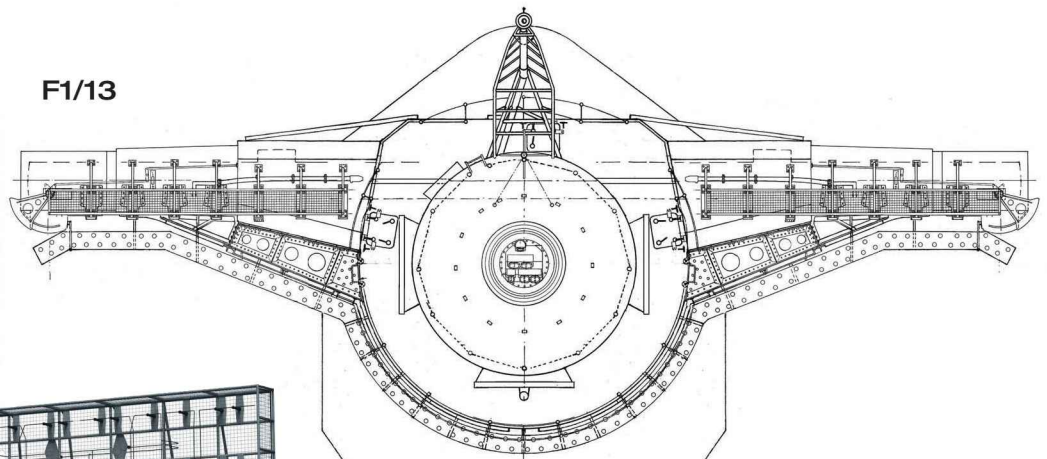
F1/16 Rear view of 'hoiban'

F1/17 Section of 'hoiban' base

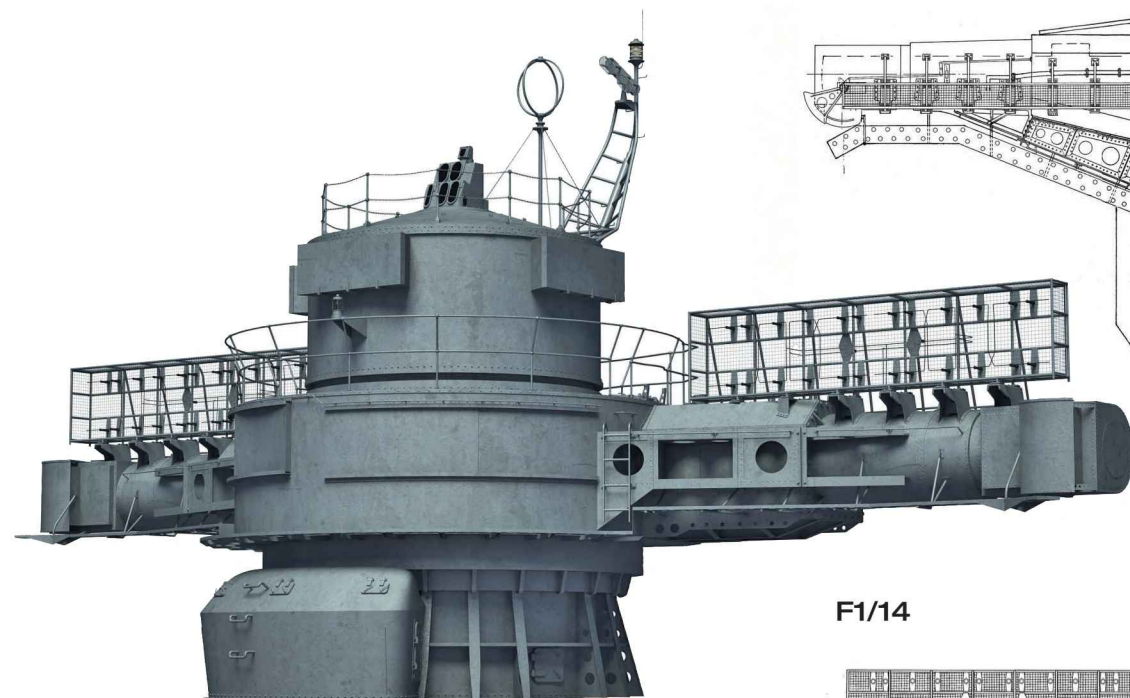
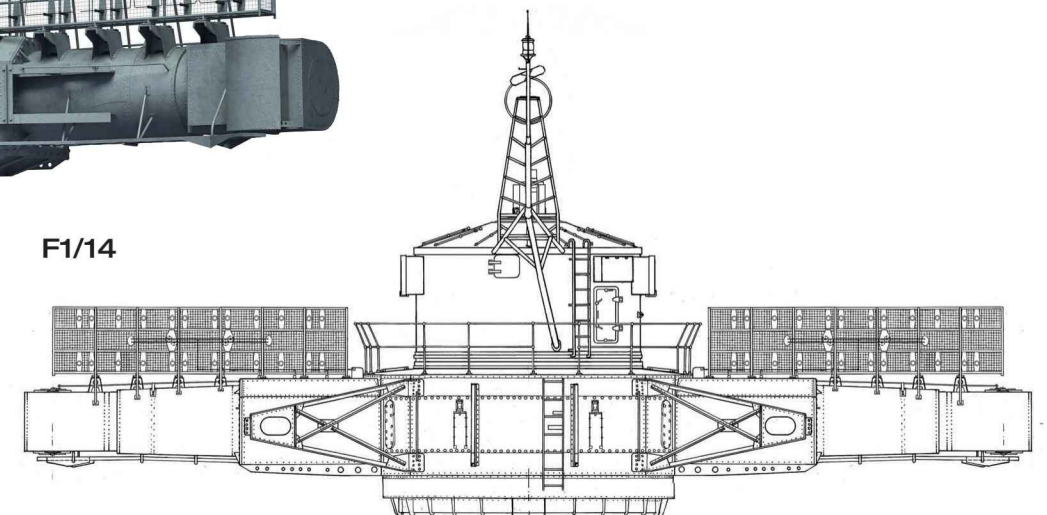
F1/12

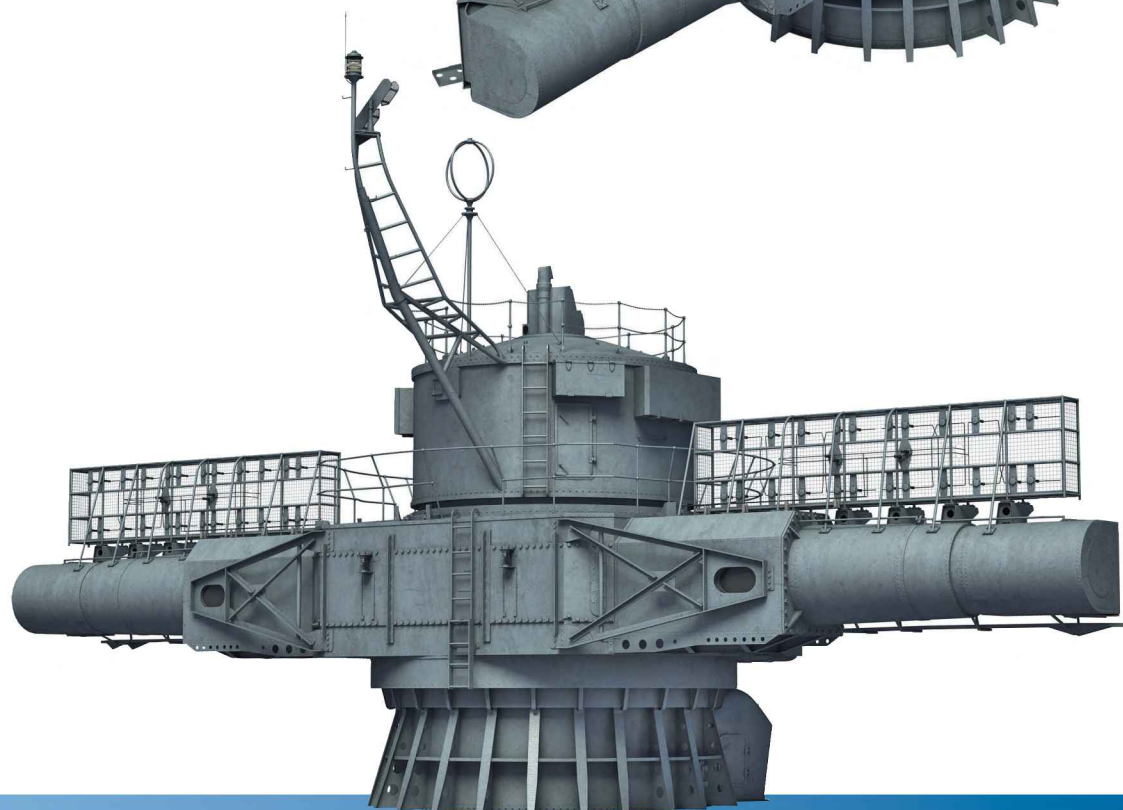
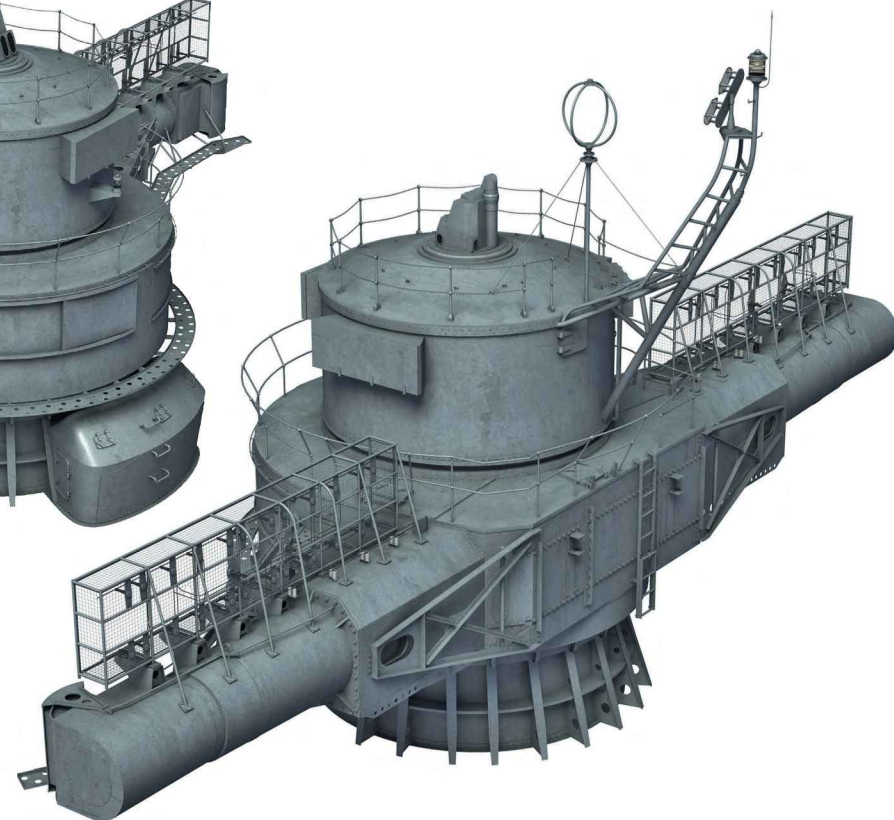
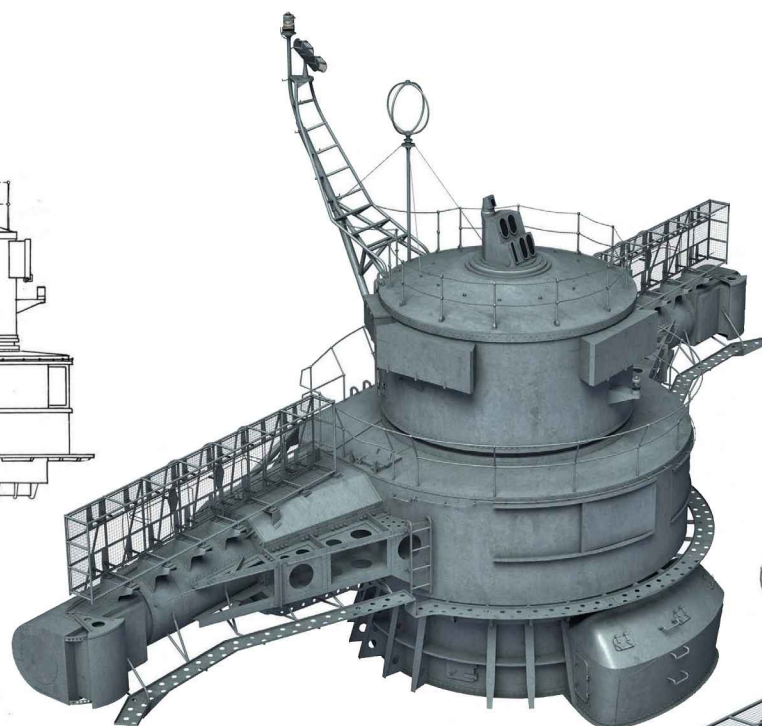
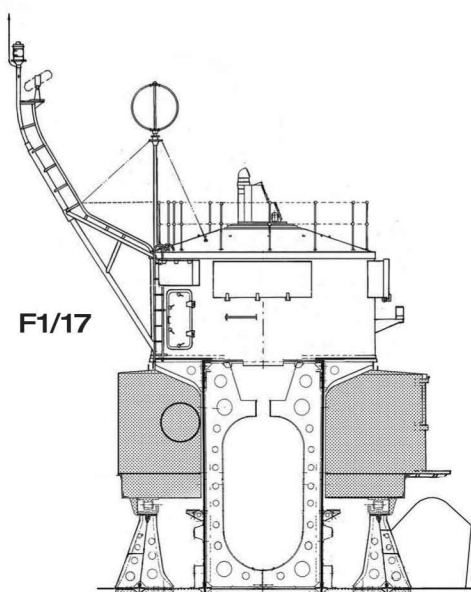
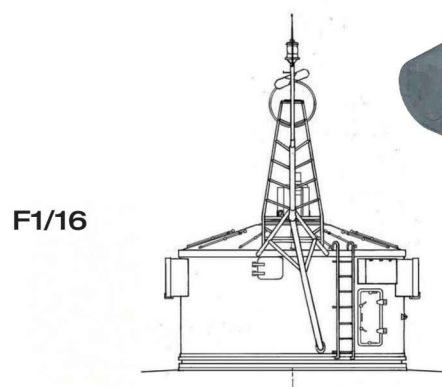
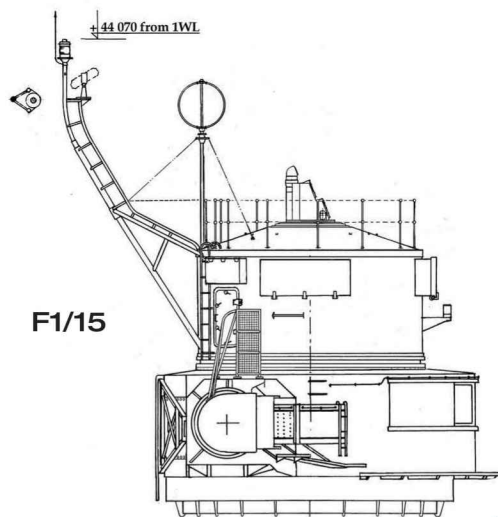


F1/13



F1/14





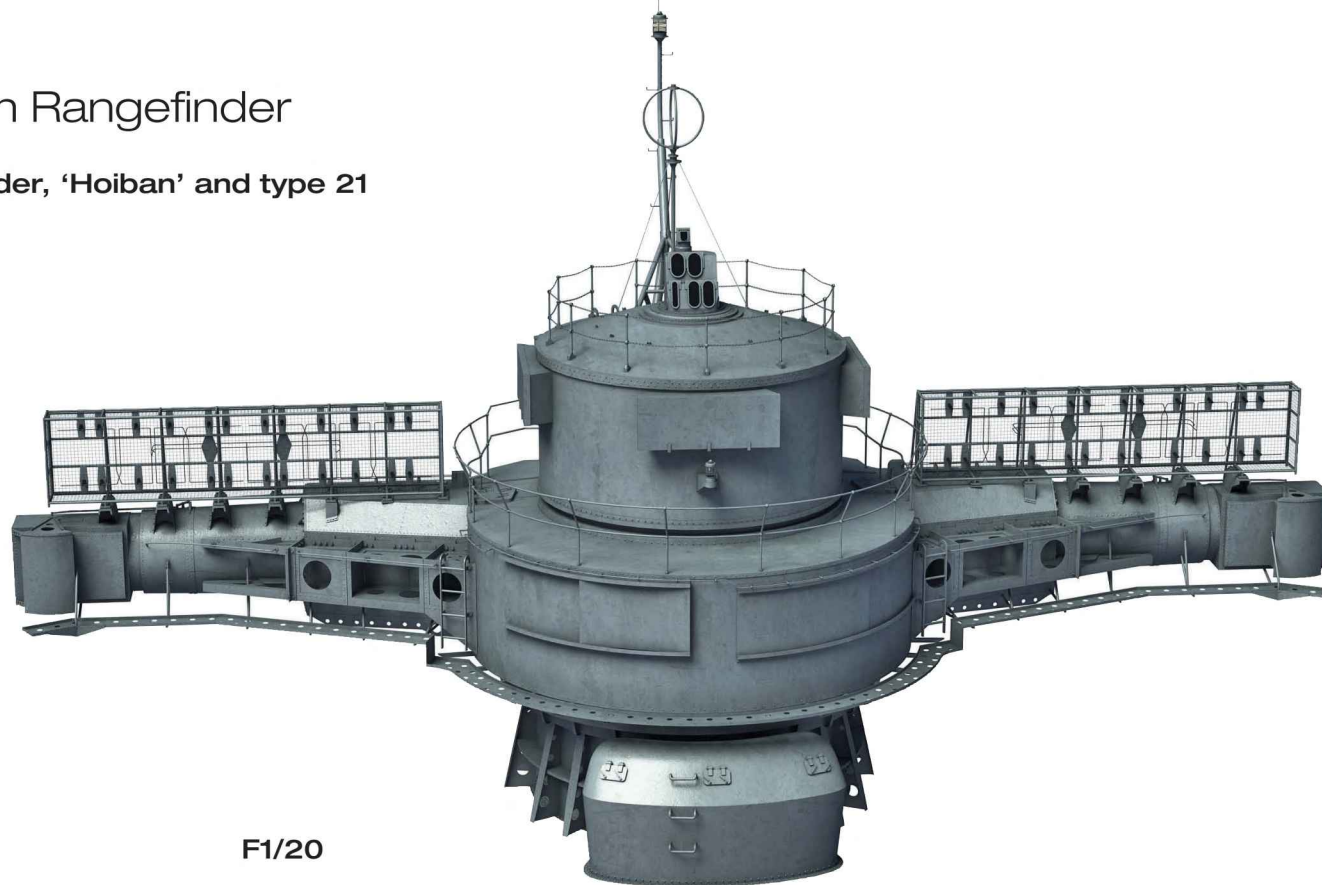
F Fire Control – 15.5m Rangefinder

Musashi 1944 15.5m rangefinder, 'Hoiban' and type 21 radar antenna (1/75 scale)

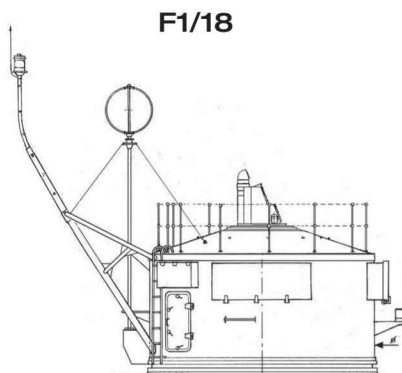
F1/18 'Hoiban' right profile

F1/19 Rear elevation

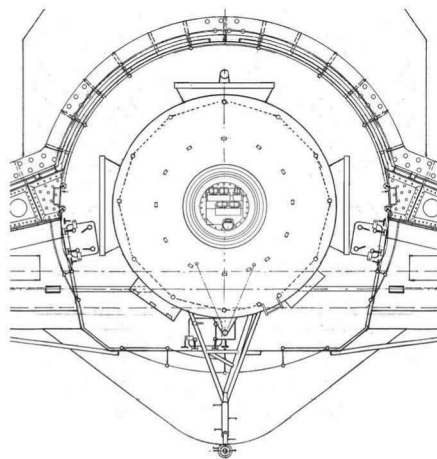
F1/20 Plan (fragment)



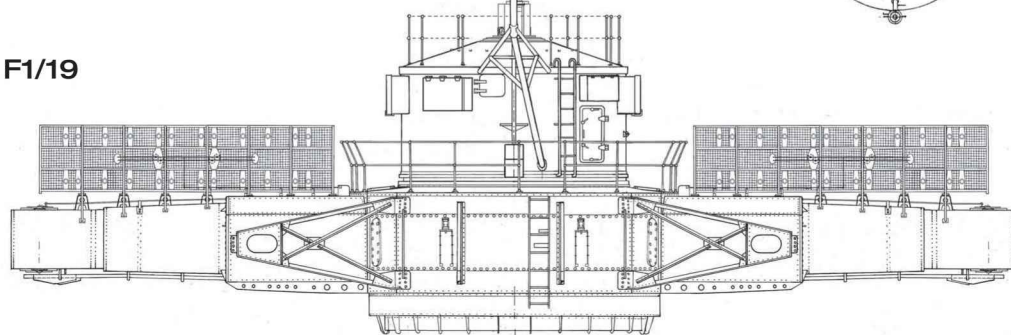
F1/20

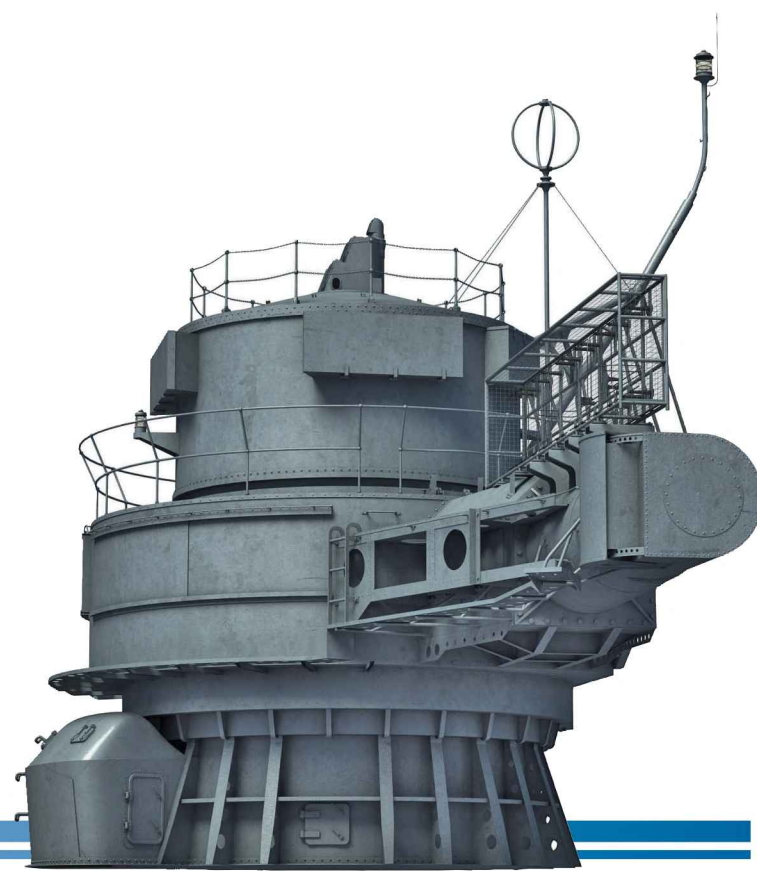
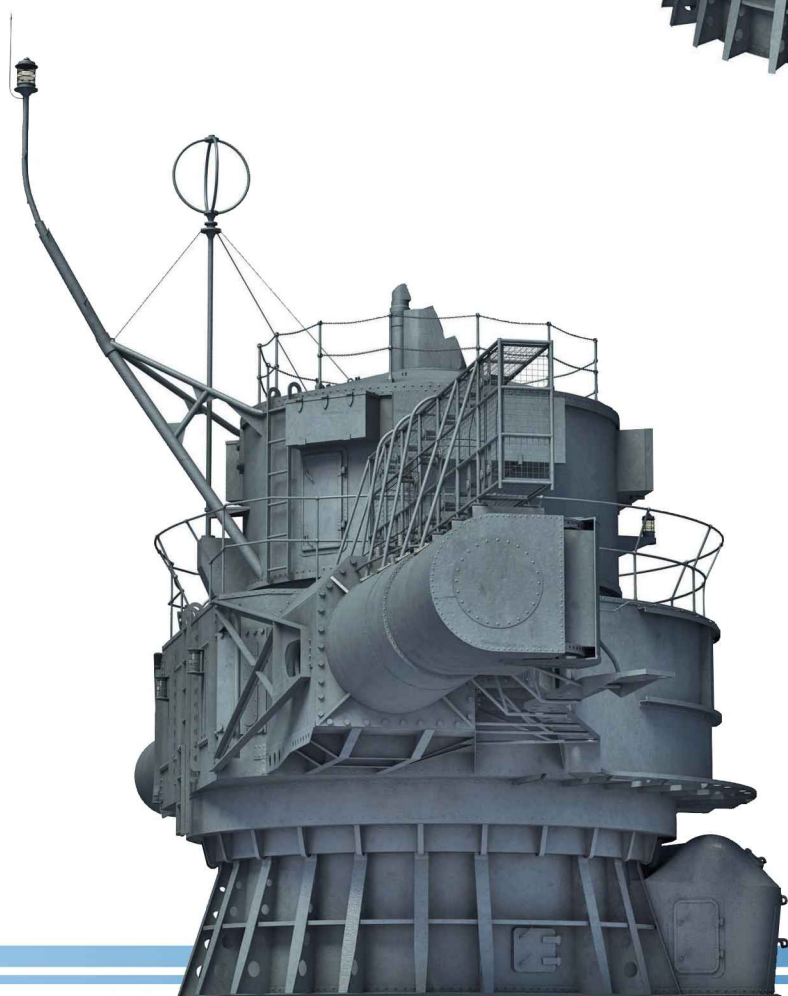
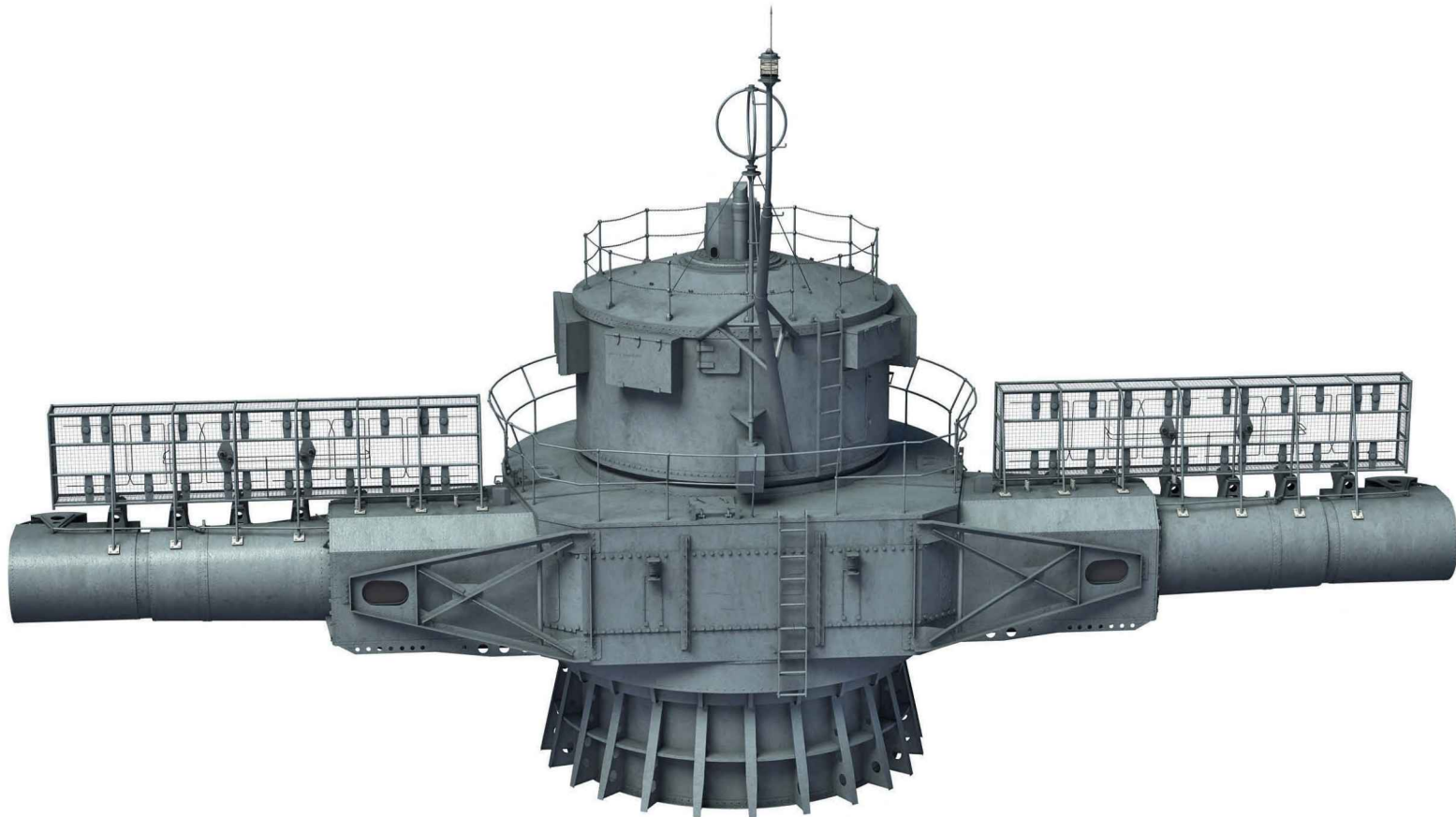


F1/18



F1/19





F Fire Control – 15.5m Rangefinder

21 Gō Dentan Kai 3 air search radar mattress type antenna (no scale)

F1/20 View from Hoiban direction

F1/21 Section

F1/22 Assembly detail

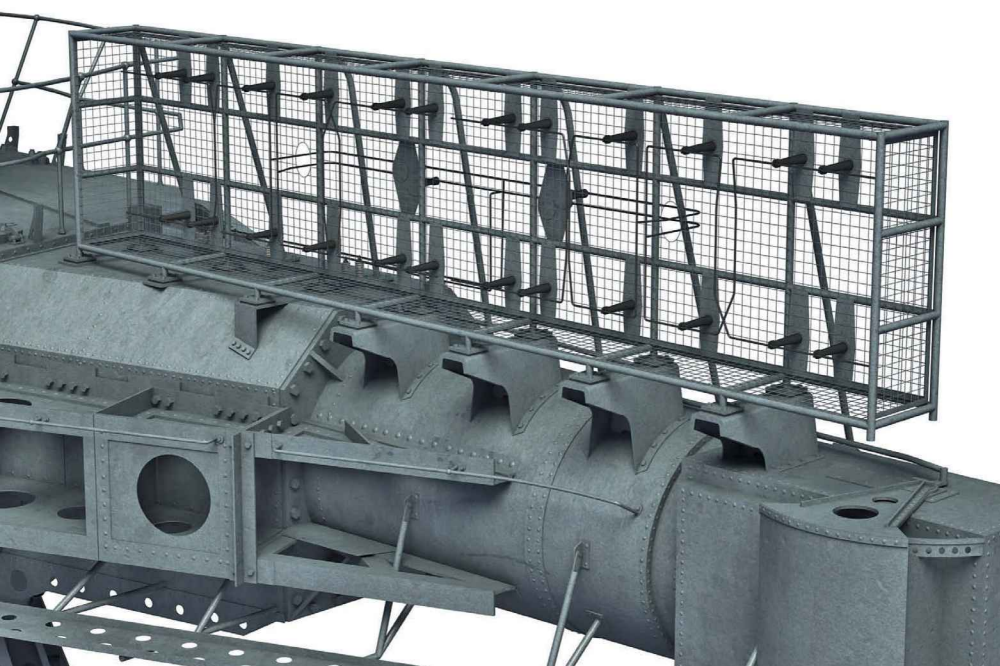
F1/23 Wire screen grid

F1/24 Section 'G'

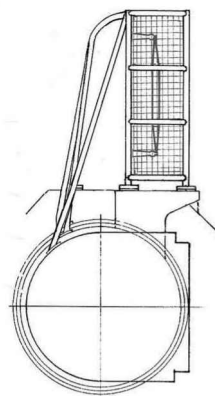
F1/25 Mattress type antenna dimensions (1/50 scale)

F1/26 Front elevation

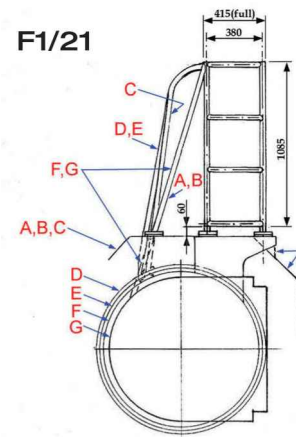
F1/27 Rear elevation



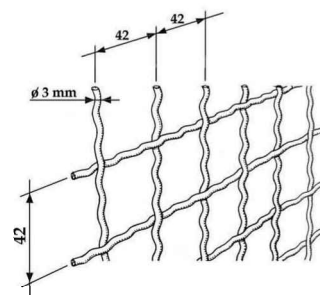
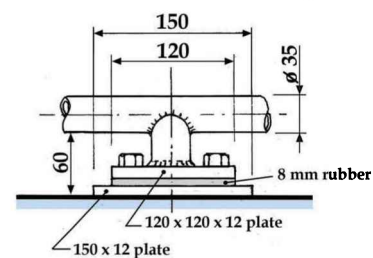
F1/20



F1/21

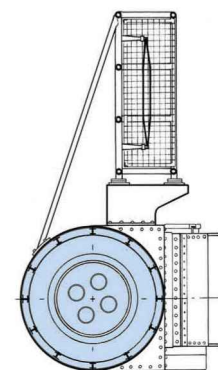


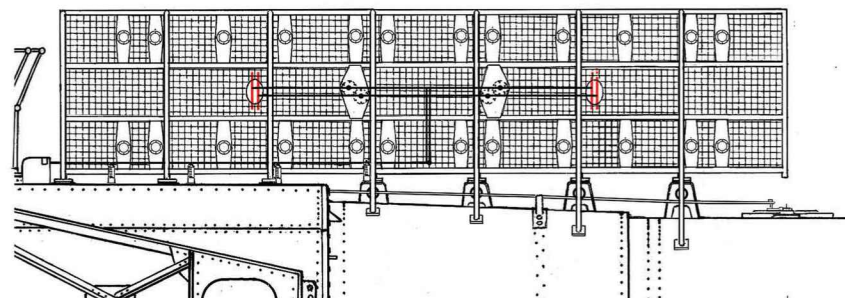
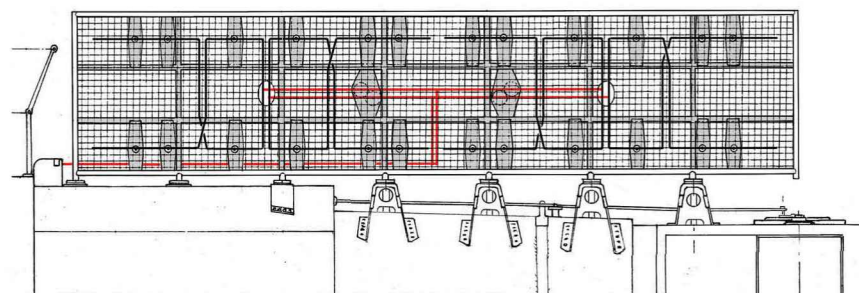
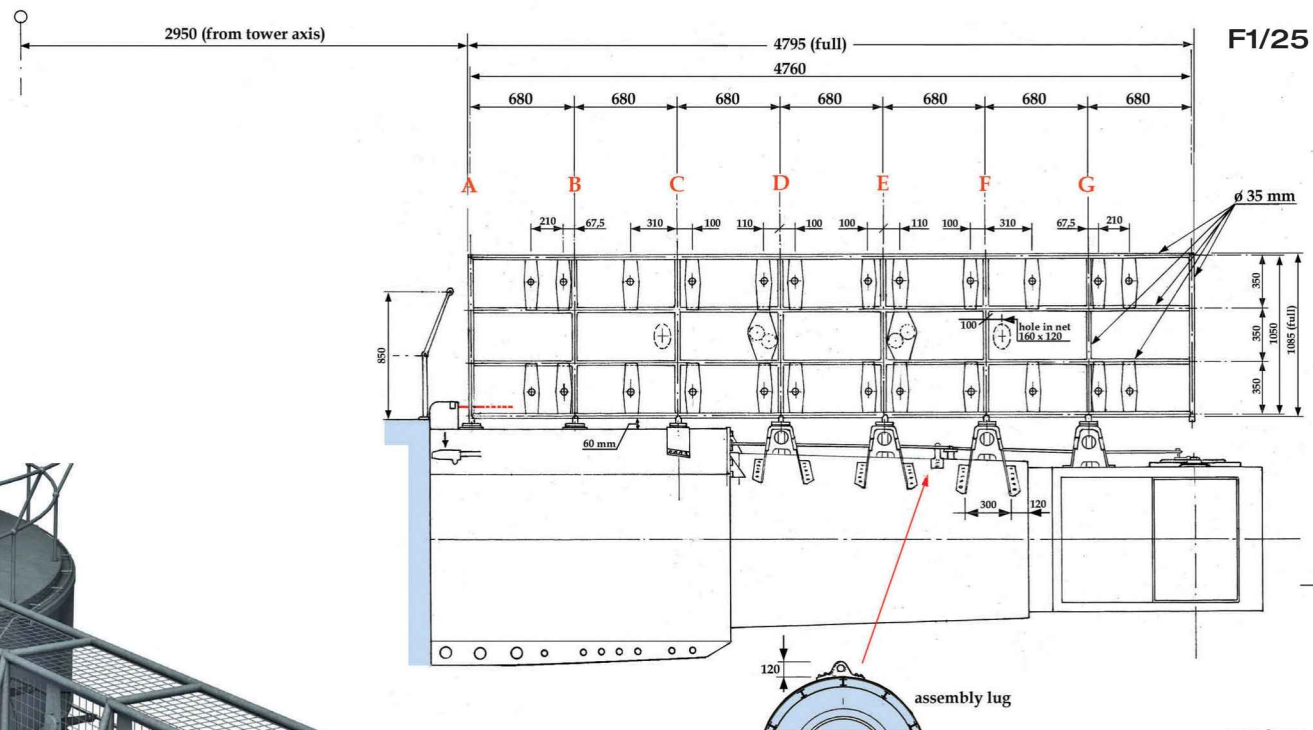
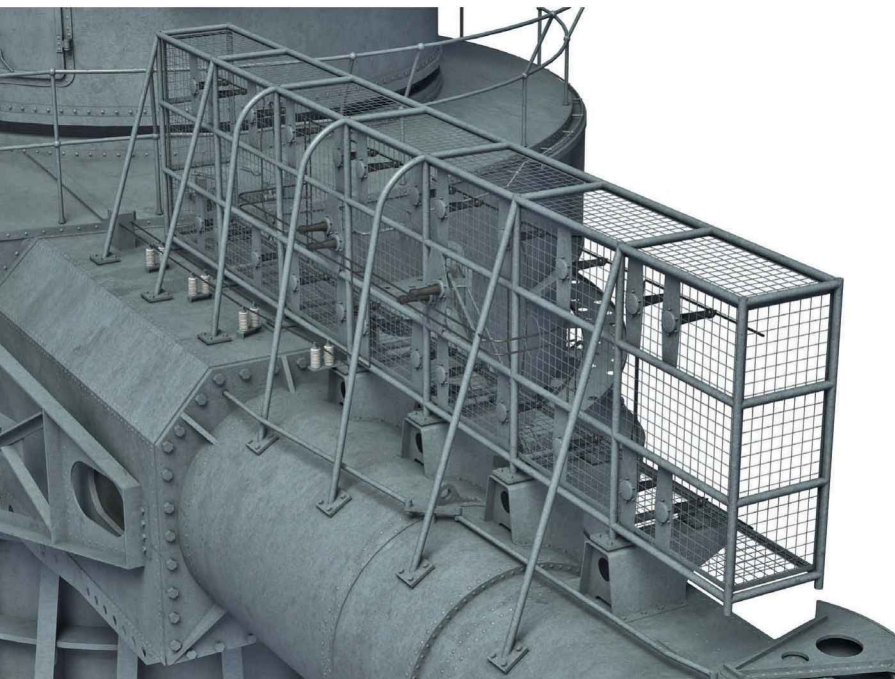
F1/22



F1/23

F1/24





F Fire Control – 15.5m Rangefinder

15.5m Rangefinder arm (no scale)

F1/28 Plan 1941

F1/29 Plan 1943

F1/30 View 'X'

F1/31 View 'Y'

15.5m Rangefinder arm details

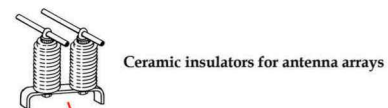
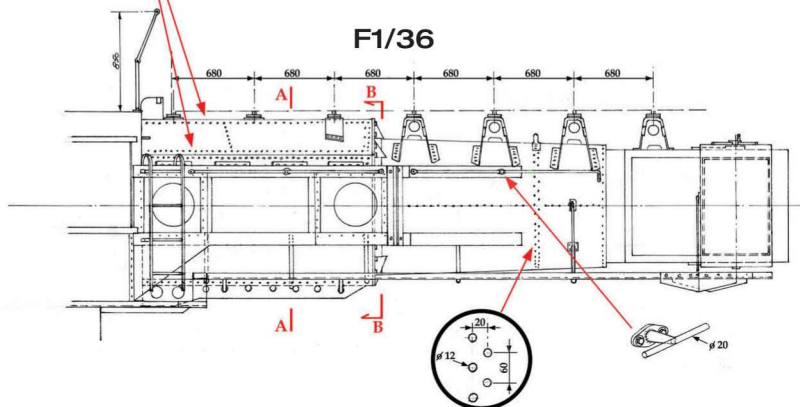
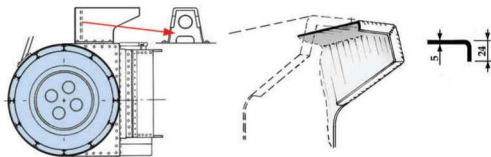
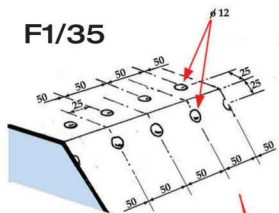
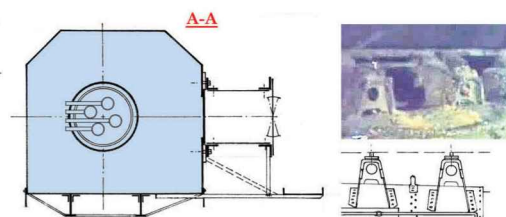
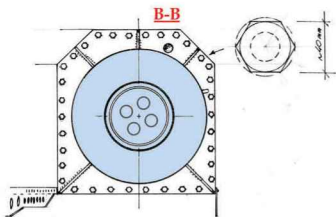
F1/32 Section B-B

F1/33 Section A-A

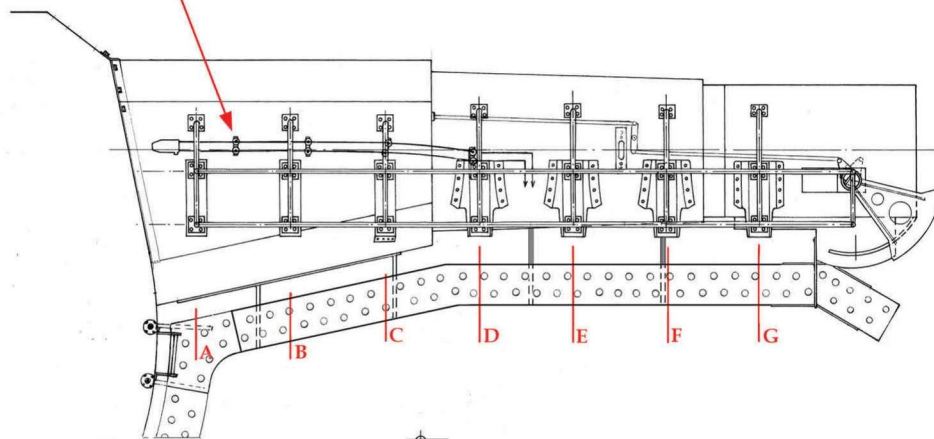
F1/34 Detail of antenna base

F1/35 Rivets

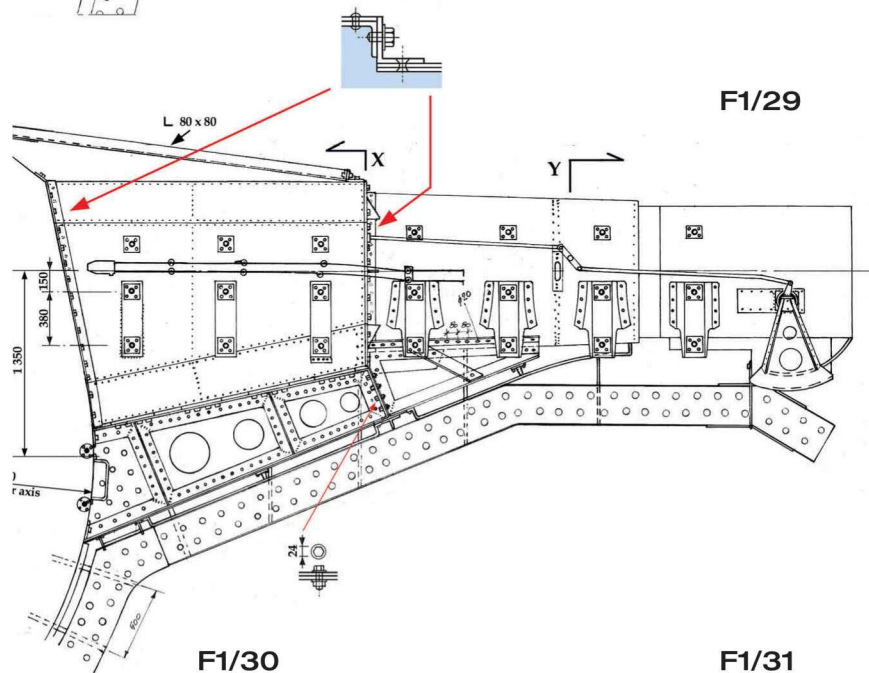
F1/36 Front elevation



F1/28

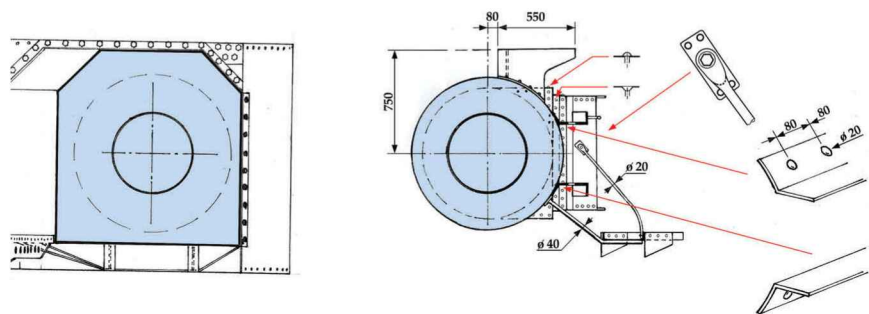


F1/29



F1/30

F1/31



F1/39 Rear view of insulator base

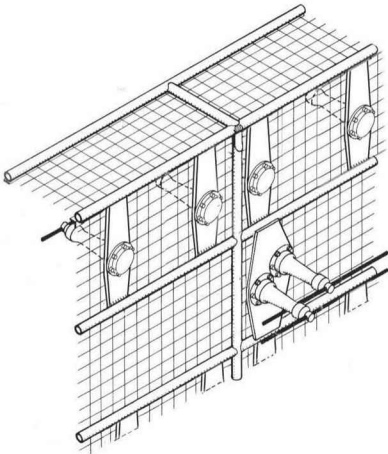


F Fire Control – 15.5m Rangefinder

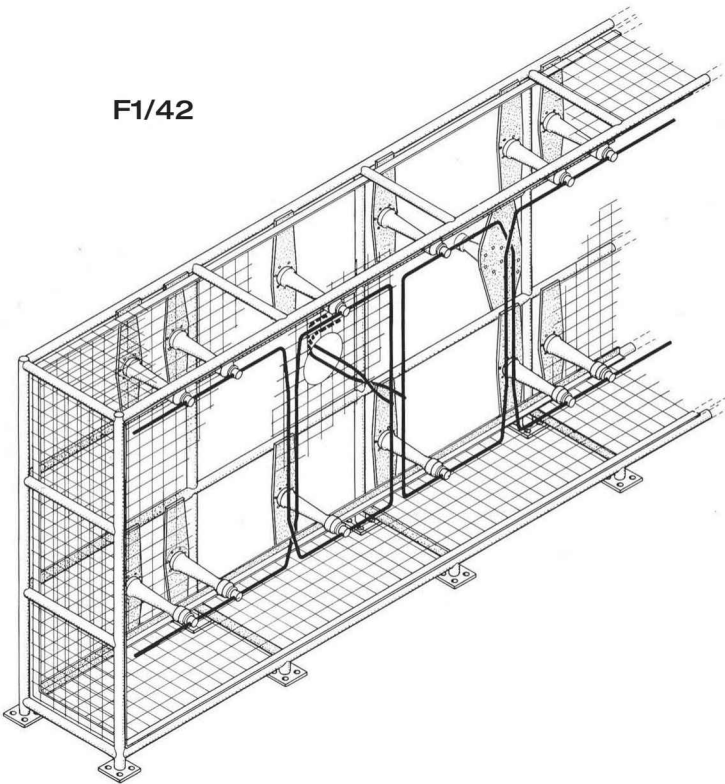
- F1/40 Rear view of aft insulators
- F1/41 Profile of aft insulators (1/5 scale)

- Type 21 Gō radar antenna
- F1/42 Front view
 - F1/43 Rear view

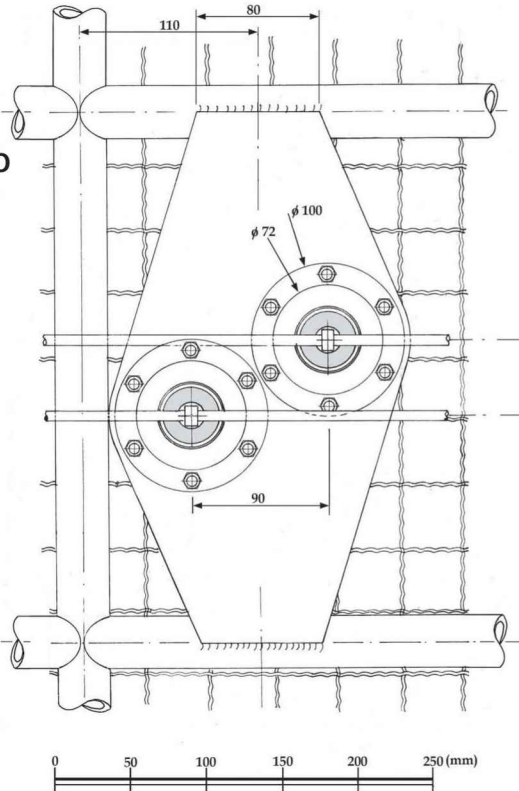
F1/43



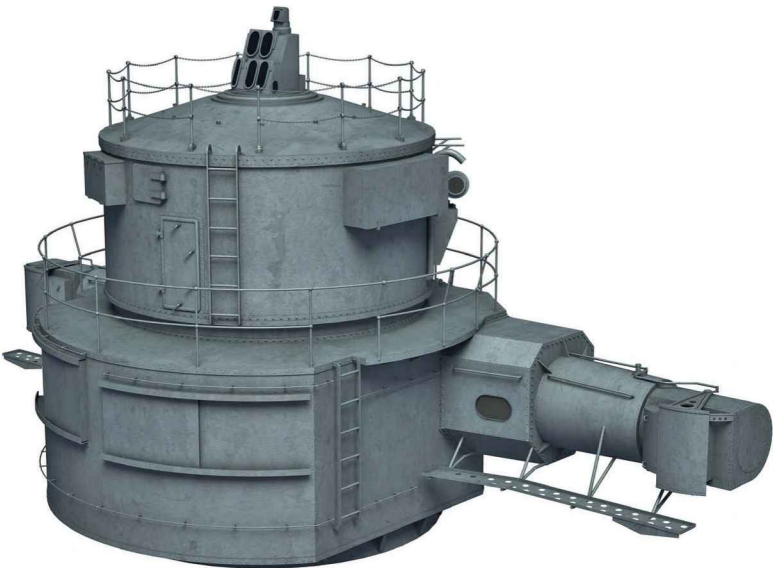
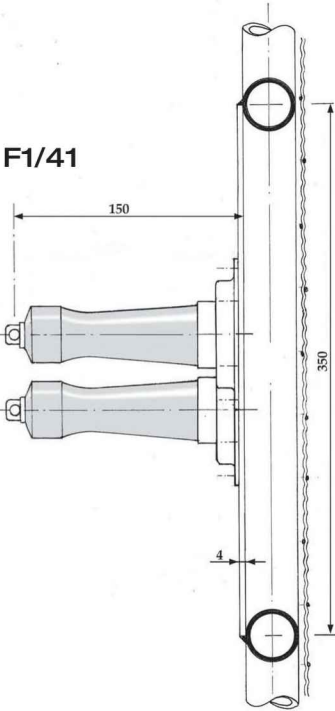
F1/42



F1/40



F1/41



Low angle director 'Hoiban' and 10m rangefinder from rear tower

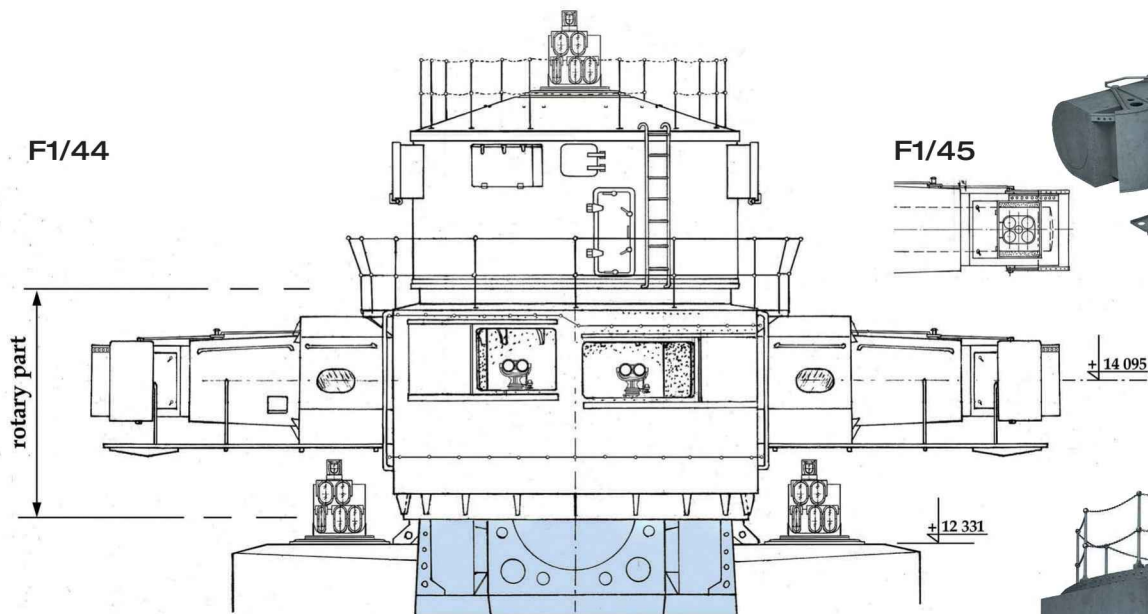
F1/44 Front elevation - view from stern direction

F1/45 Open arm window

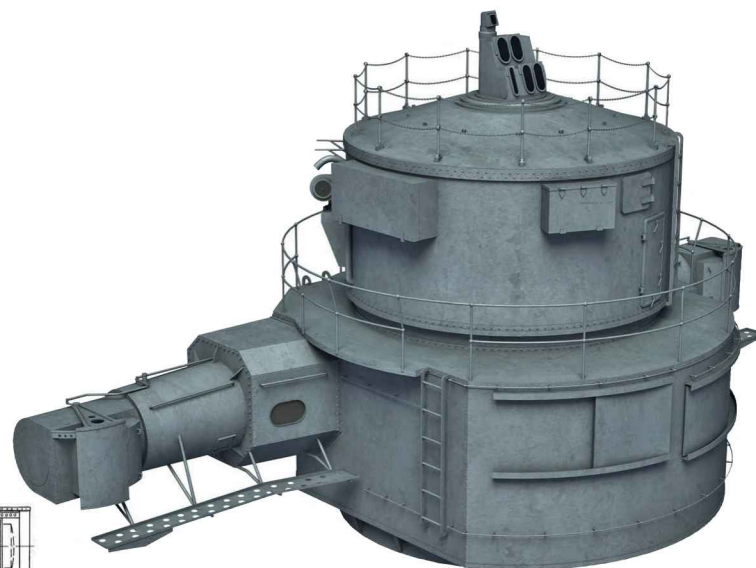
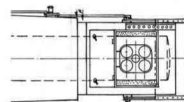
F1/46 Periscope tower

F1/47 Observation angles of periscope tower

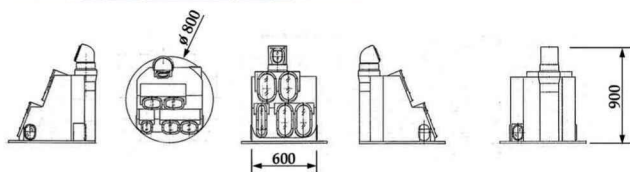
F1/44



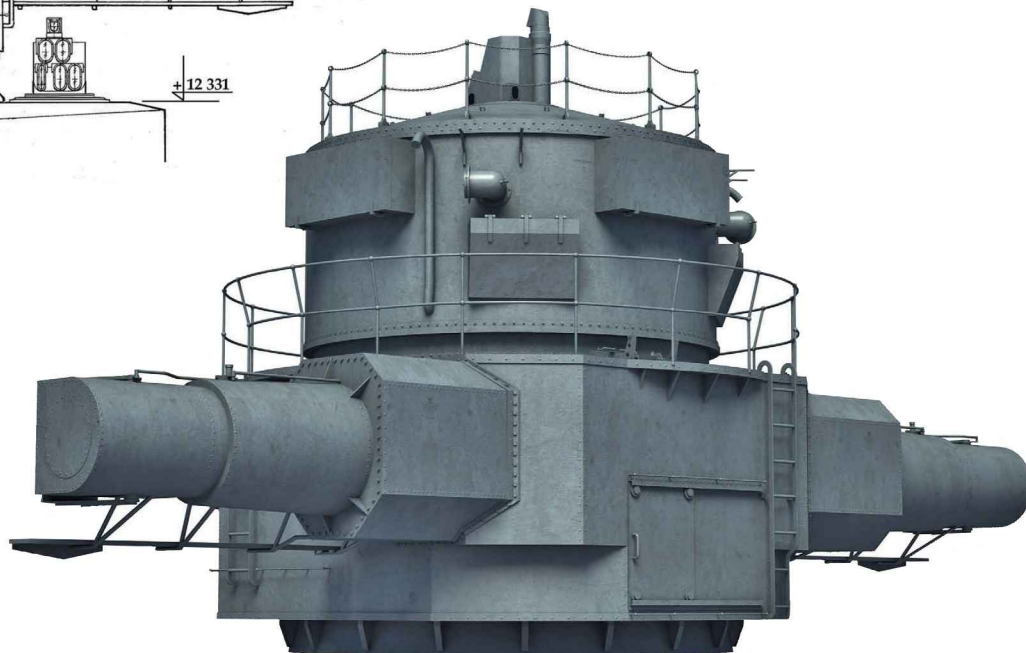
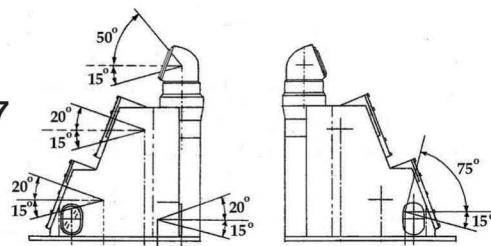
F1/45



F1/46



F1/47



F Fire Control – ‘Hoiban’ and 10m Rangefinder

‘Hoiban’ and 10m rangefinder

F1/48 Plan

F1/49 Plan of rangefinder’s room – rotatable part

F1/50 Plan of rangefinder arm

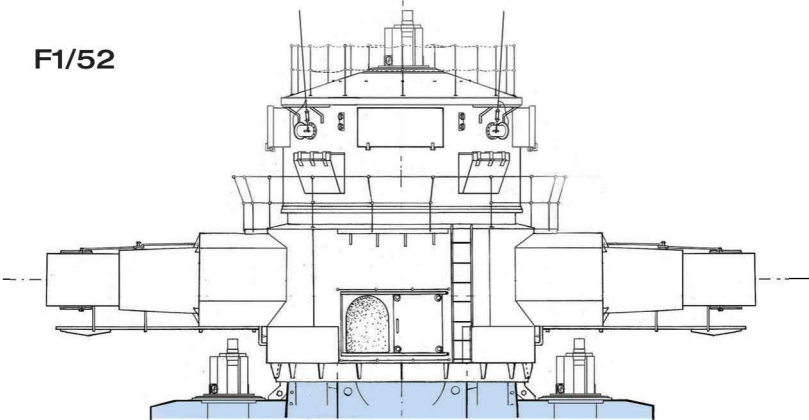
F1/51 Front view of open window

F1/52 Rear elevation – view from bow direction

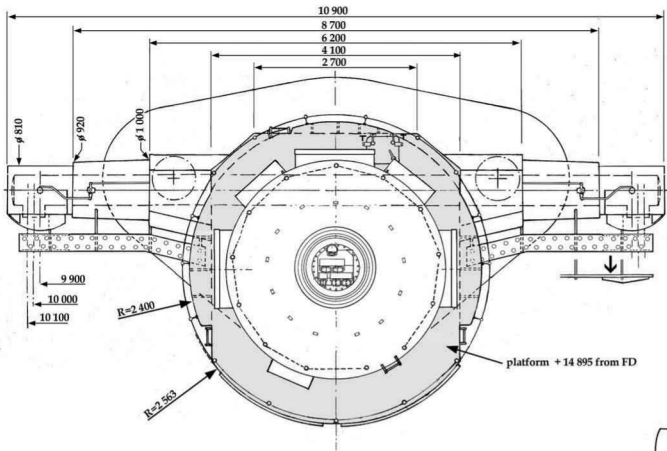
F1/53 Starboard elevation

F1/54 Water-tight seal of rotatable periscope tower

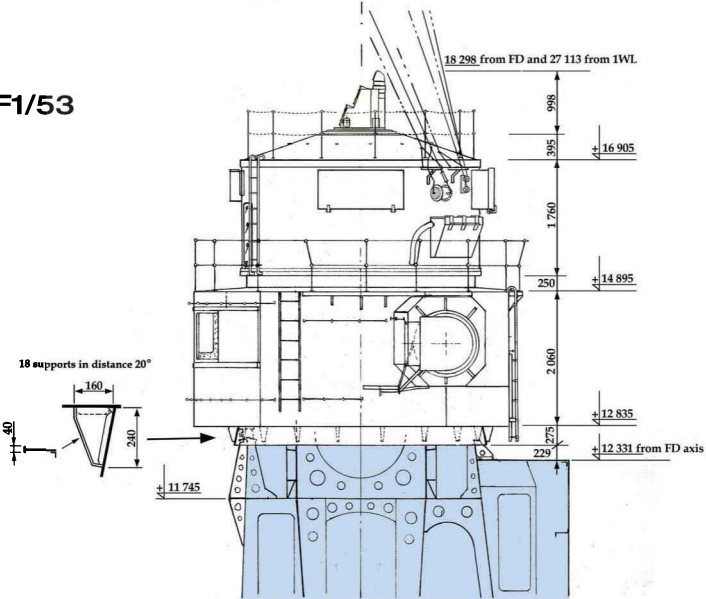
F1/52



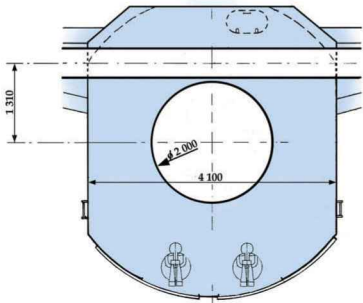
F1/48



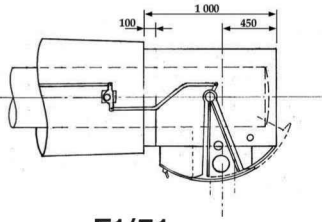
F1/53



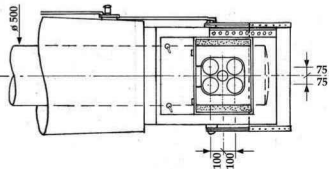
F1/49



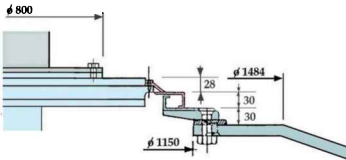
F1/50



F1/51



F1/54



Diameters of holes for rangefider lenses:
Four 120mm
One 80mm

Type 13 Gō air search radar antenna installed on both sides of main mast (1/50 scale)(1/50 scale)

F1/55 Profile

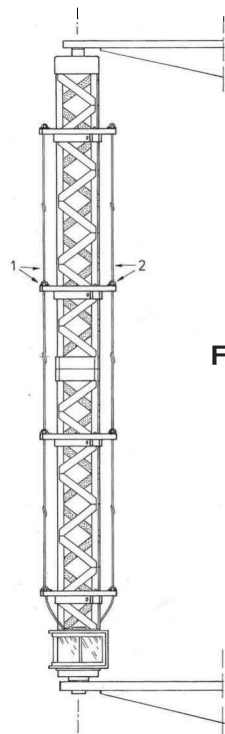
F1/56 Front view

F1/57 Rear view

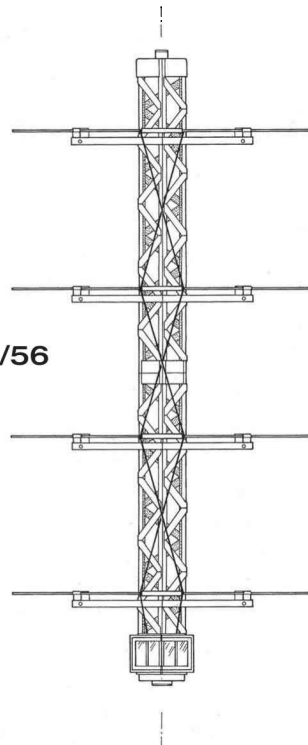
F1/58 Plan

F1/59 Section of pillar

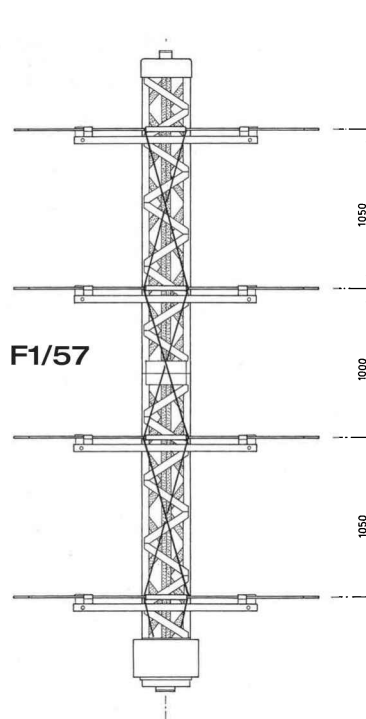
F1/55



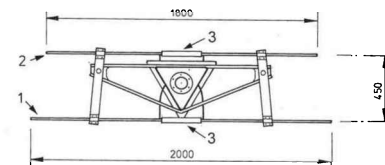
F1/56



F1/57

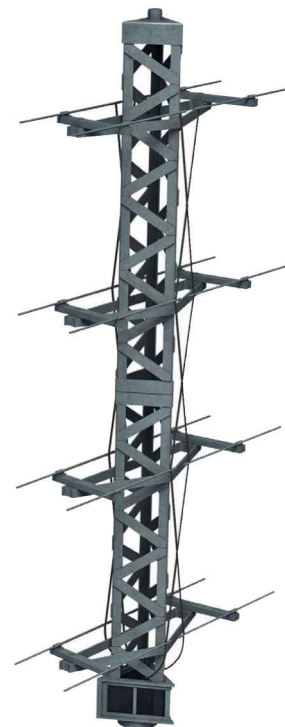
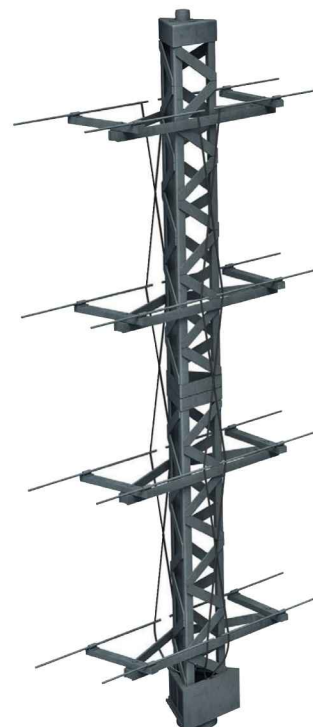
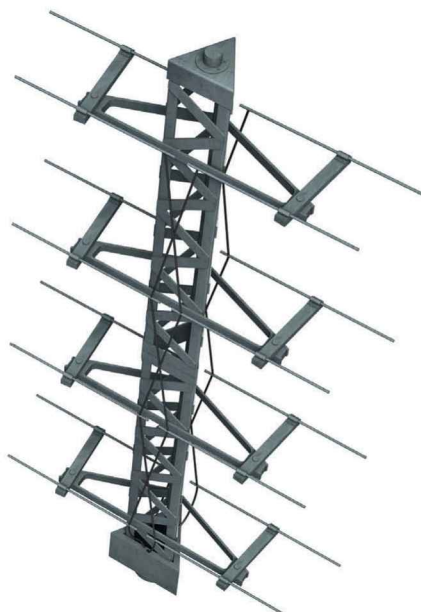
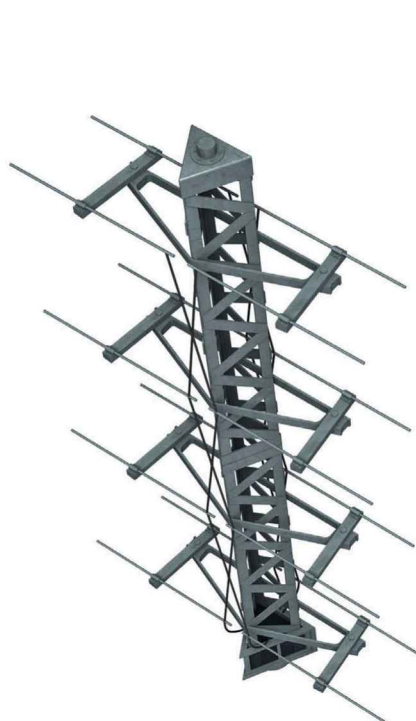
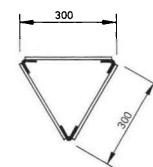


F1/58



- 1 - Receiving array (10mm diameter bar)
- 2 - Transmitting array (10mm diameter bar)
- 3 - Insulator

F1/59



F Fire Control – 15.5m Rangefinder

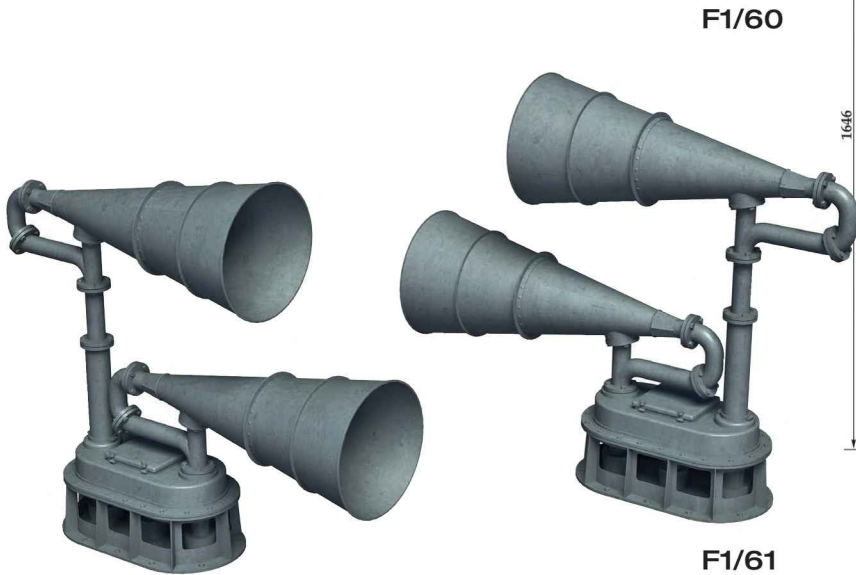
Type 22 Gō Dentan Kai 4 surface search radar horns

Antenna fitted in January – April 1944 (1/20 scale)

Receiving horn – upper
Transmitting horn – lower

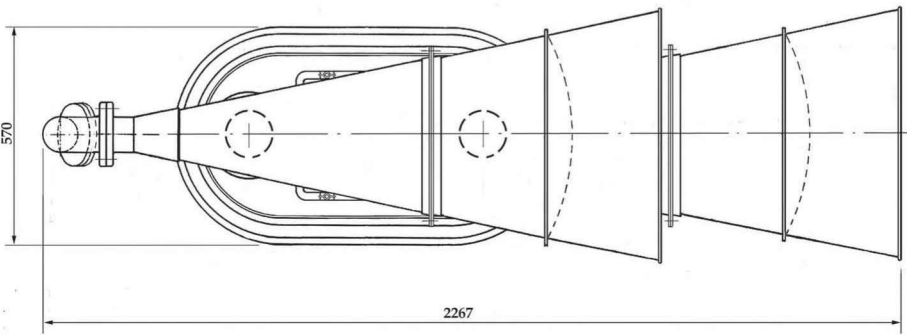
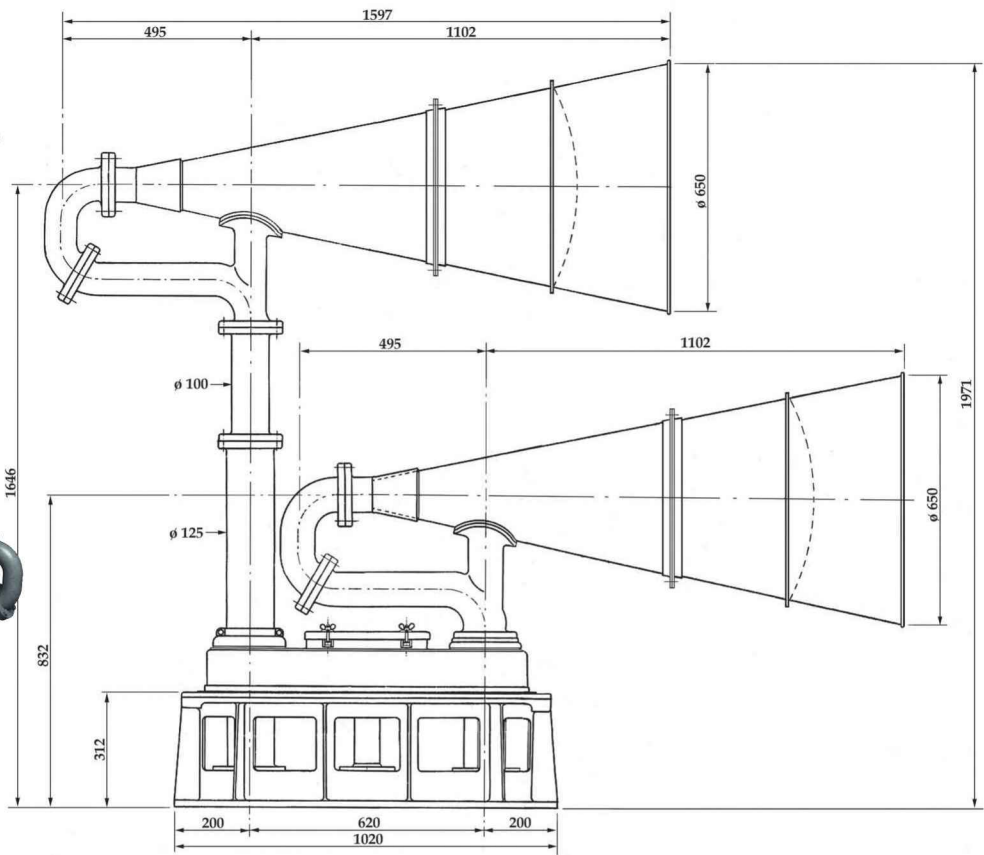
F1/60 Side view

F1/61 Plan



F1/60

F1/61



F Fire Control – 4.5m to 1.5m Rangefinders

4.5m Rangefinder type 94 for high angle fire control fitted on *Yamato* and *Musashi* (*Musashi* version until end of 1942) Fitted at frame 125 (1/100 scale)

F2/1 Left profile (closed windows)

F2/2 Front (port side) elevation

F2/3 Right profile

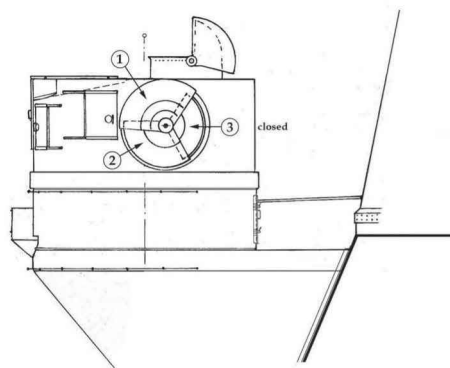
F2/4 Plan

F2/5 Left profile with open windows and rotating shield of rangefinder arm

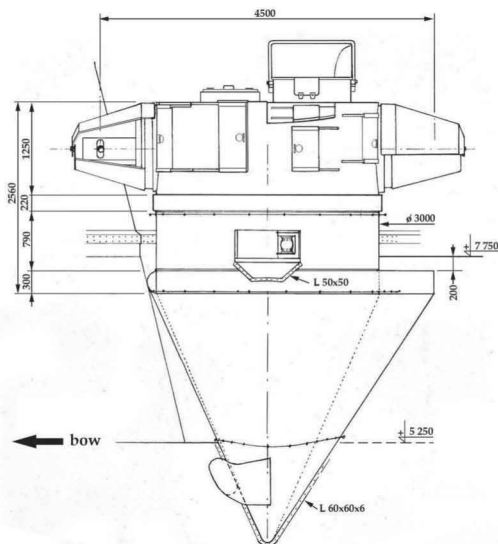
F2/6 Right profile with open windows and rotating shield

F2/7 Observation port cover

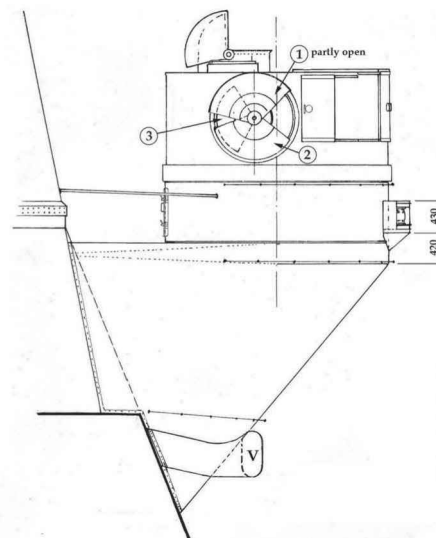
F2/1



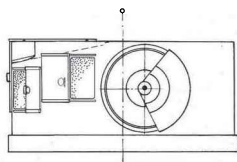
F2/2



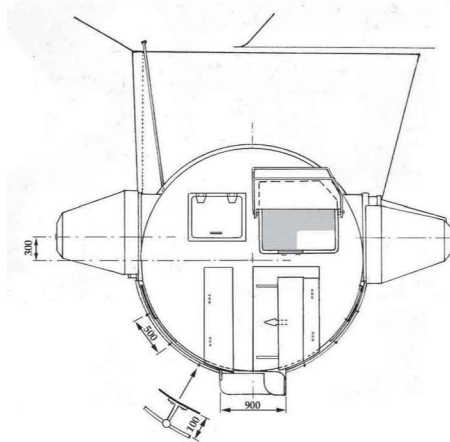
F2/3



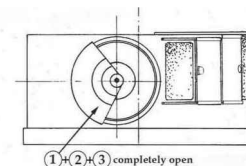
F2/4



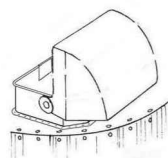
F2/5



F2/6



F2/7

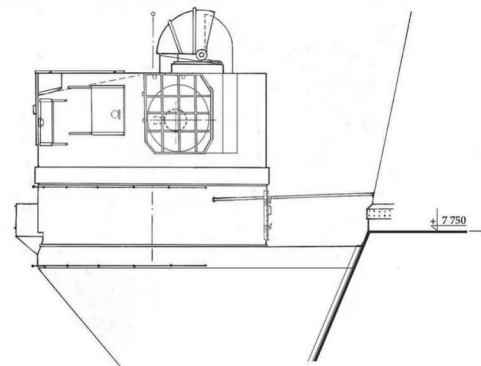


① ② moving covers (rotary)
③ motionless cover

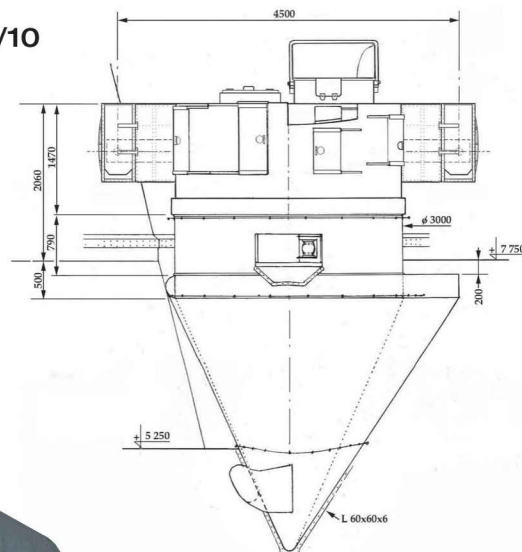
F Fire Control – 4.5m to 1.5m Rangefinders

Perspective views of 4.5m Rangefinder type 94 for high angle fire control fitted on *Yamato* and *Musashi* (*Musashi* version until end of 1942) Fitted at frame 125

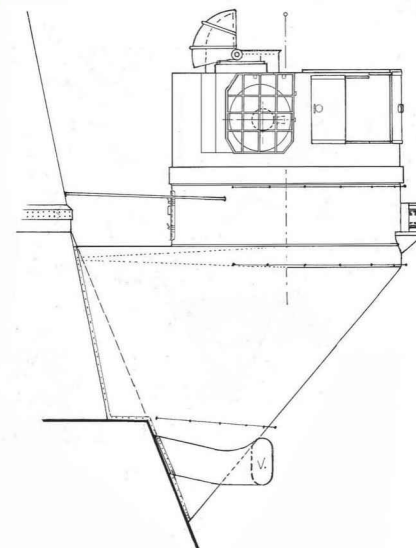
F2/8



F2/10



F2/9



4.5m Rangefinder type 94 on *Musashi* after
modernisation in early 1943 (1/100 scale)

F2/8 Left profile

F2/9 Front elevation (port side)

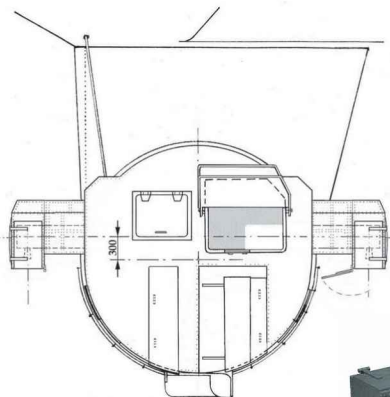
F2/10 Right profile

F2/11 Plan

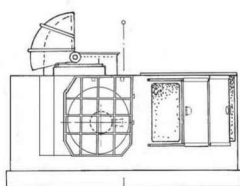
F2/12 Right profile with open windows

F2/13 Windows handle

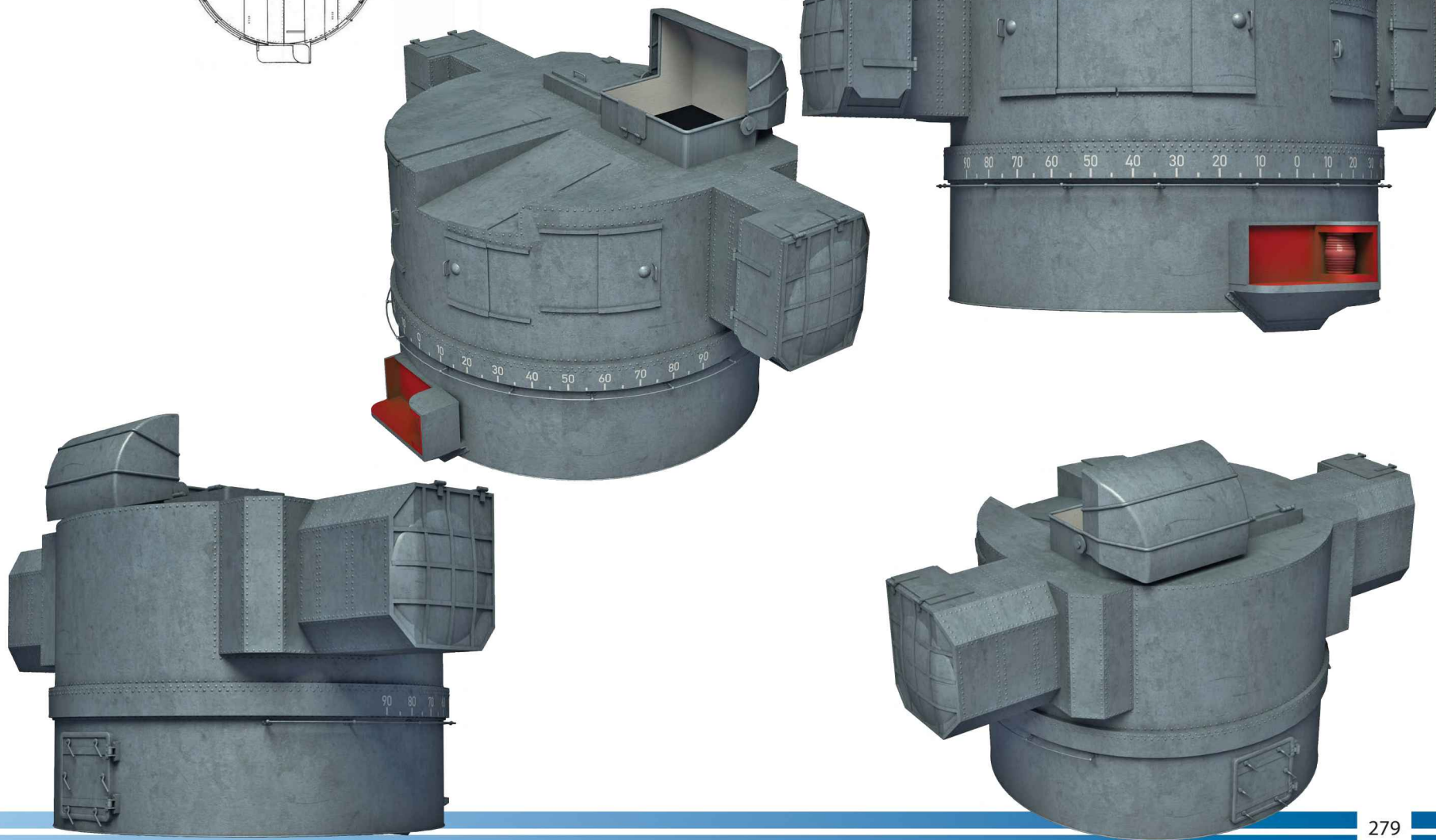
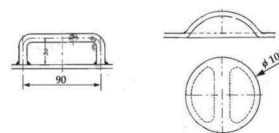
F2/11



F2/12



F2/13



F Fire Control – 4.5m to 1.5m Rangefinders

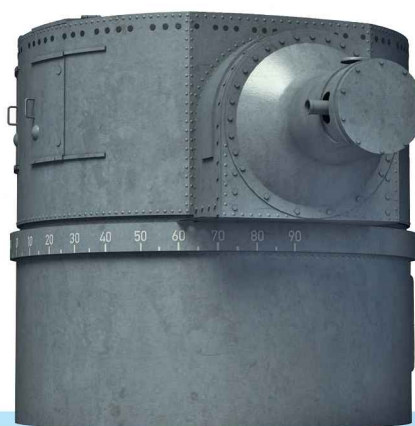
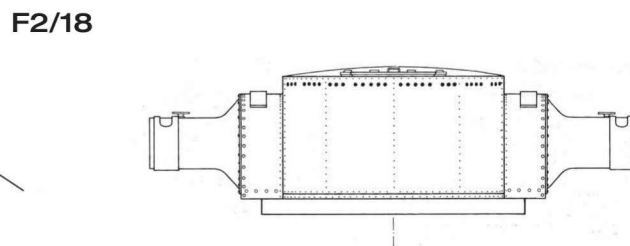
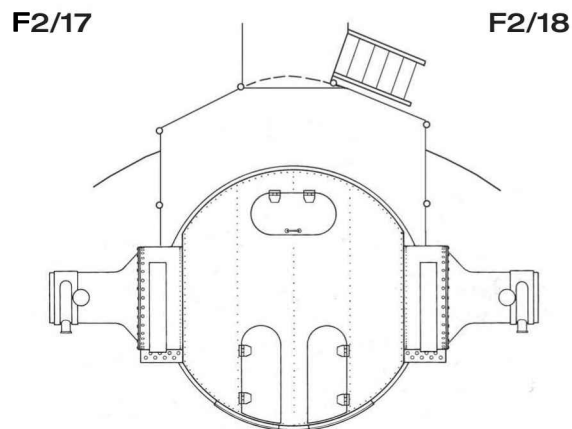
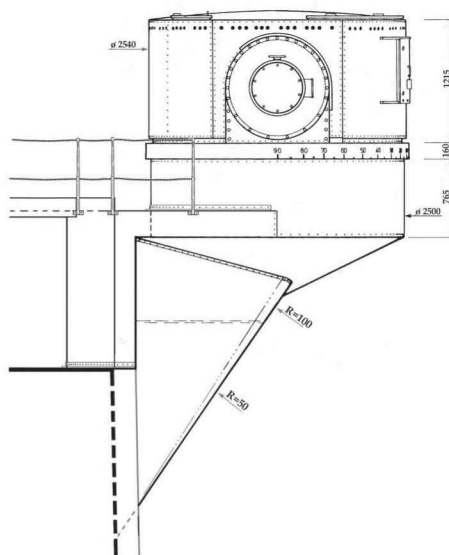
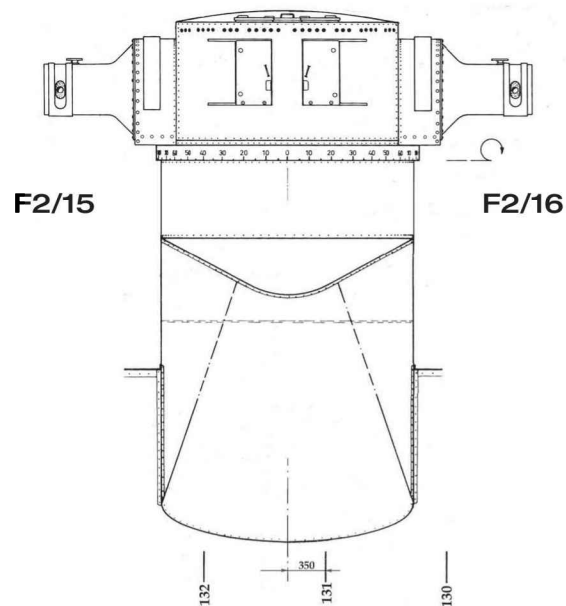
4.5m rangefinder on *Yamato* and *Musashi* fitted at frame 131 (removed in 1944) (1/75 scale)

F2/15 Front elevation

F2/16 Right profile

F2/17 Plan

F2/18 Rear view



4.5m Rangefinder fitted on *Yamato* in April 1944 fitted
at frame 146 (1/75 scale)

F2/19 Front elevation

F2/20 Left profile

F2/21 Plan

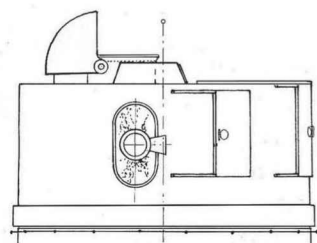
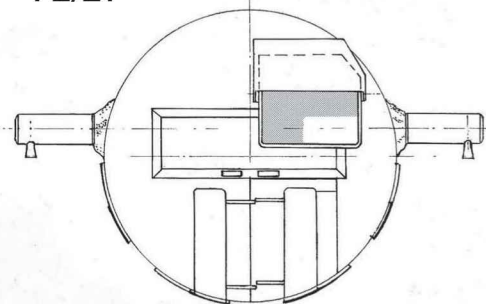
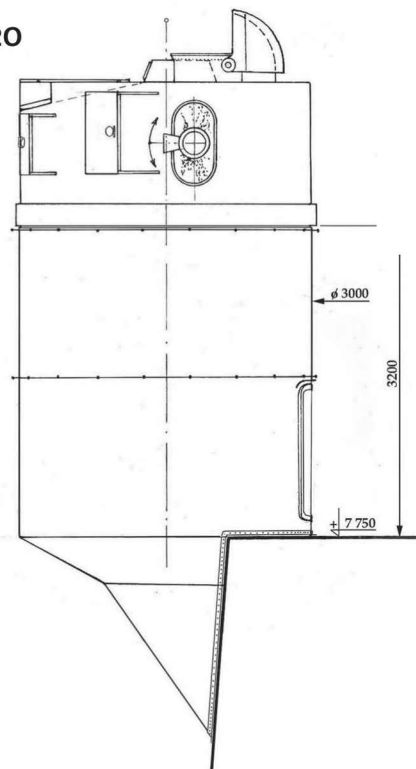
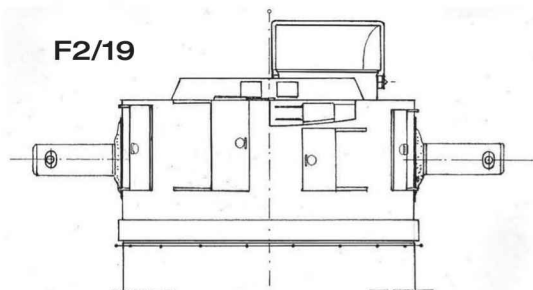
F2/22 Right profile

F2/19

F2/20

F2/21

F2/22



F Fire Control – 4.5m to 1.5m Rangefinders

1.5m Type 14 navigation rangefinder from fore wall
of tower bridge (1/50 scale)

F2/23 Profile view

F2/24 Front elevation

F2/25 Left profile

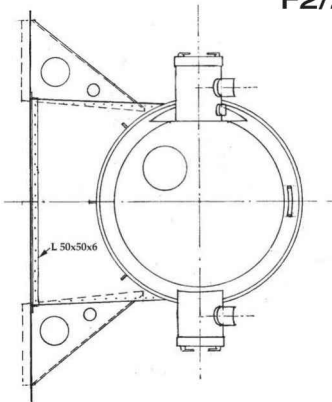
F2/26 Plan

F2/27 Sections of base column

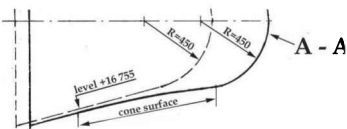
F2/28 Roller bearing



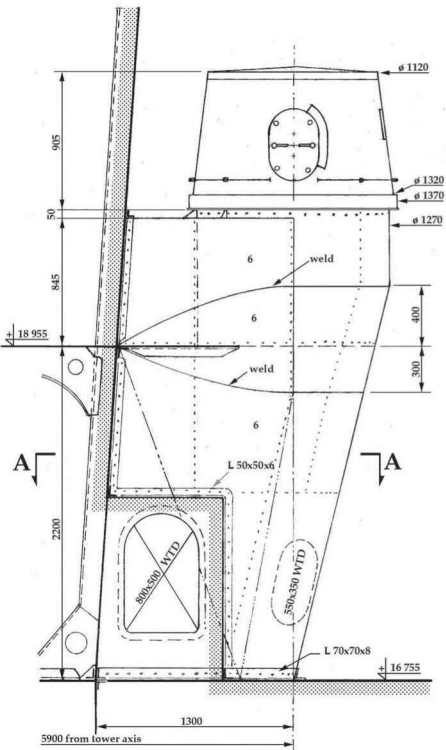
F2/26



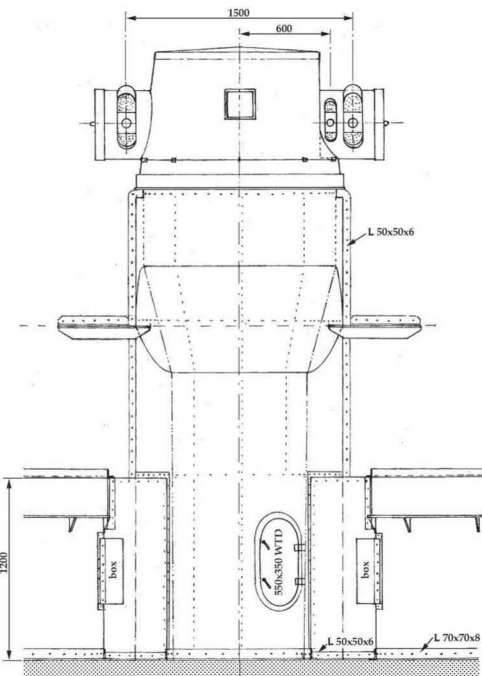
F2/27



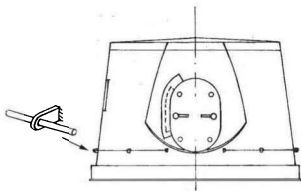
F2/23



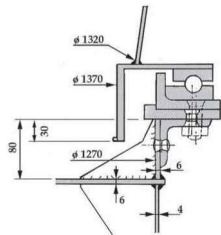
F2/24



F2/25



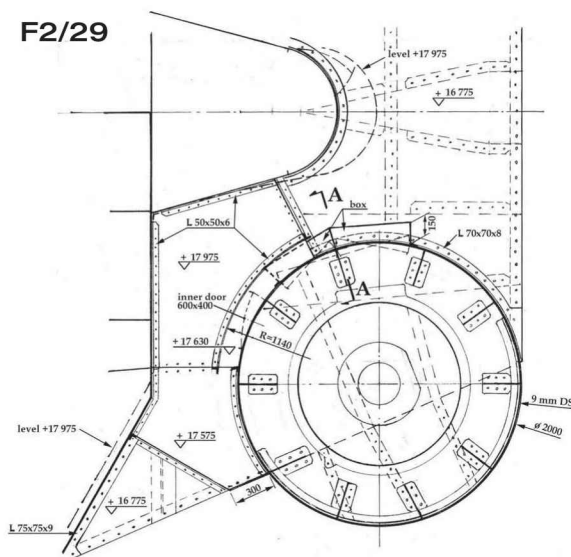
F2/28



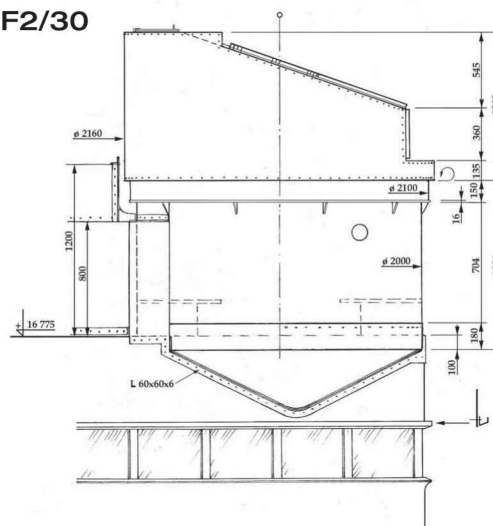
Type 85 machine gun fire control tower
 F2/29 Plan of montage on compass bridge
 F2/30 Right profile with base of compass bridge
 F2/31 Front elevation
 F2/32 Plan
 F2/33 Section A-A
 F2/34 Author's study model



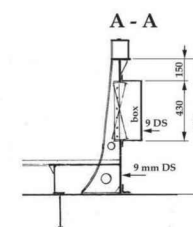
F2/29



F2/30



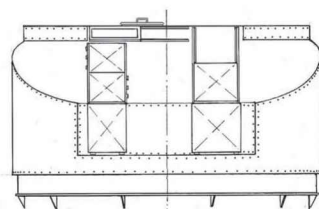
F2/33



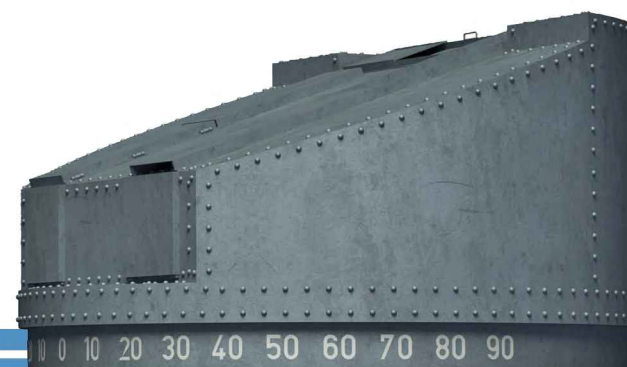
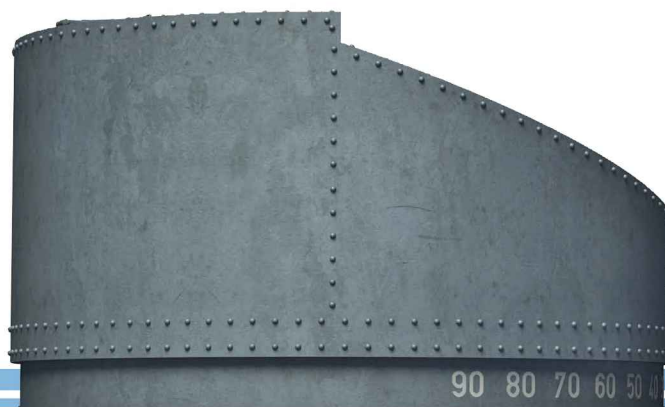
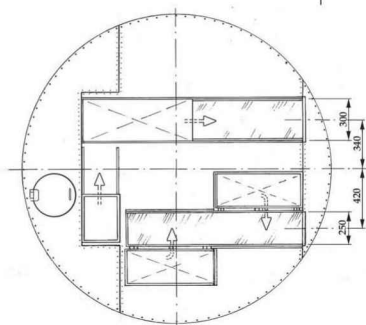
F2/34



F2/31



F2/32



F Fire Control – 4.5m to 1.5m Rangefinders

Searchlight control tower (1/35 scale)

F2/35 Front view

F2/36 Profile

F2/37 Plan

F2/38 Rear view

Type 95 Kai 1 machine gun control tower (1/50 scale)

F2/39 Profile view with base at frame 154 (*Yamato* only)

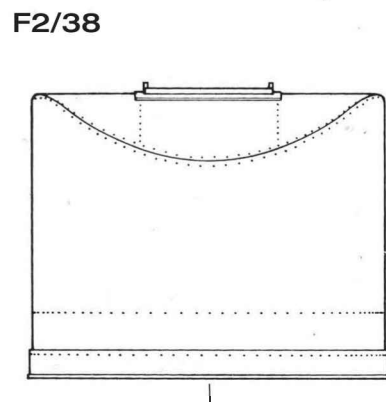
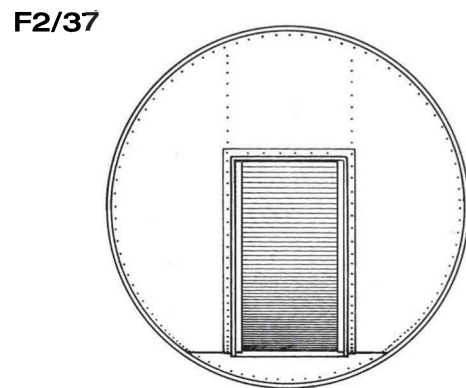
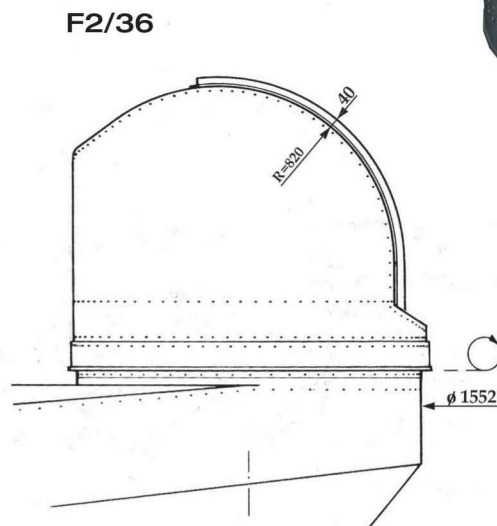
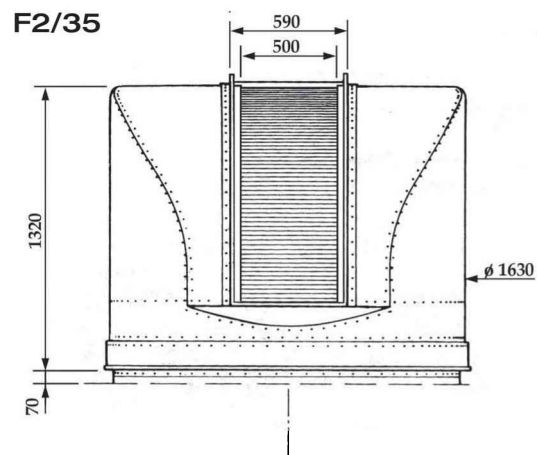
F2/40 Rear view (*Yamato*)

F2/41 Plan (*Yamato*)

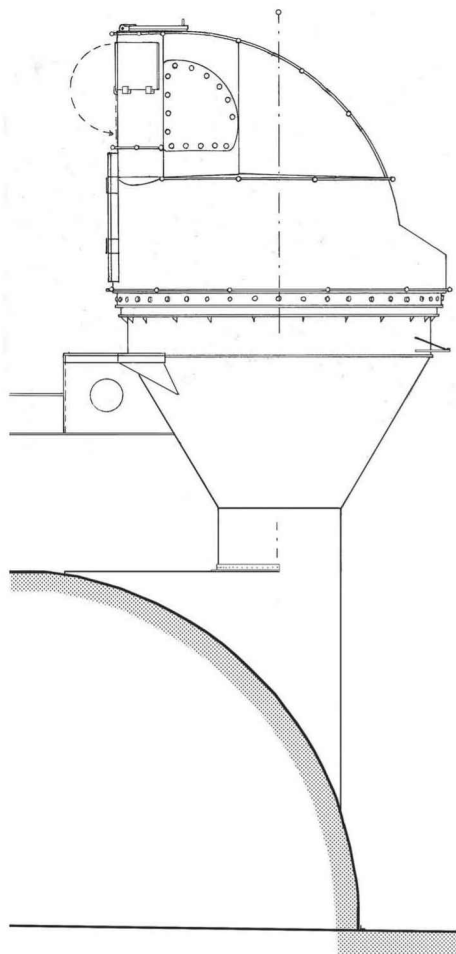
F2/42 Profile – other stands – *Yamato* and *Musashi*

F2/43 Roller bearing

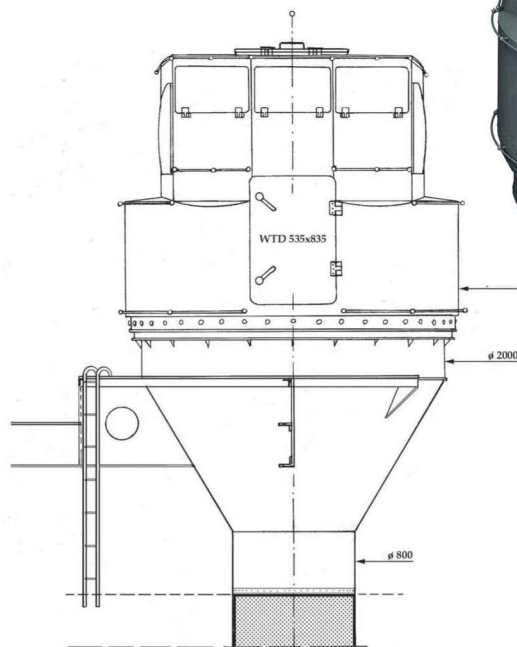
F2/44 Section (scheme)



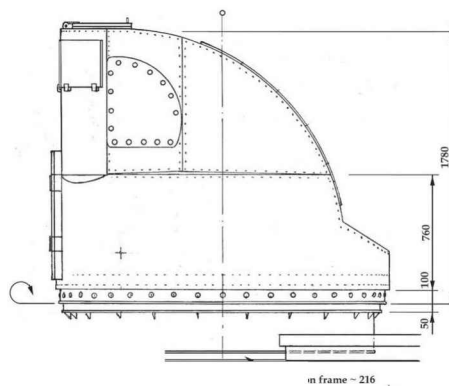
F2/39



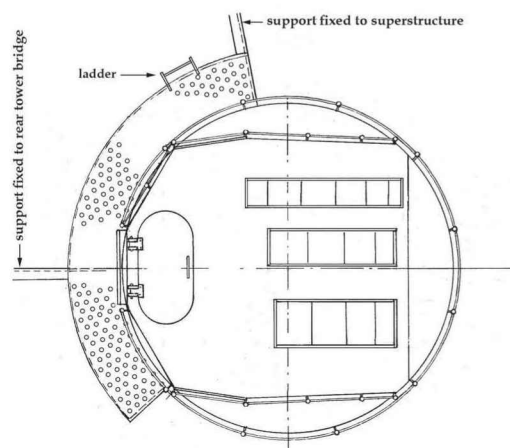
F2/40



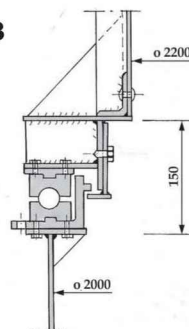
F2/42



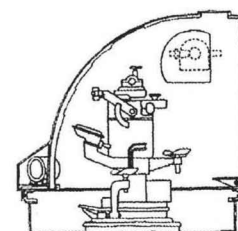
F2/41



F2/43



F2/44



G Fittings – Searchlights

150cm searchlight (1/50 scale)

G1/1 Left profile

G1/2 Front view

G1/3 Right profile

G1/4 Rear view

G1/5 Plan

G1/6 Scheme

60cm signalling searchlight (1/50 scale)

G1/7 Left profile

G1/8 Front view

G1/9 Right profile

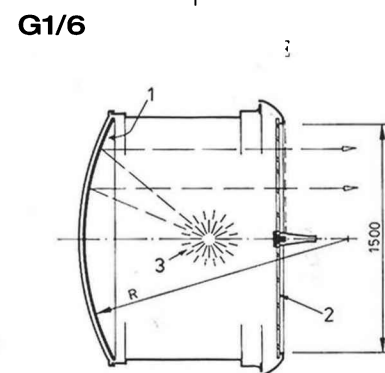
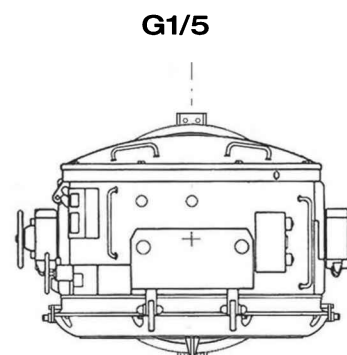
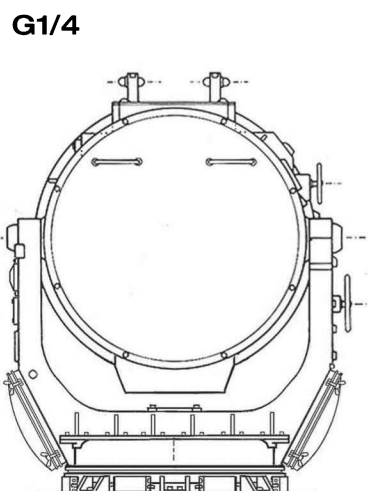
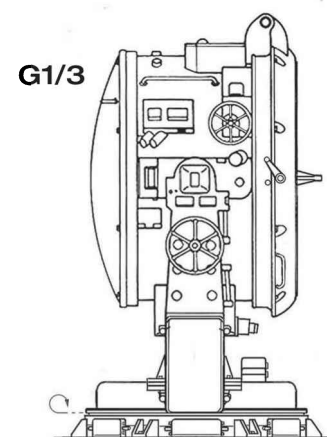
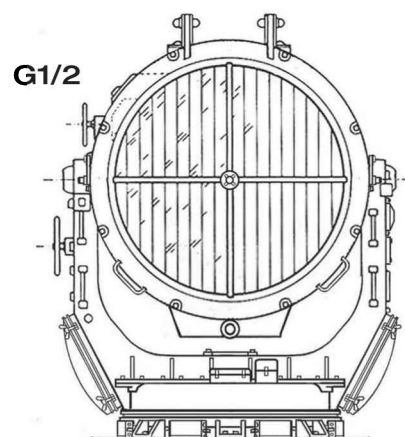
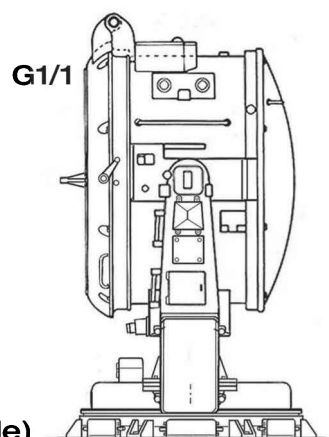
G1/10 Plan

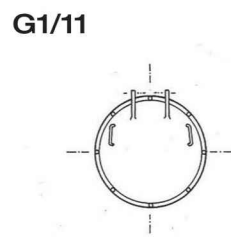
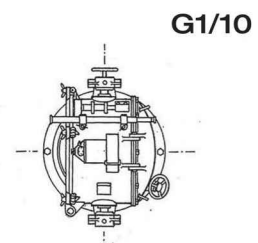
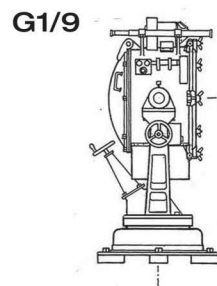
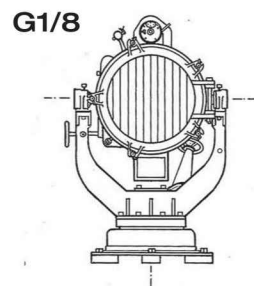
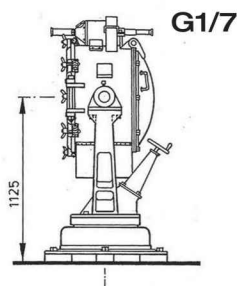
G1/11 Rear cover

G1/12 60cm searchlight on
sunken *Yamato*

G1/13 30cm Deck lamp (no scale)

G1/14 30cm Signalling lamp

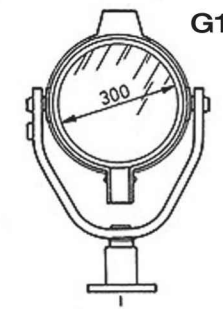
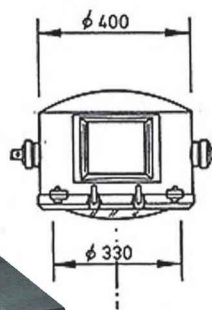
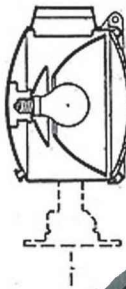
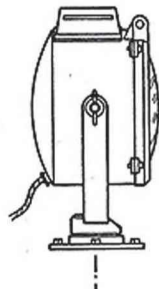




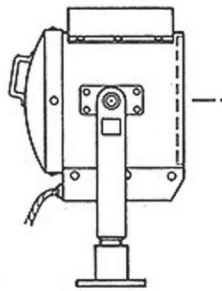
G1/12



G1/13



G1/14



G Fittings – Lanterns and Binoculars

G1/15 2kW daylight signal lantern (1/25 scale)

G1/16 Typical lantern

G1/17 8cm binoculars (1/25 scale)

G1/18 12cm binoculars

G1/19 6cm binoculars

G1/20 Typical mounting

G1/21 Binoculars with signalling lamp

G1/22 12cm Binoculars with infra-red message transmitter

G1/23 12cm binoculars (1/25 scale)

G1/24 12cm binoculars

G1/25 1.5 m rangefinder from air combat platform of tower bridge

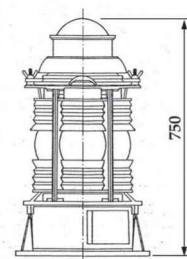
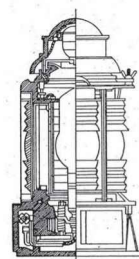
G1/26 18cm binoculars

G1/27 18cm binoculars from closed compartments of tower bridge

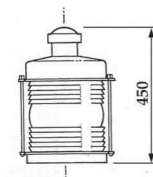
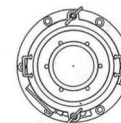
G1/28 12cm binoculars mount from air combat platform on sunken *Yamato*



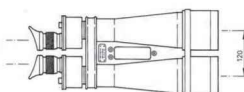
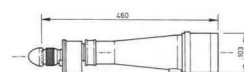
G1/15



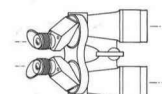
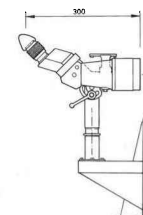
G1/16



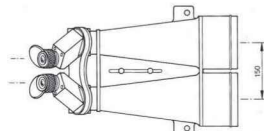
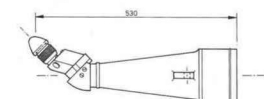
G1/17



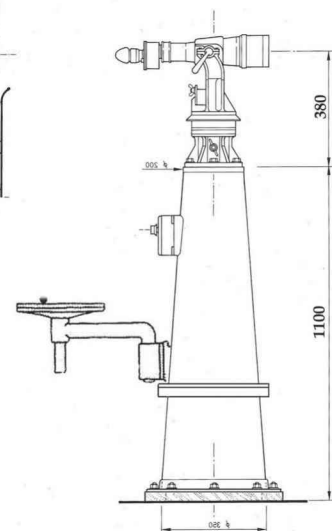
G1/19



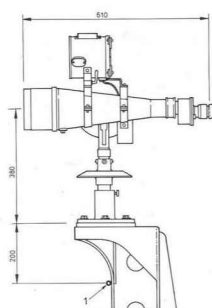
G1/18



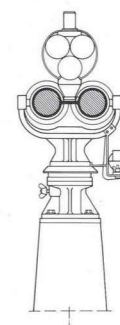
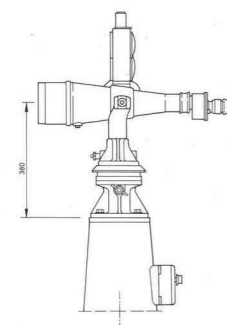
G1/20



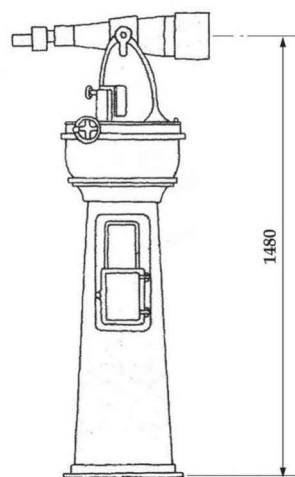
G1/21



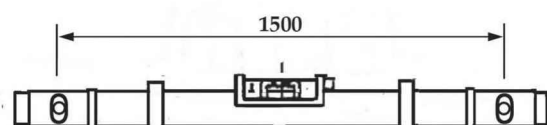
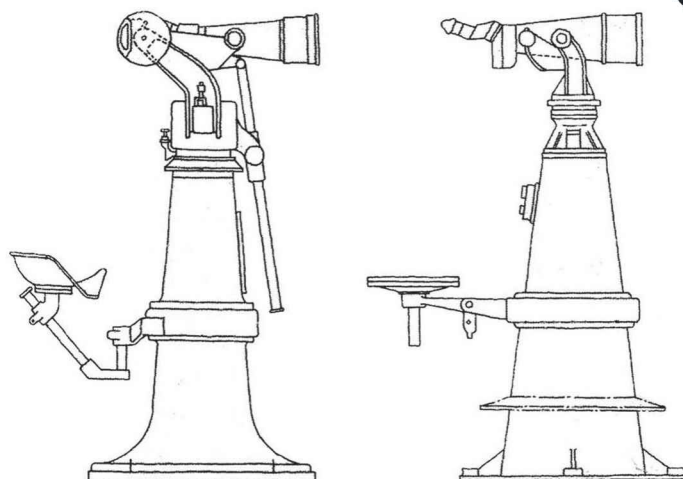
G1/22



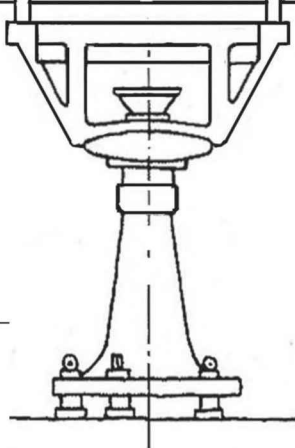
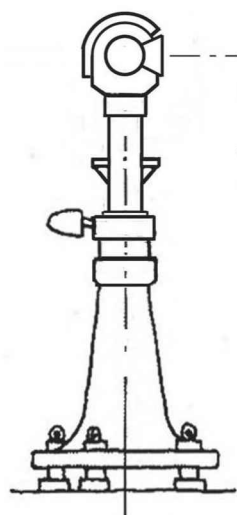
G1/23



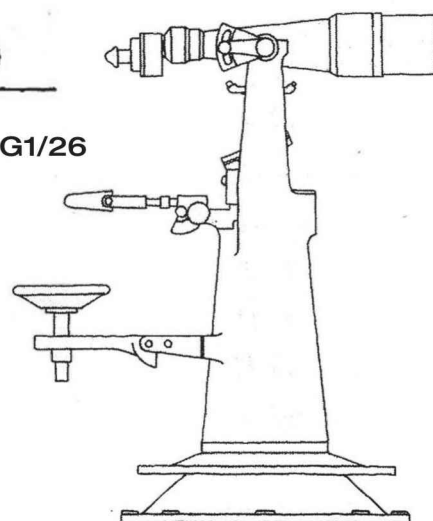
G1/24



G1/25



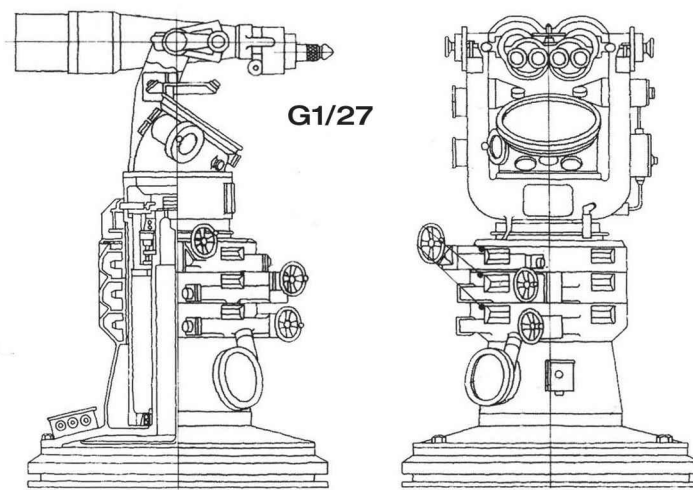
G1/26



G1/28



G1/27



G Fittings – Side Scuttles

Side Scuttle

G2/1 Inner view

G2/2 Section

G2/3 Front view of all types:

G2/3a side scuttle only *Musashi* at frames 101-104 and 116-126 (starboard side UD)

G2/3b side scuttle on UD and MD

G2/3c side scuttle of LD compartments and on super-structure walls

G2/3d side scuttle fitted on UD compartments at frames 156-162

G2/4 Hull scuttles blanked off by steel rings (diameter 50mm bigger than hole) after 1944 refit

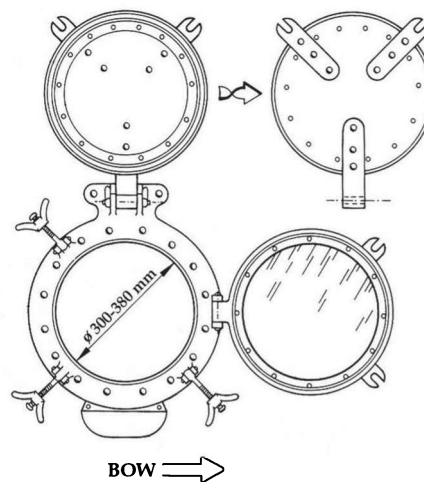
Deck fittings

G2/5 Typical fairleads

G2/6 Bollards

G2/7 Davit

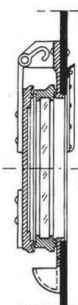
G2/1



G2/3a



G2/2



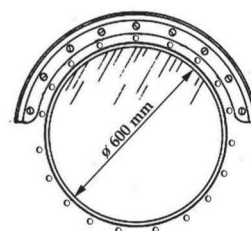
G2/3b



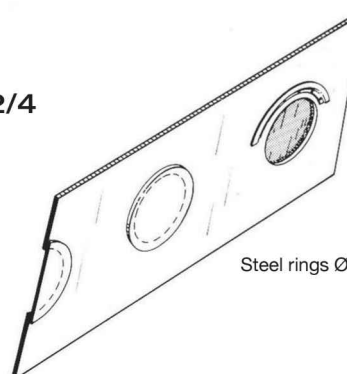
G2/3c



G2/3d

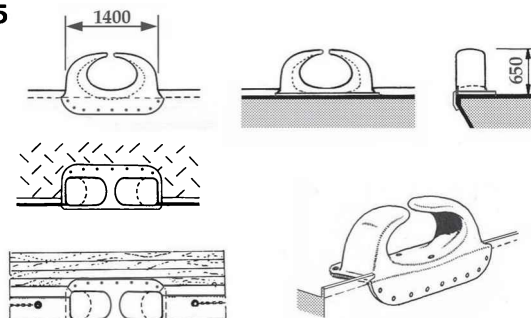


G2/4

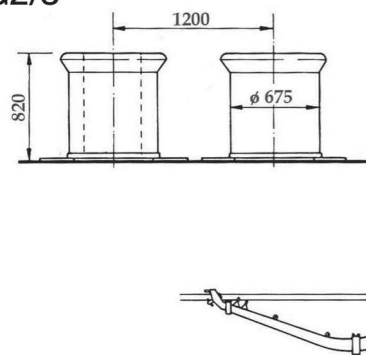


Steel rings Ø 50mm bigger than hole

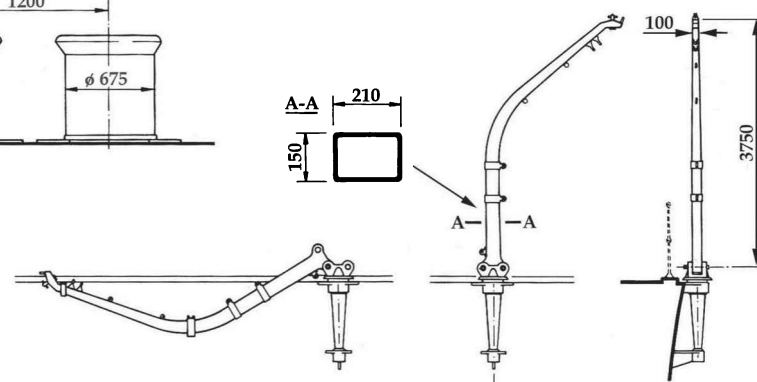
G2/5



G2/6



G2/7



G2/8 Guardrails and edge of decks

G2/9 Profile view

G2/10 Section

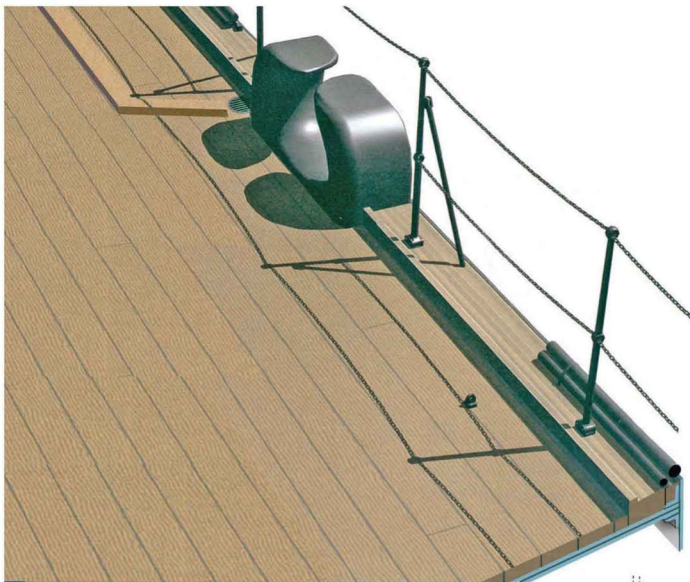
G2/11 Guard rail stanchion

G2/12 Scupper

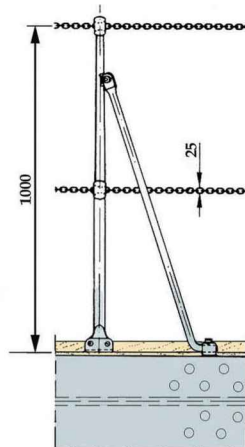
G2/13 View

G2/14 Plan

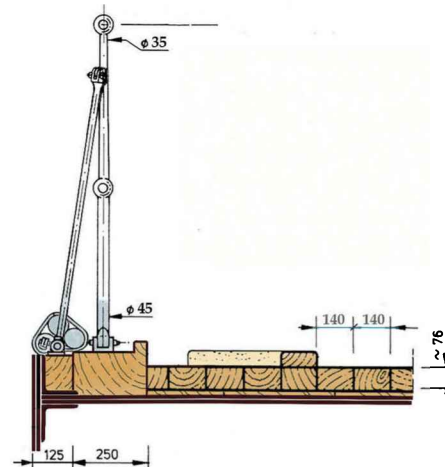
G2/8



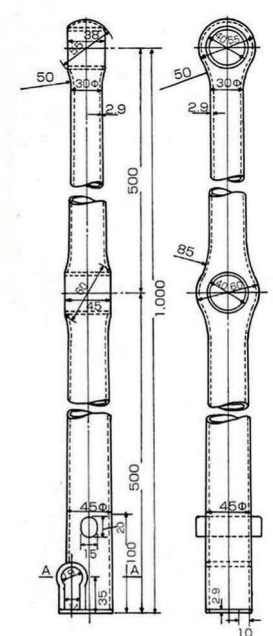
G2/9



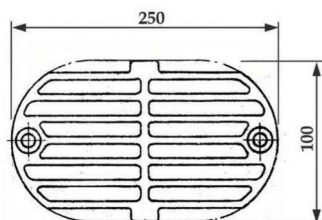
G2/10



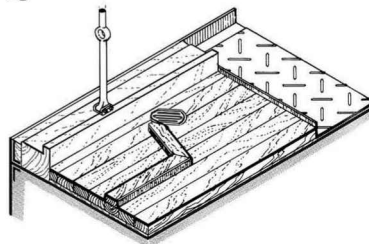
G2/11



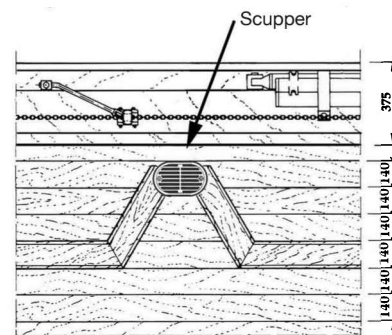
G2/12



G2/13



G2/14



Stanchion height:
Forecastle deck = 1000mm
Superstructure platforms
= 800mm
'Hoibans' = 750mm

G Fittings – Hatches and Ammunition Box

Deck hatch

G2/15 Plan

G2/16 Profile

G2/17 Rear view

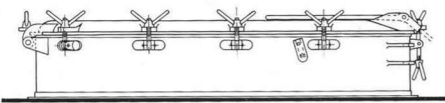
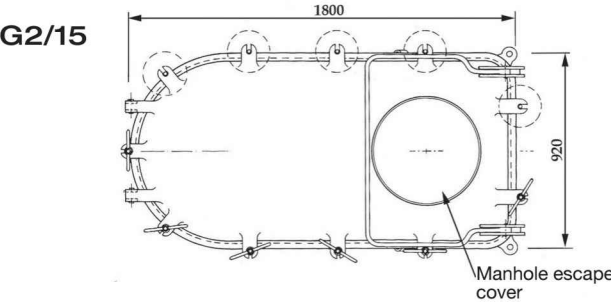
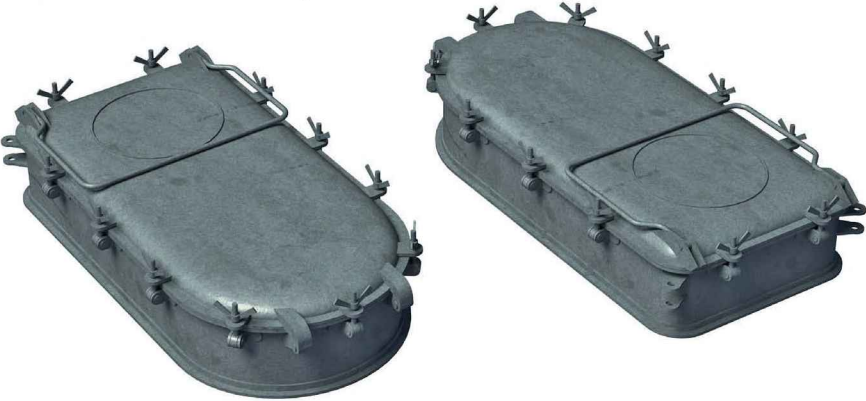
G2/18 Profile of open hatch

25mm MG ammunition box for 240 rounds

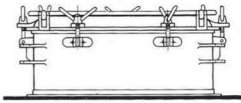
G2/19 Profile

G2/20 Front view

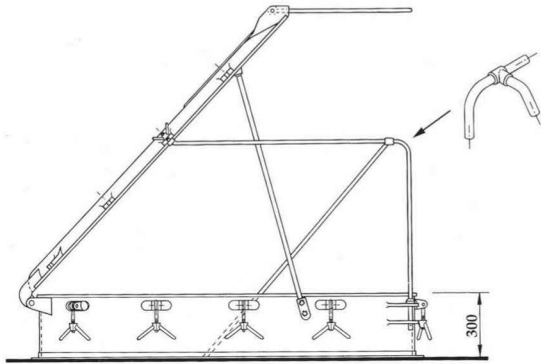
G2/21 Plan



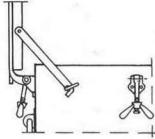
G2/16



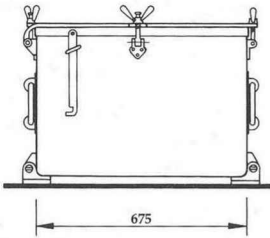
G2/17



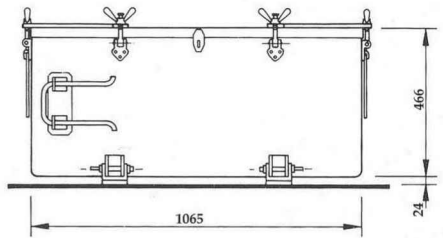
G2/18



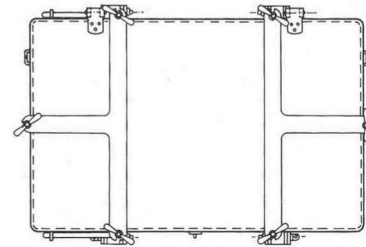
G2/19



G2/20



G2/21



G2/22

G2/23

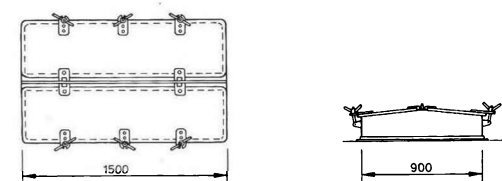
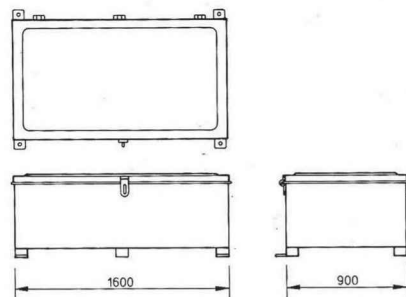
G2/22 Wash deck locker at frame 65

G2/23 Skylight at frame 66

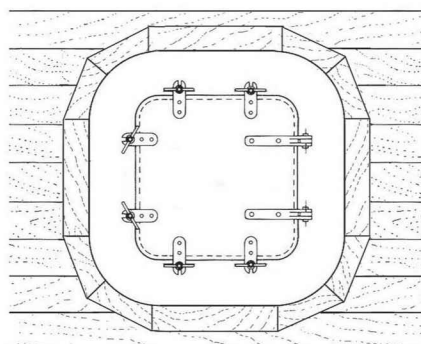
G2/24 Hatch at frame 151

G2/25 Hatch at frame 88-89

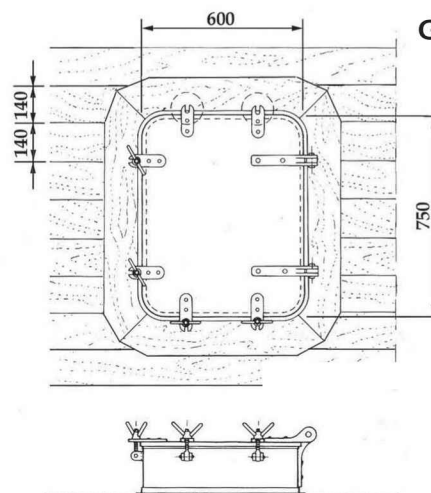
**G2/26 Hatch at frame 103-104
(only starboard)**



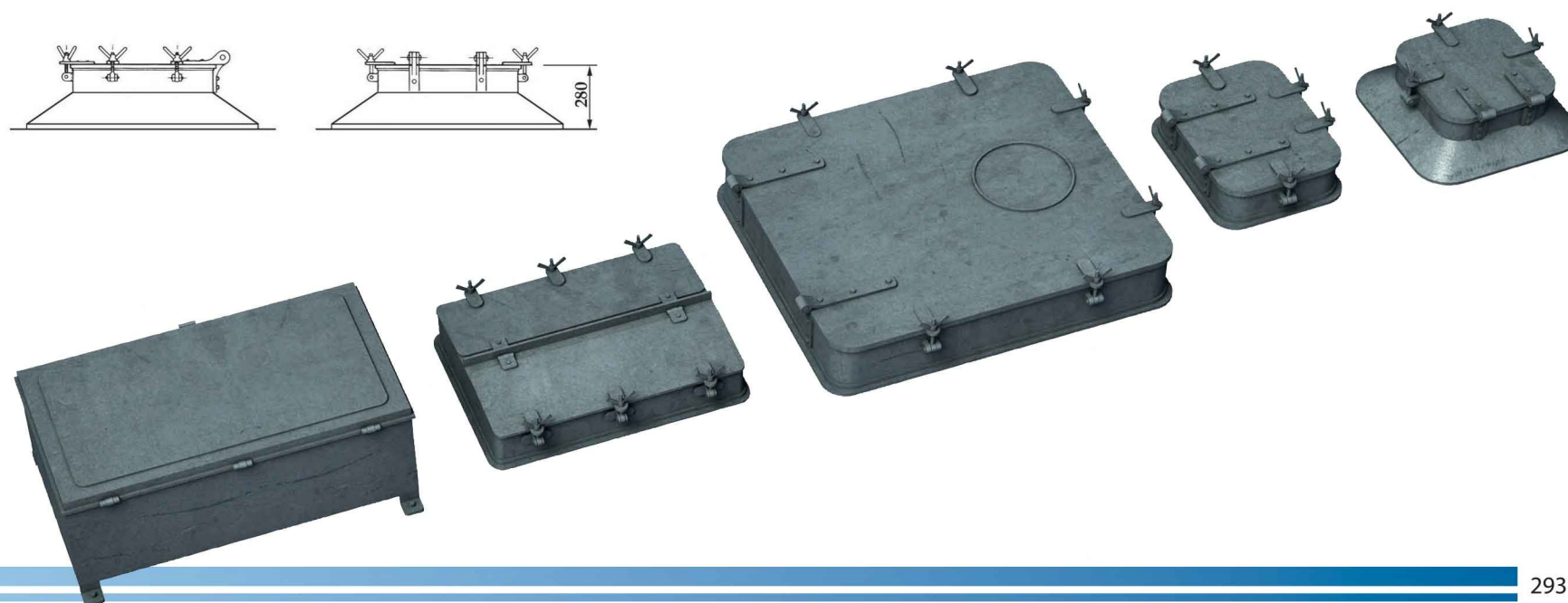
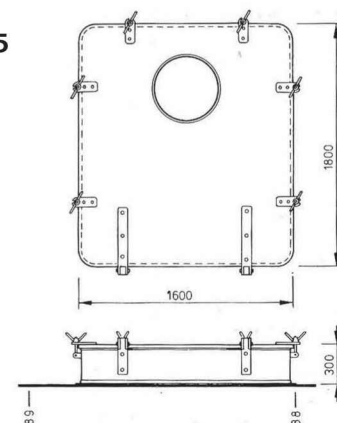
G2/26



G2/24



G2/25



G Fittings – Water-tight Doors and Ladders

Water-tight doors

G2/27 Water-tight door of lower fore walls
of superstructure

G2/28 Water-tight door from superstructure platforms

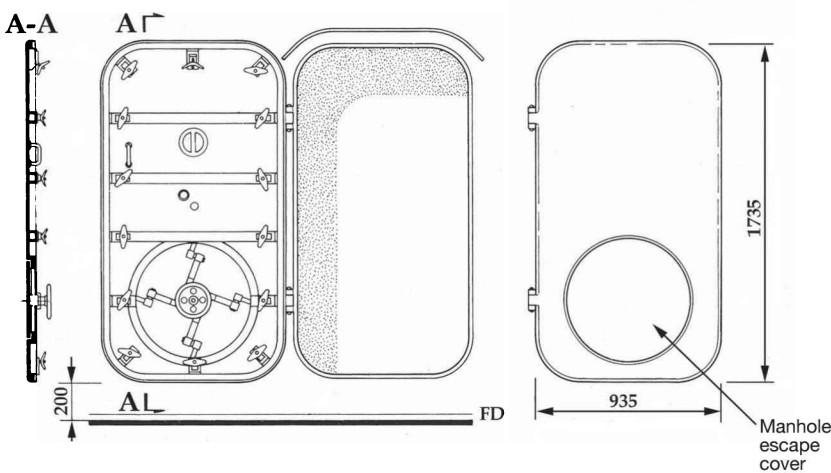
G2/29 Clip

G2/30 Water-tight door door from lower side walls
of superstructure

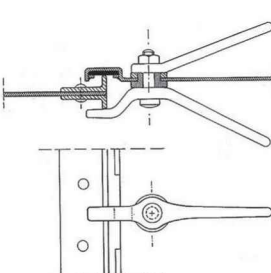
G2/31 Clip



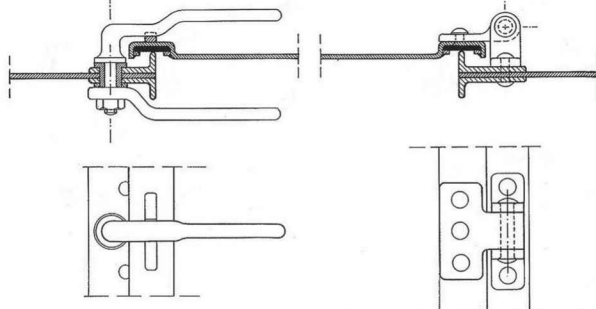
G2/27



G2/29

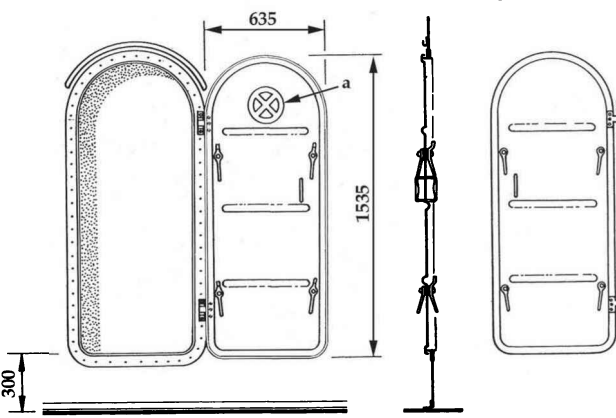


G2/31

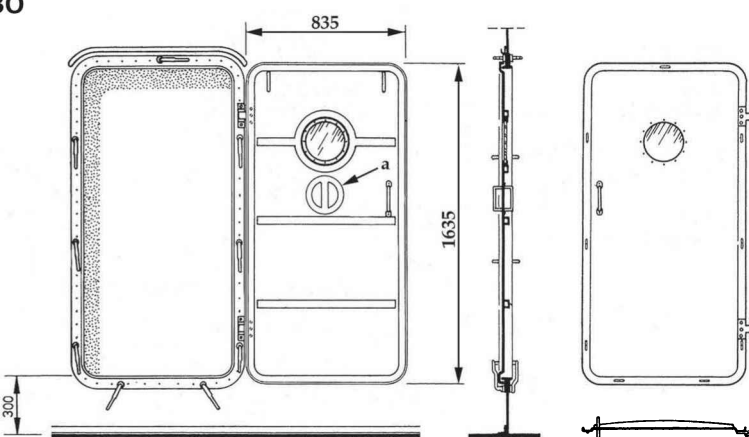


G2/28

a = white colour sign



G2/30



Ladders

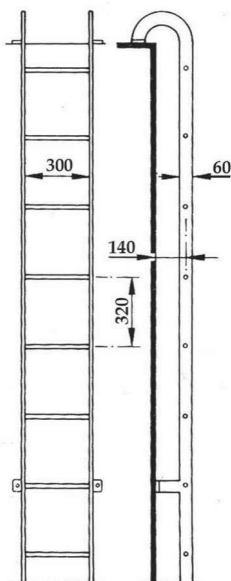
G2/32 Ladder from gunhouses, rangefinders

G2/33 From lower parts of superstructure

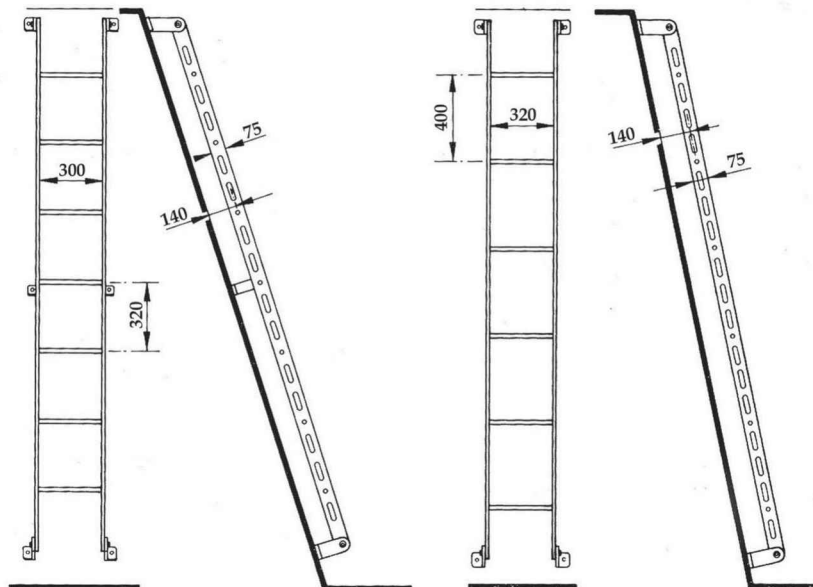
G2/34 From rear upper wall of tower bridge

G2/35 From signal platform

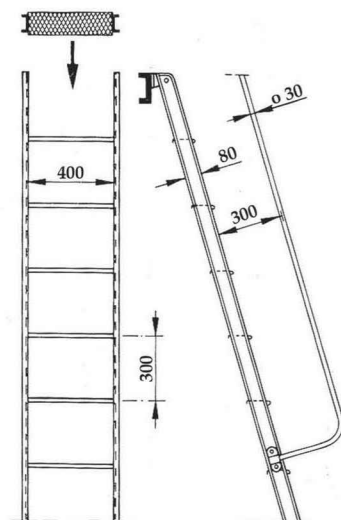
G2/32



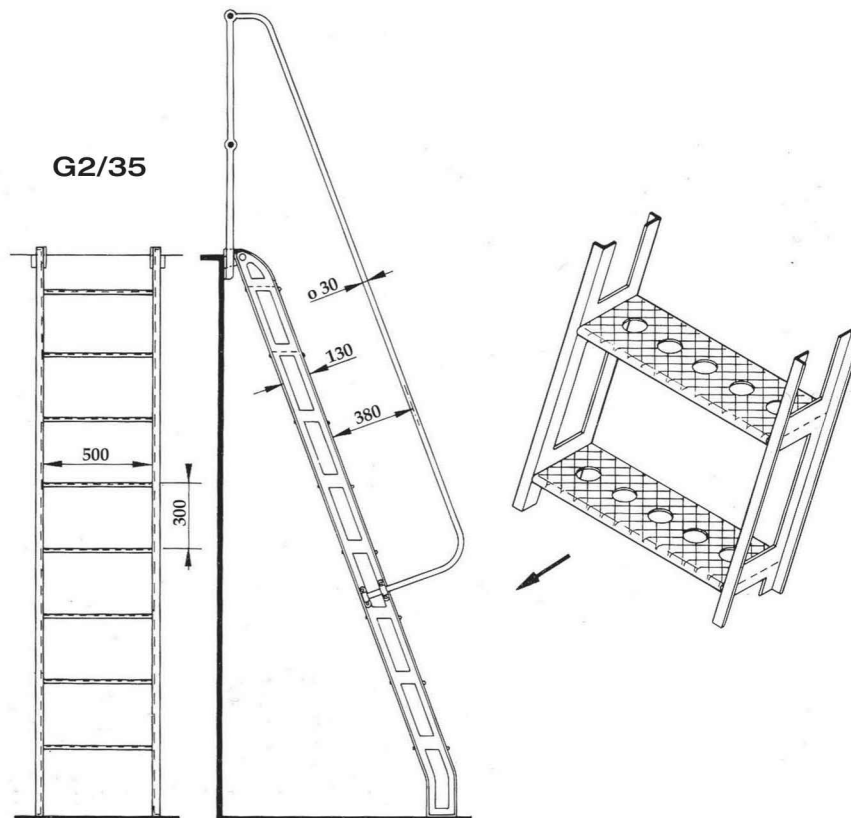
G2/33



G2/34



G2/35



G Fittings – Reels And Parvane

Reels

G2/36 Type 'A' profile

G2/37 Type 'A' view

G2/38 Type 'B' profile

G2/39 Type 'B' view

G2/40 Type 'C'

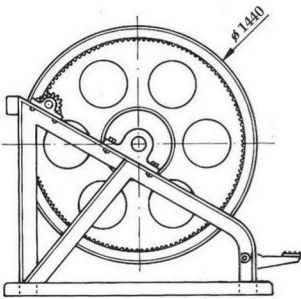
G2/41 Type 'D'

G2/42 Type 'E'

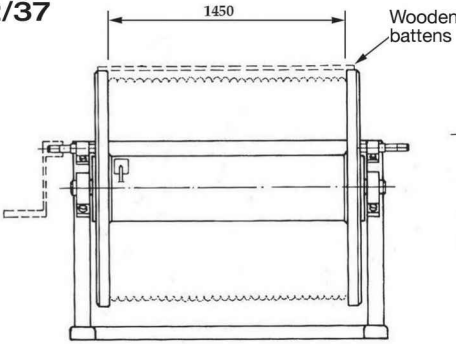
G2/43 Type 'F'

G2/44 scheme of protection cover

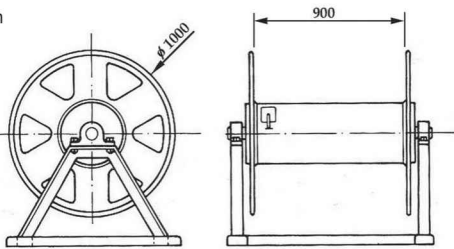
G2/36



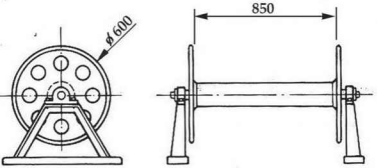
G2/37



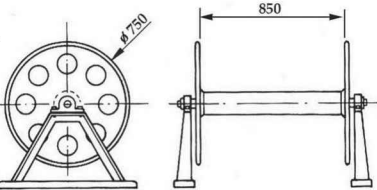
G2/41



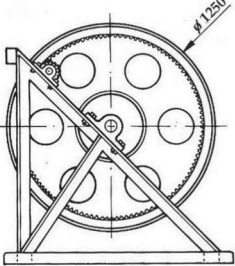
G2/42



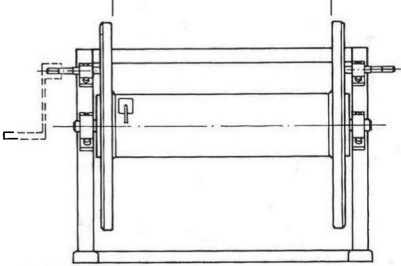
G2/43



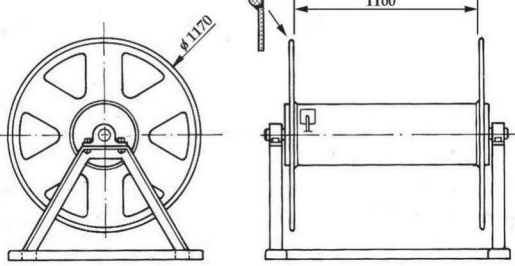
G2/38



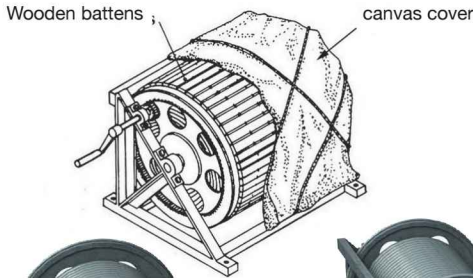
G2/39



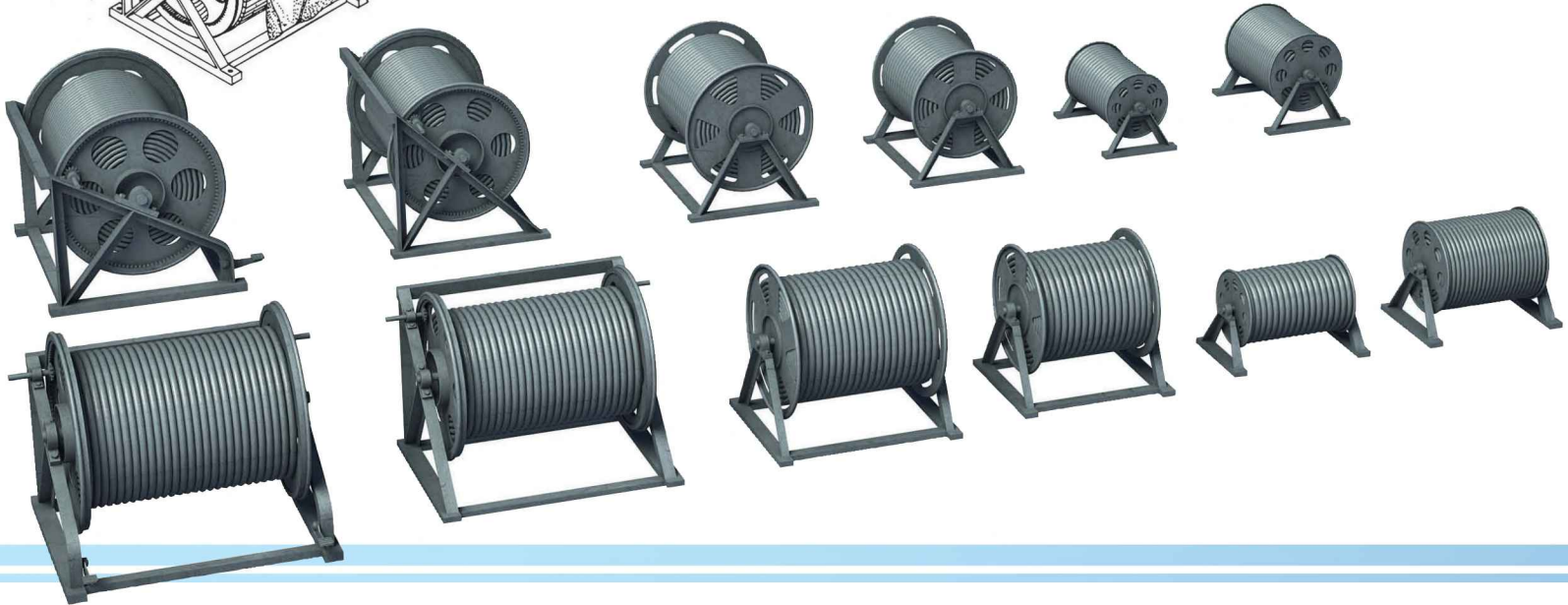
G2/40



G2/44



Reels type A, B, C, D fitted at frame 60
Reels type D, E, F fitted at frames 65-66
Reels type B on frame 191, type C at frame 194



Paravane

G2/45 Plan (1/75 scale)

G2/46 Profile

G2/47 Front view

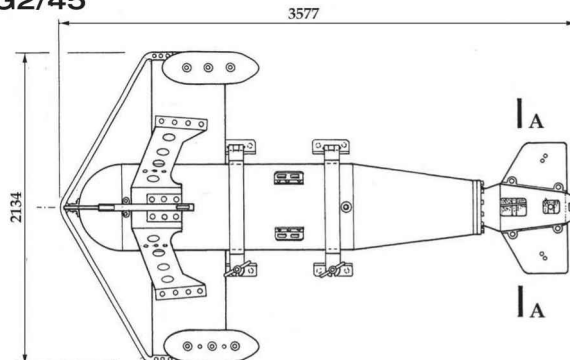
G2/48 Deck support

G2/49 Section A-A

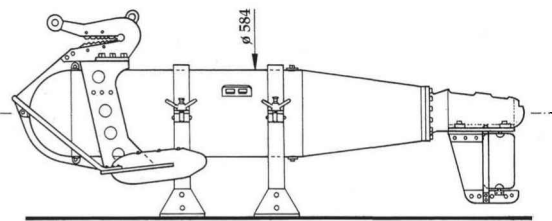
G2/50 Deck winch - Side profile

G2/51 Plan

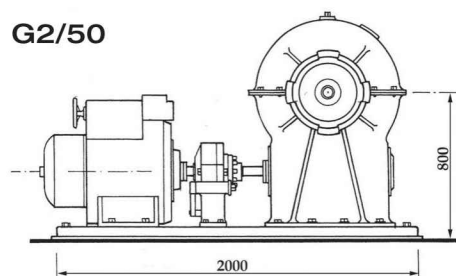
G2/45



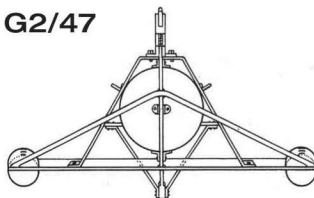
G2/46



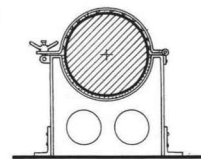
G2/50



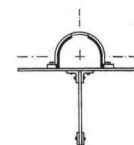
G2/47



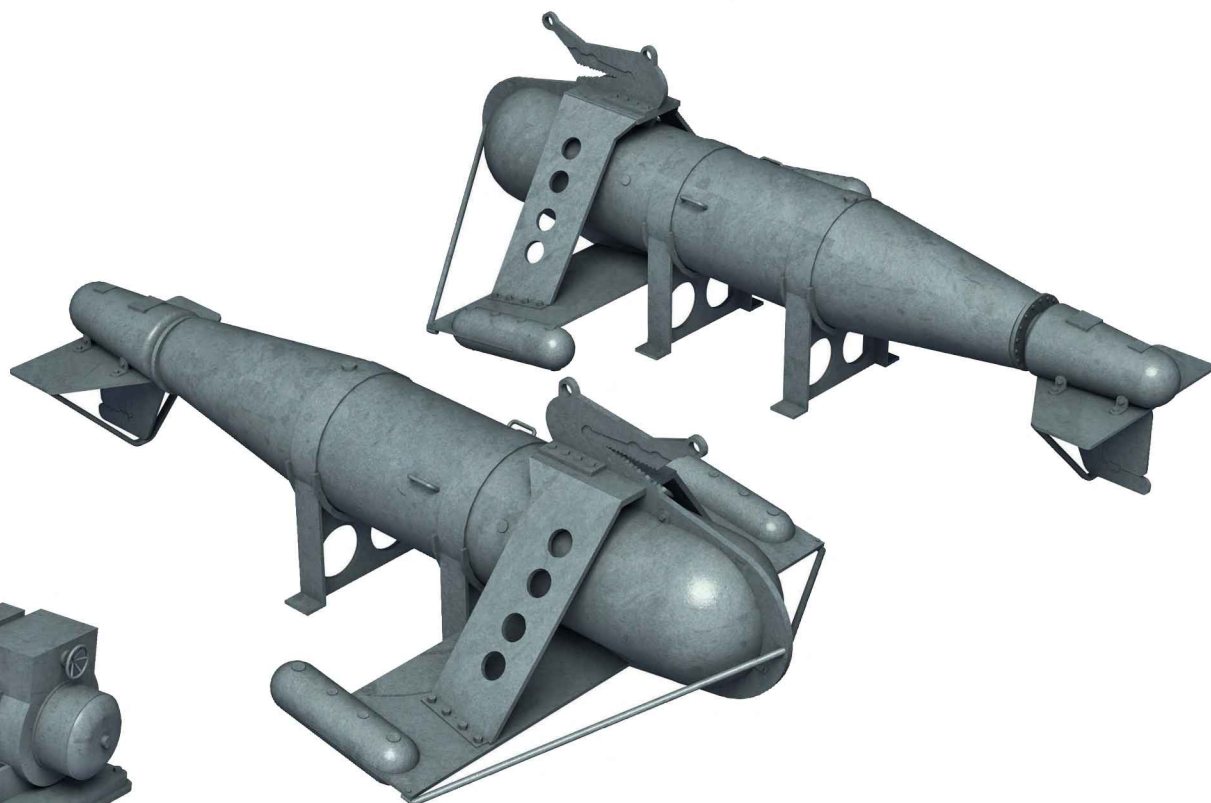
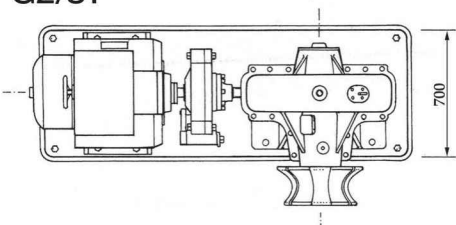
G2/48



G2/49



G2/51



G Fittings – Anchoring

Electric cable holder – port bower (1/75 scale)

G2/52 Profile view

G2/53 Plan

G2/54 Rear view

G2/55 Forecastle electric capstan – plan

G2/56 Profile

G2/57 Anchor cable

G2/58 Deck stopper (two per one anchor cable) profile and view

Stern anchor (1/50 scale)

G2/59 Front view

G2/60 Profile

15-ton main anchor (Imperial Japanese Navy design) stockless type (1/50 scale)

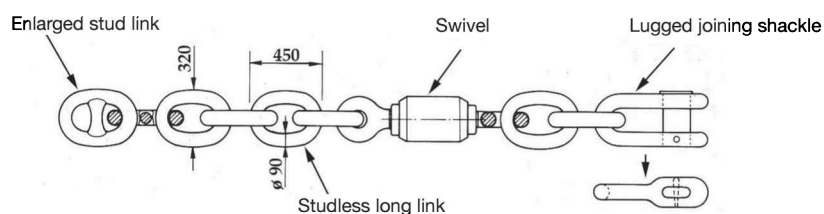
G2/61 View

G2/62 Profile

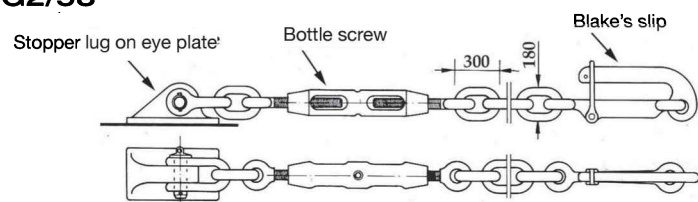
G2/63 Bottom view

G2/64 Sections

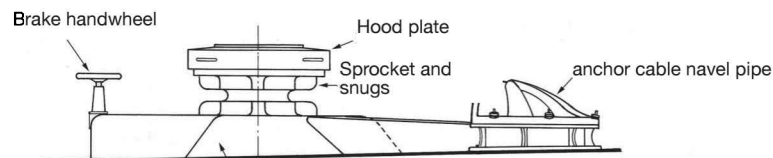
G2/57



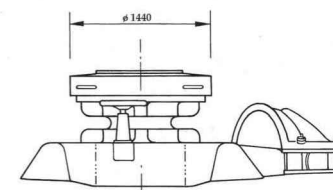
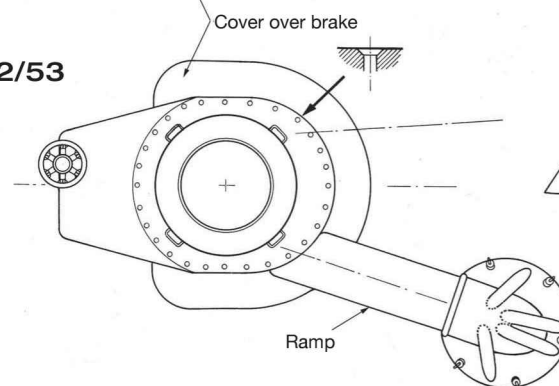
G2/58



G2/52

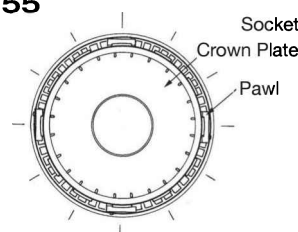


G2/53

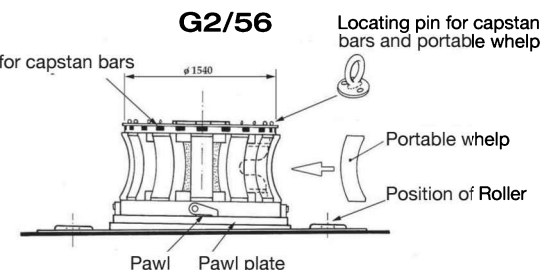


G2/54

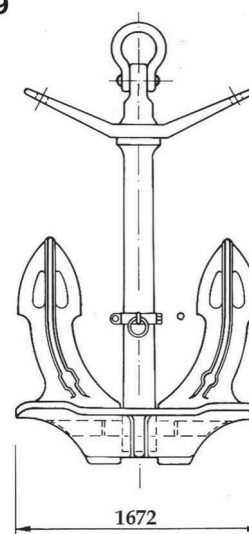
G2/55



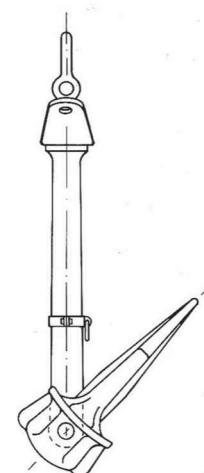
G2/56



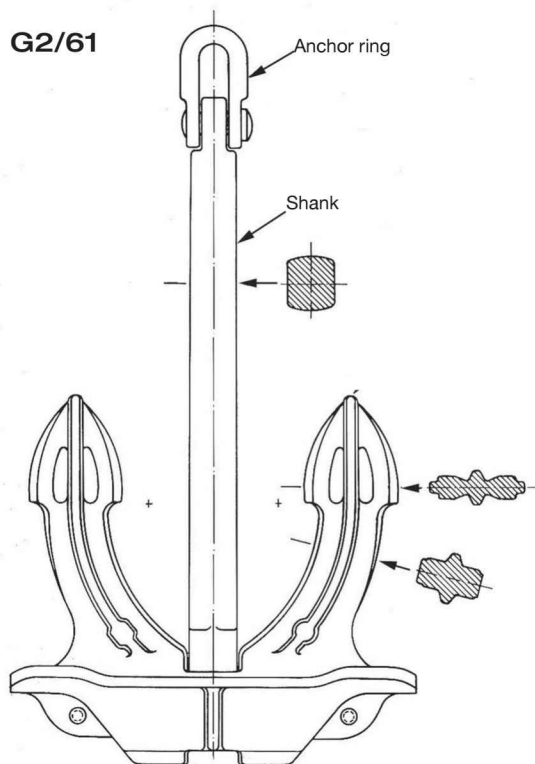
G2/59



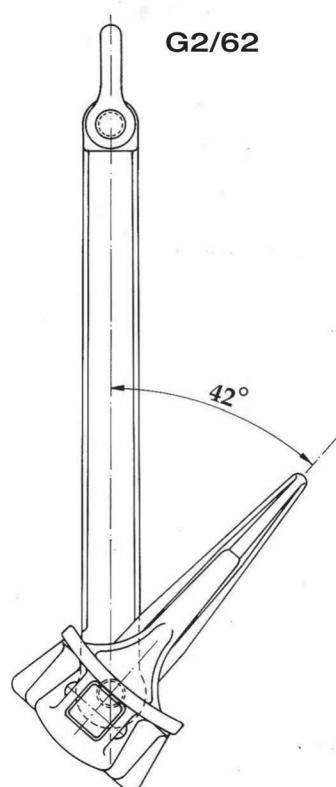
G2/60



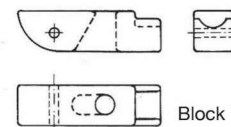
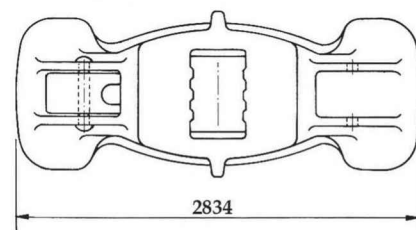
G2/61



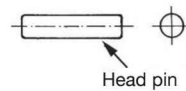
G2/62



G2/63

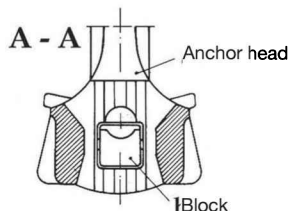
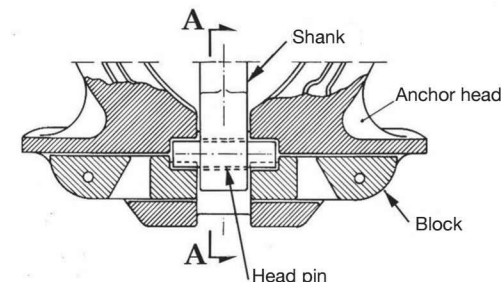


Block



Head pin

G2/64



G Fittings

Lifebuoy frame (1/35 scale)

G2/65 Front view

G2/66 Profile

G2/67 Perspective

Wind intensity transmitter

G2/68 Front view

G2/69 Plan

Wind direction indicator

G2/70 Front view

G2/71 Plan

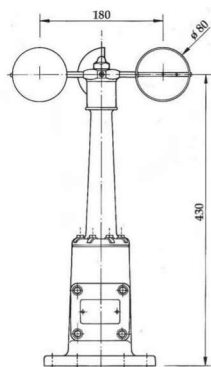
G2/72 Mounting for *Yamato* – port side profile

G2/73 Plan

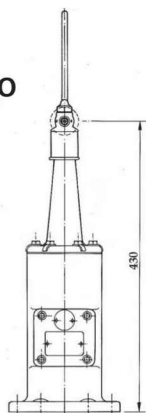
G2/74 Mounting for *Musashi* – port side profile

G2/75 Plan

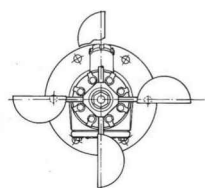
G2/68



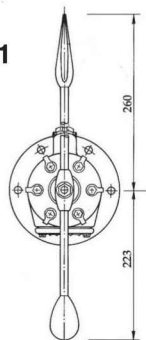
G2/70



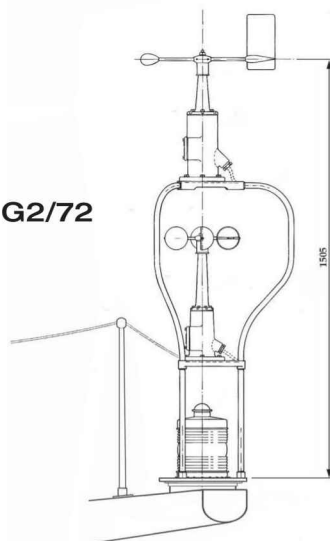
G2/69



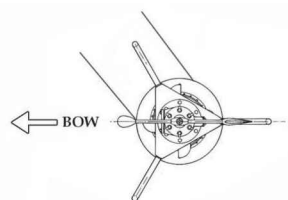
G2/71



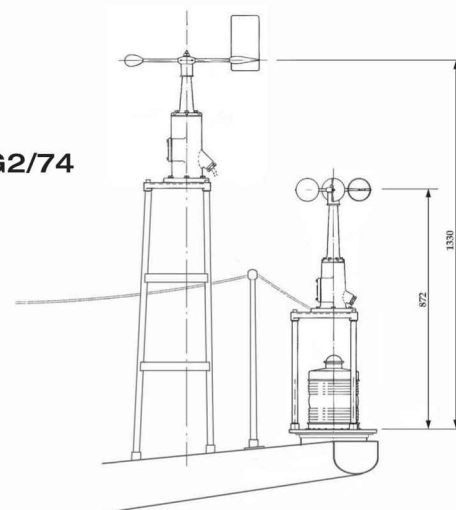
G2/72



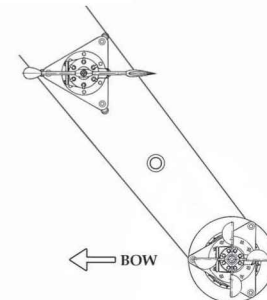
G2/73



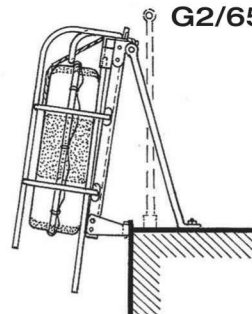
G2/74



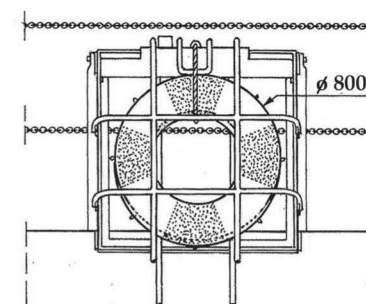
G2/75



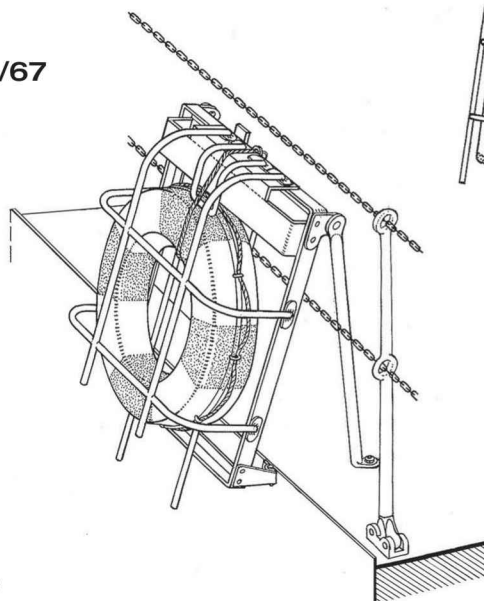
G2/66



G2/65

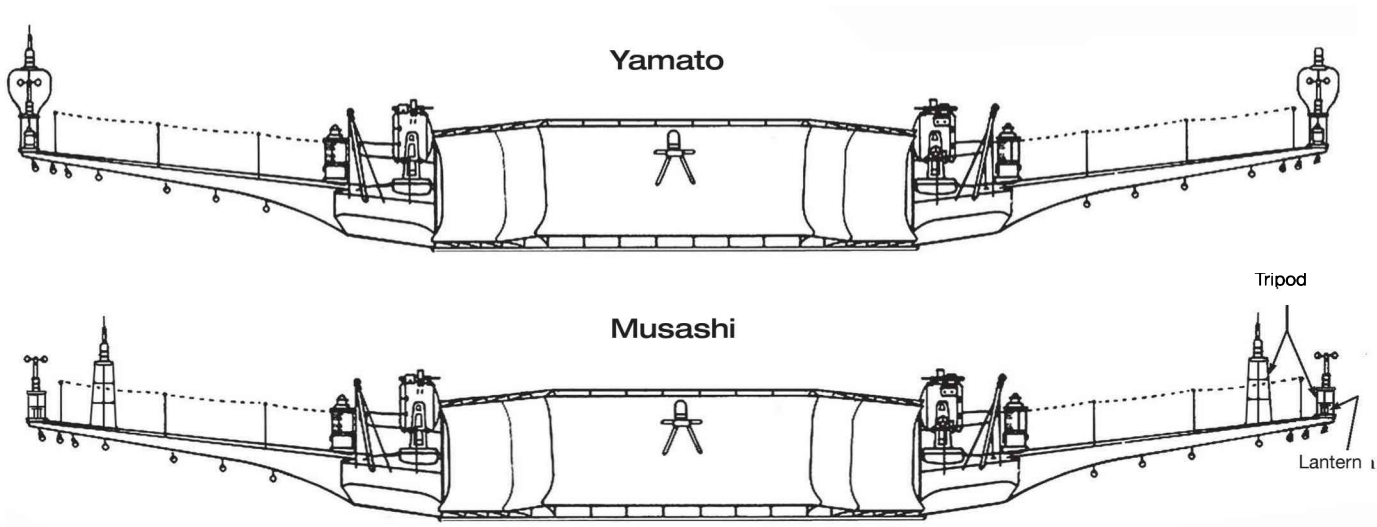


G2/67



G2/76 Views of signal yards Yamato and Musashi

G2/76



G Fittings

Antenna wires connecting tube

G-2/77 Plan

G-2/78 Front view

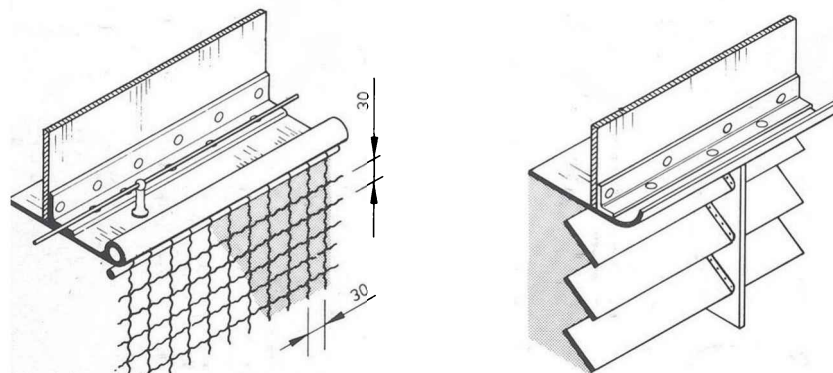
G-2/79 Profile

Ventilation intake from superstructure walls

G2/80 Details of ventilator intake (1/15 scale)

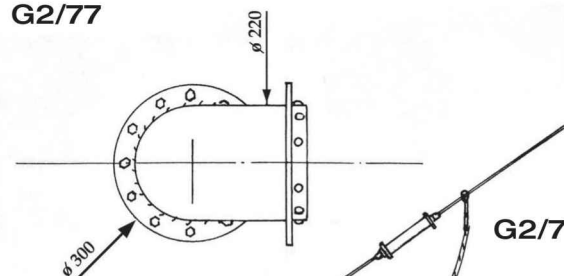
- Typical wire netting intake with railing for canvas shield
- Ventilation intake shutter at back of conning tower

G2/81 Small ventilators from superstructure walls

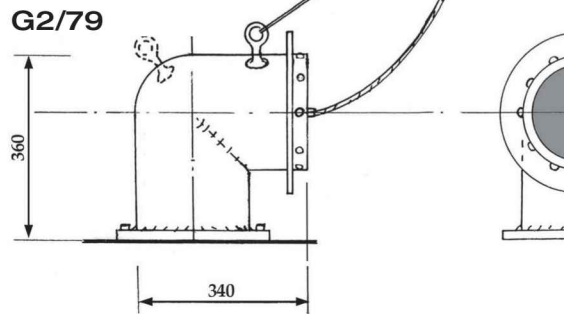


G2/80

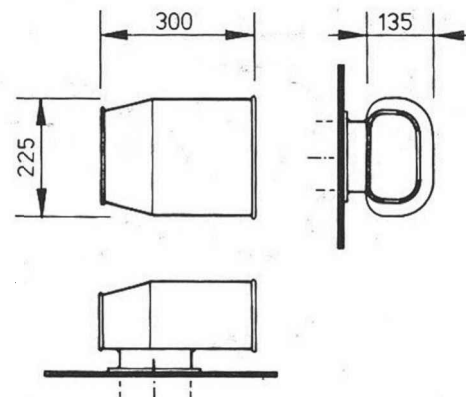
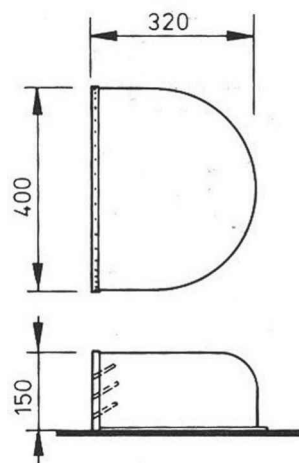
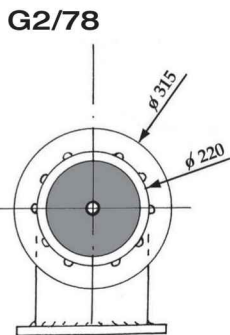
G2/77



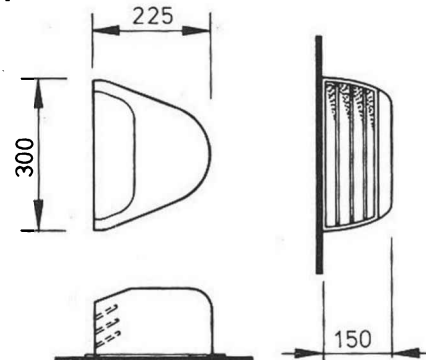
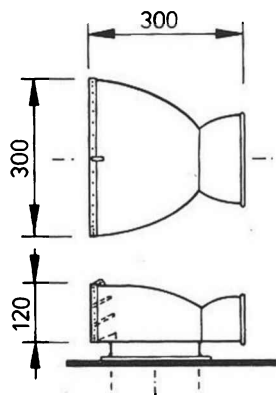
G2/79



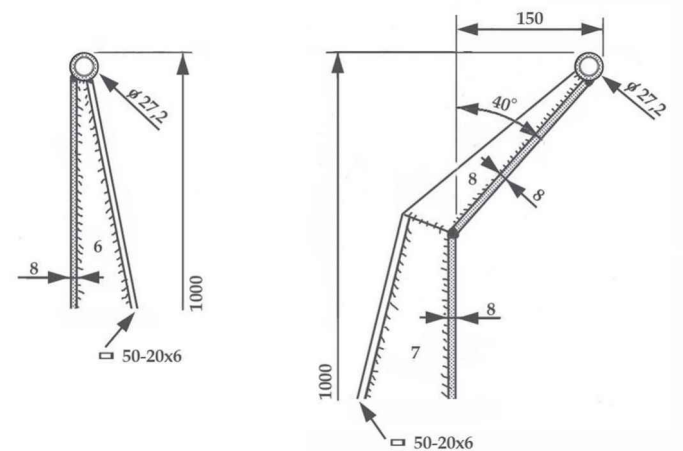
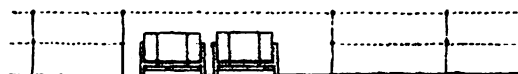
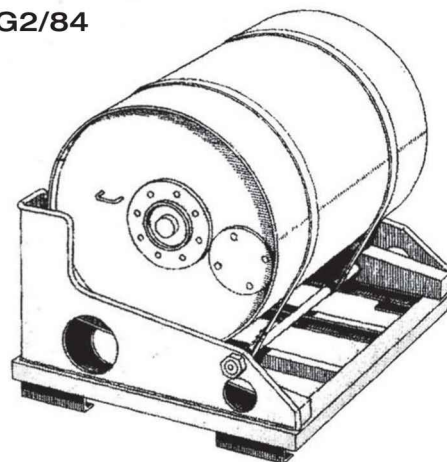
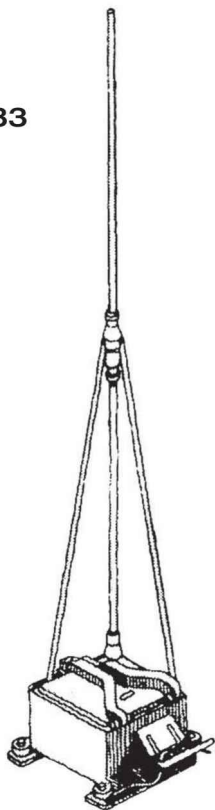
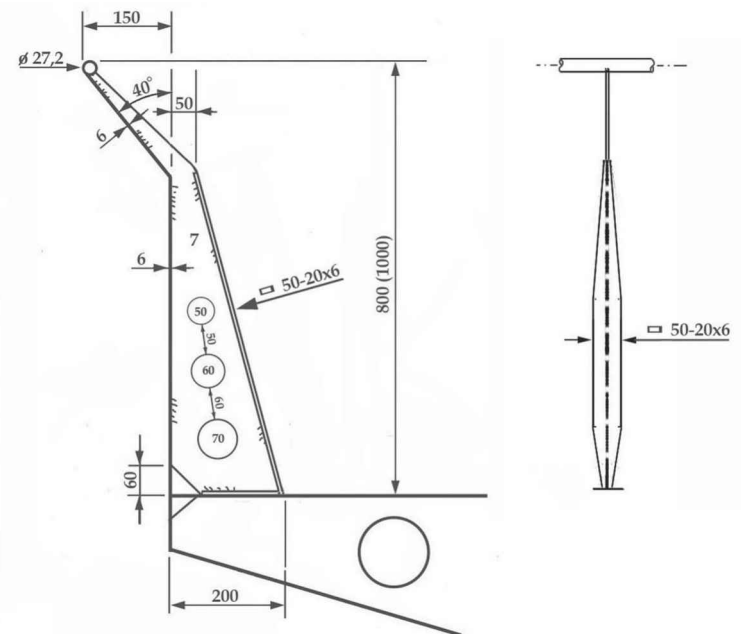
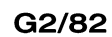
G2/78



G2/81



G2/84 Depth charge fitted on *Musashi* stern deck in 1944



H Aircraft

H1/1 Catapult Kure Shiki 2 Gō 5 Gata –
profile with aircraft trolley (1/150 scale)

H1/2 Front view

H1/3 Rear view

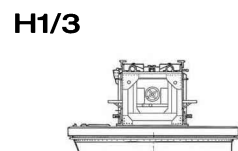
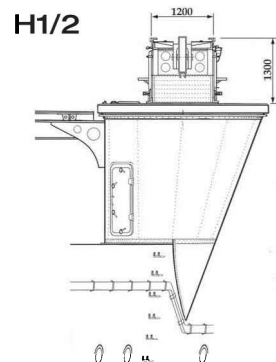
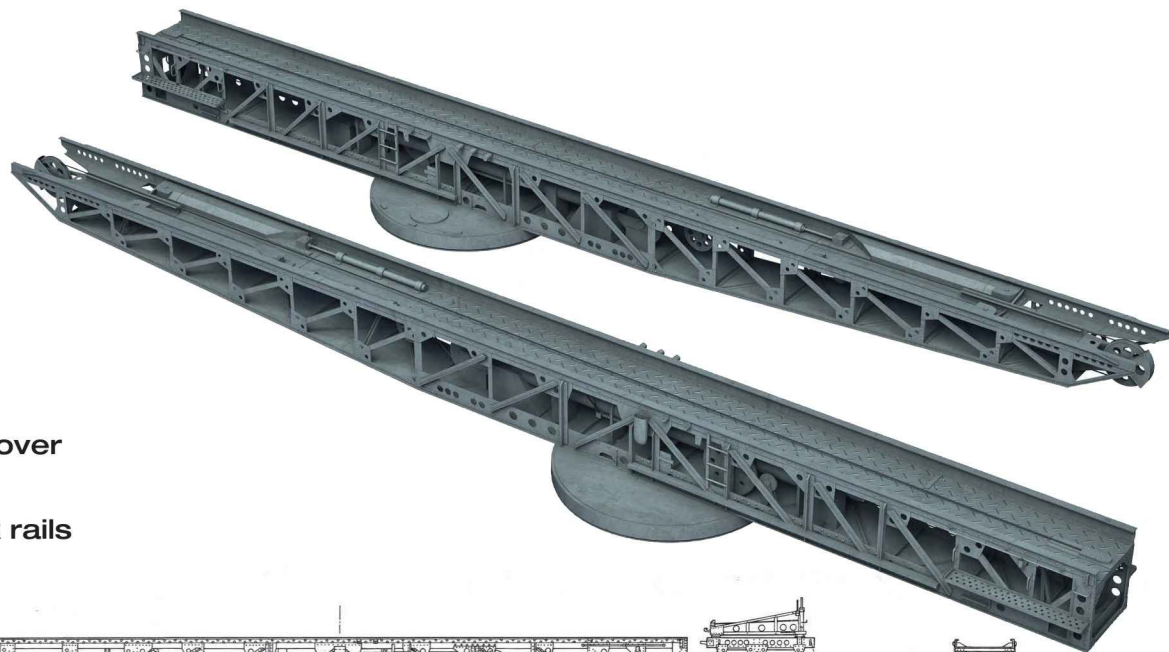
H1/4 Plan (with trolley)

H1/5 Perspective of fore part

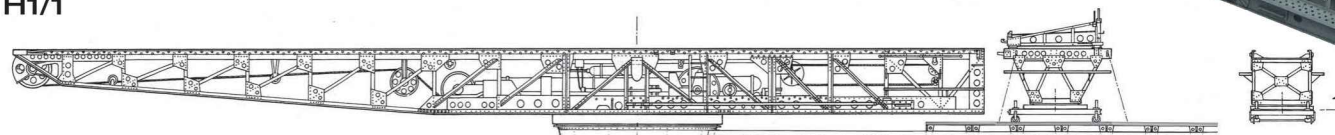
H1/6 Details - wooden support for canvas cover

H1/7 Catapult cradle for single float plane

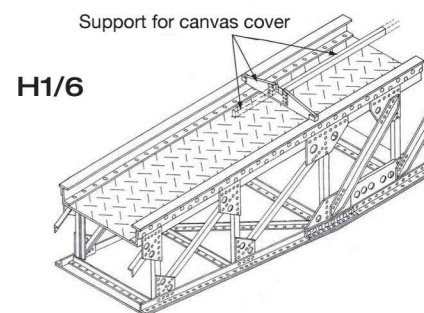
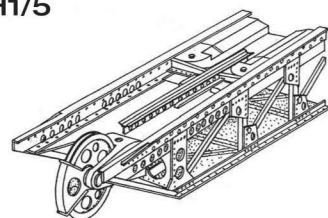
H1/8 Trolley for floatplane transport on deck rails



H1/1

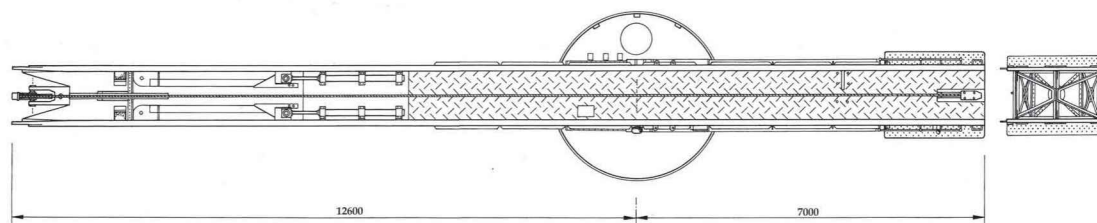


H1/5

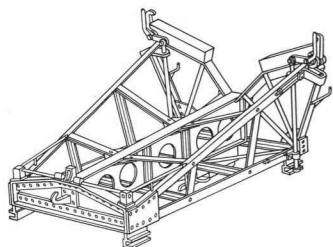


H1/6

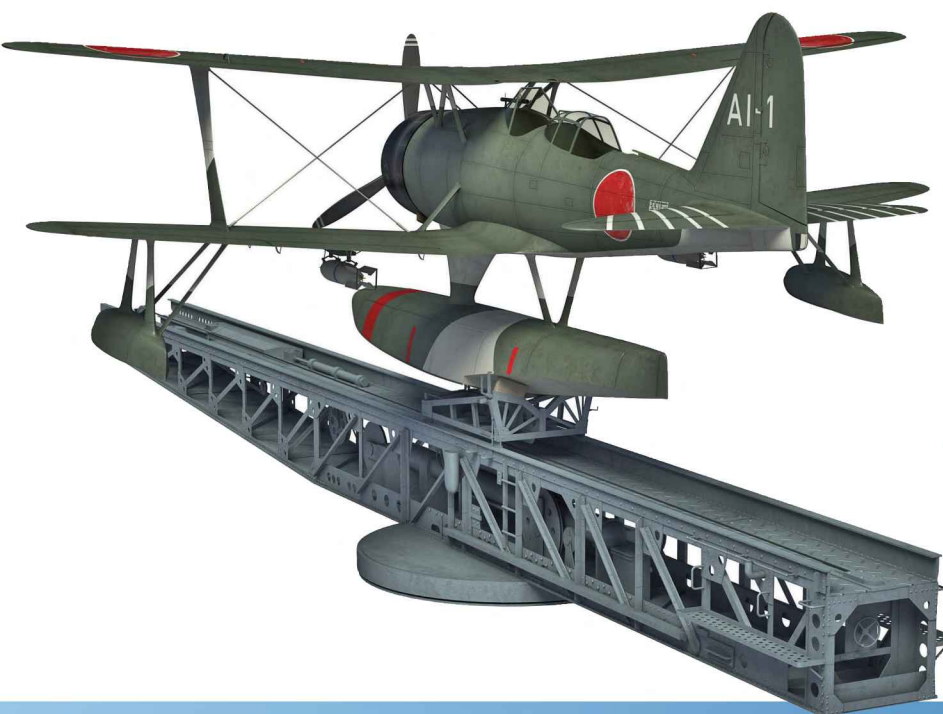
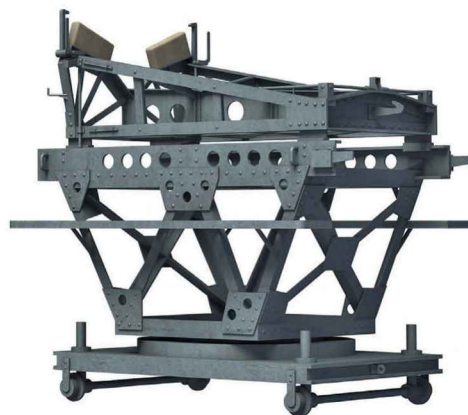
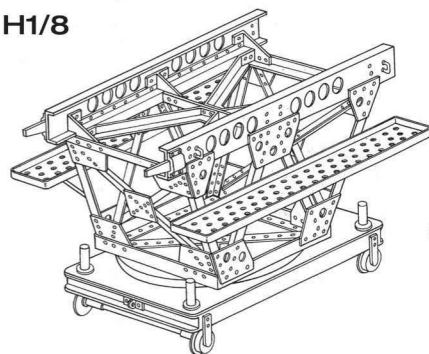
H1/4



H1/7



H1/8



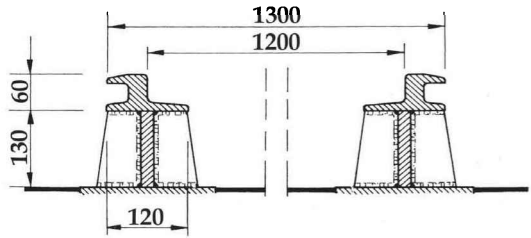
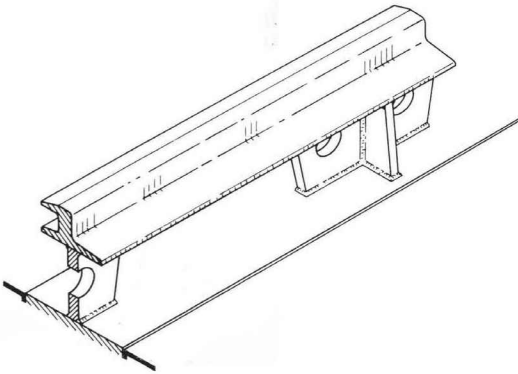
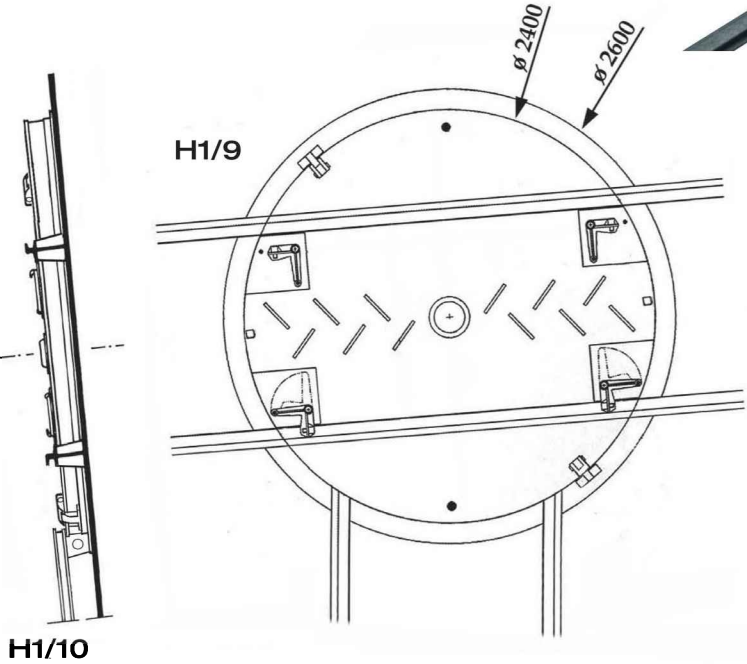
H Aircraft

H1/9 Turntable for aircraft deck rails plan and profile

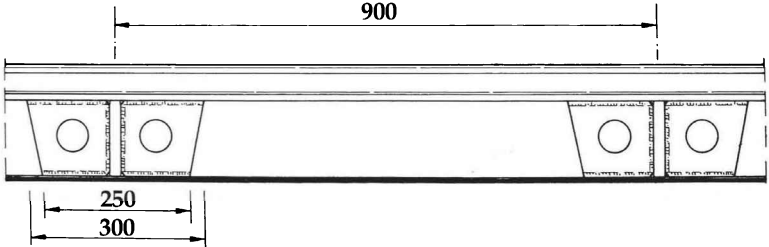
H1/10 Deck rails section

H1/11 Profile view

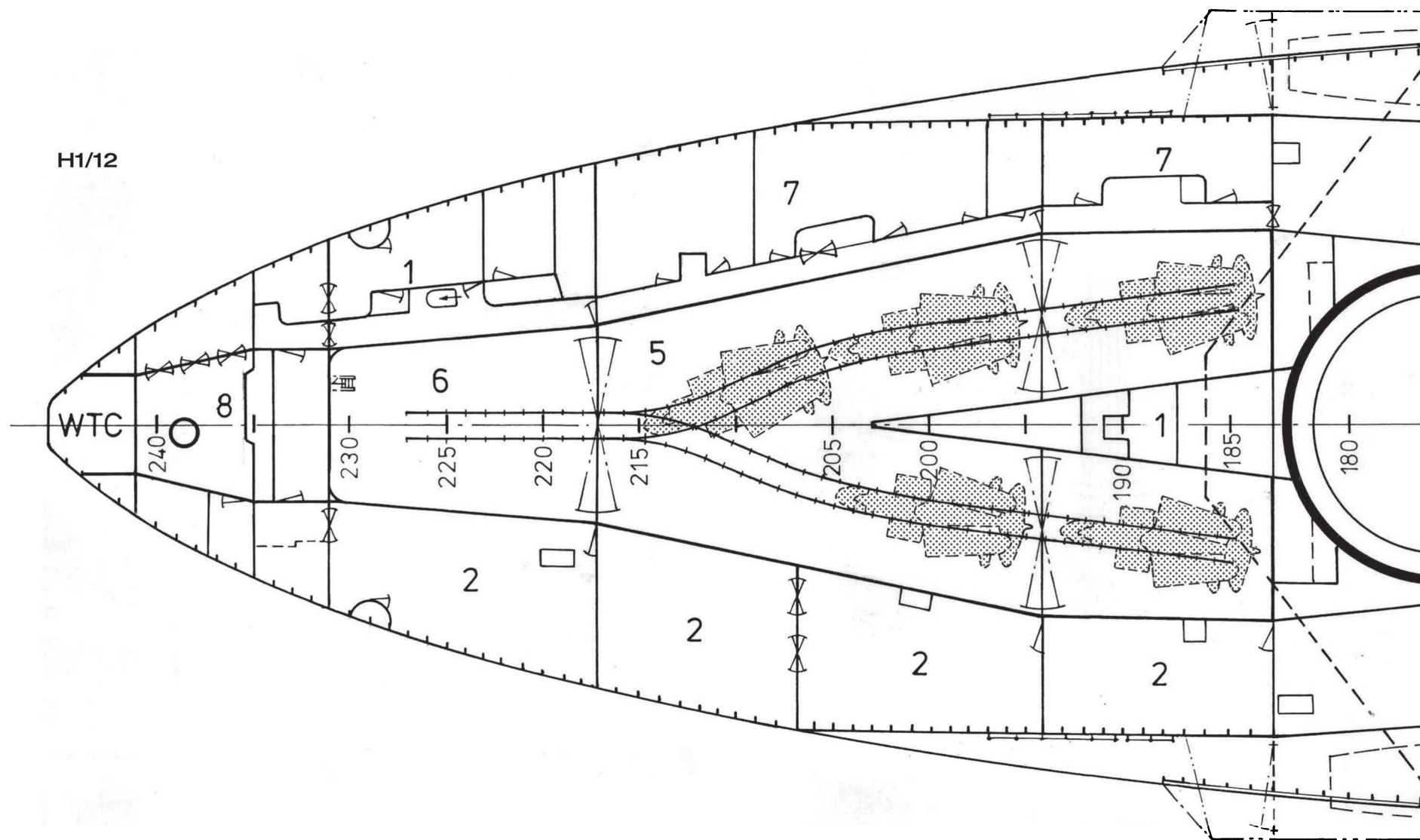
H1/12 Aircraft hangar on middle deck for five F1M2 floatplanes



H1/11



H1/12



H Aircraft

Mitsubishi F1M2 type 'O' floatplane [only this type was used on *Yamato* and *Musashi*] (1/100 scale)

H1/12 Profile view

H1/13 Plan

H1/14 Front view

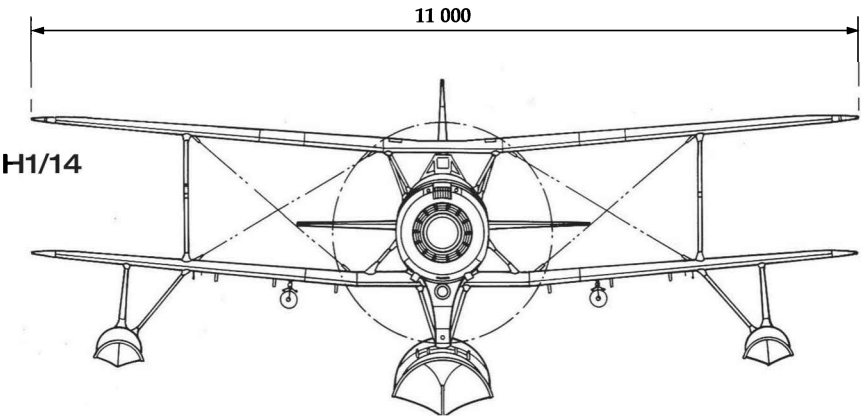
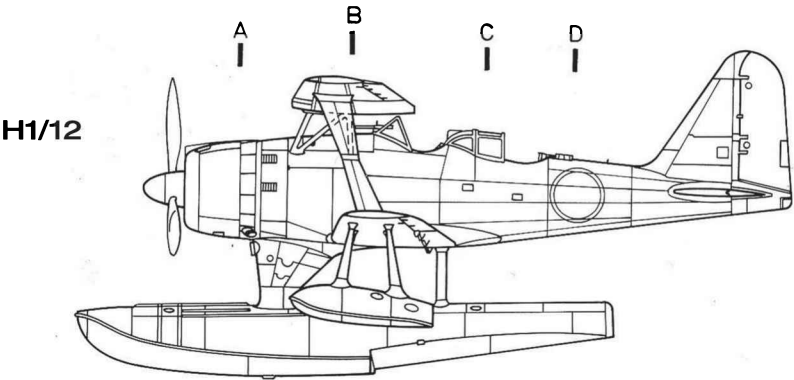
H1/15 Propeller

H1/16 60kg bomb

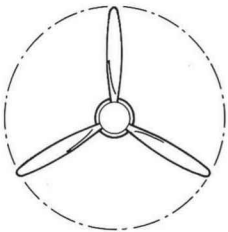
H1/17 Sections

H1/18 Tail markings

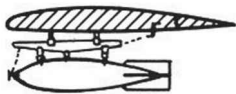
From left to right: *Yamato* 1941-43, *Yamato* 1944-45, *Musashi* 1944



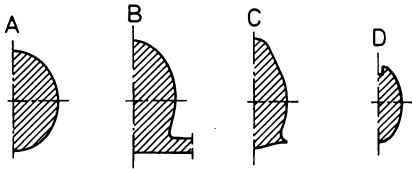
H1/15



H1/16



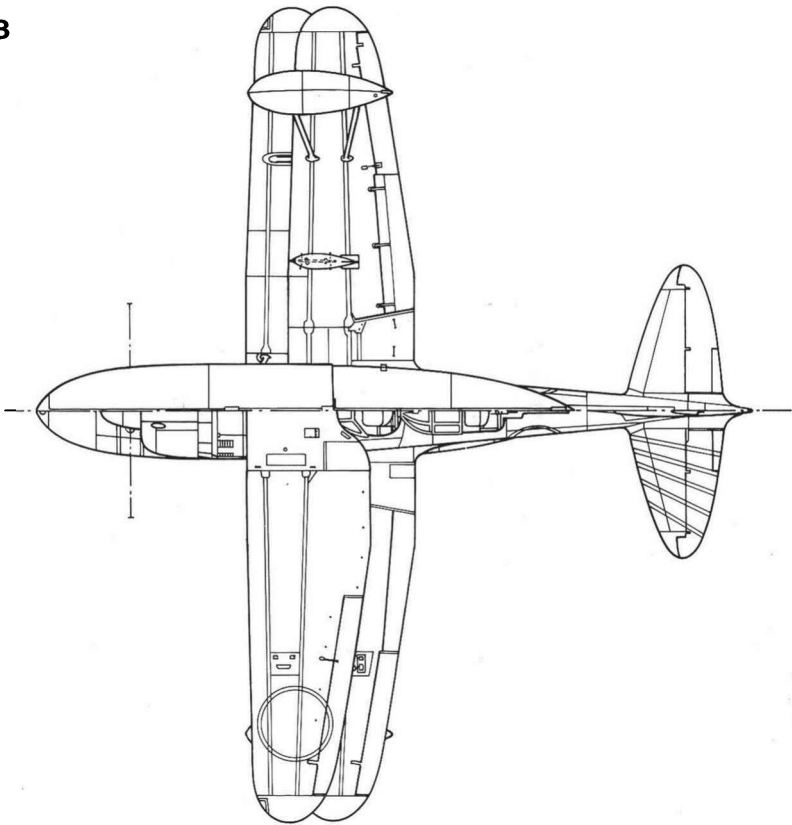
H1/17

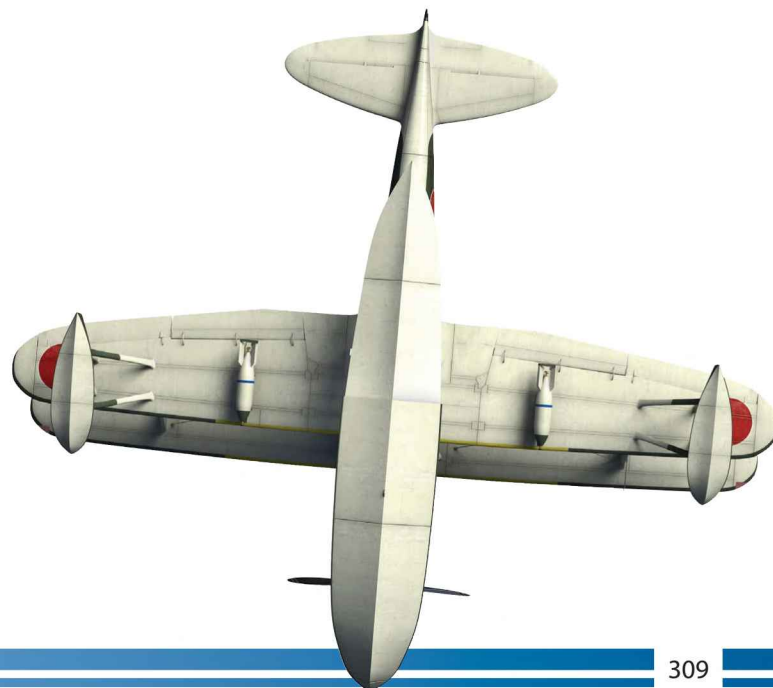
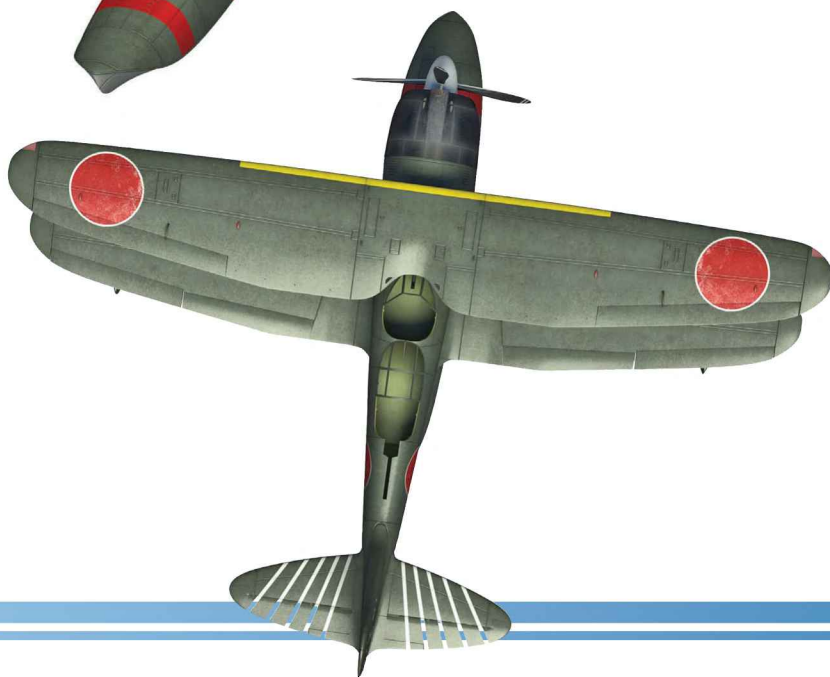


H1/18



H1/13





I Boats

17m Motor Pinnace - ceremonial barge (1/100 scale)

I1/1 Profile

I1/2 Plan

I1/3 Internal profile

I1/4 Internal plan

I1/5 Body plan

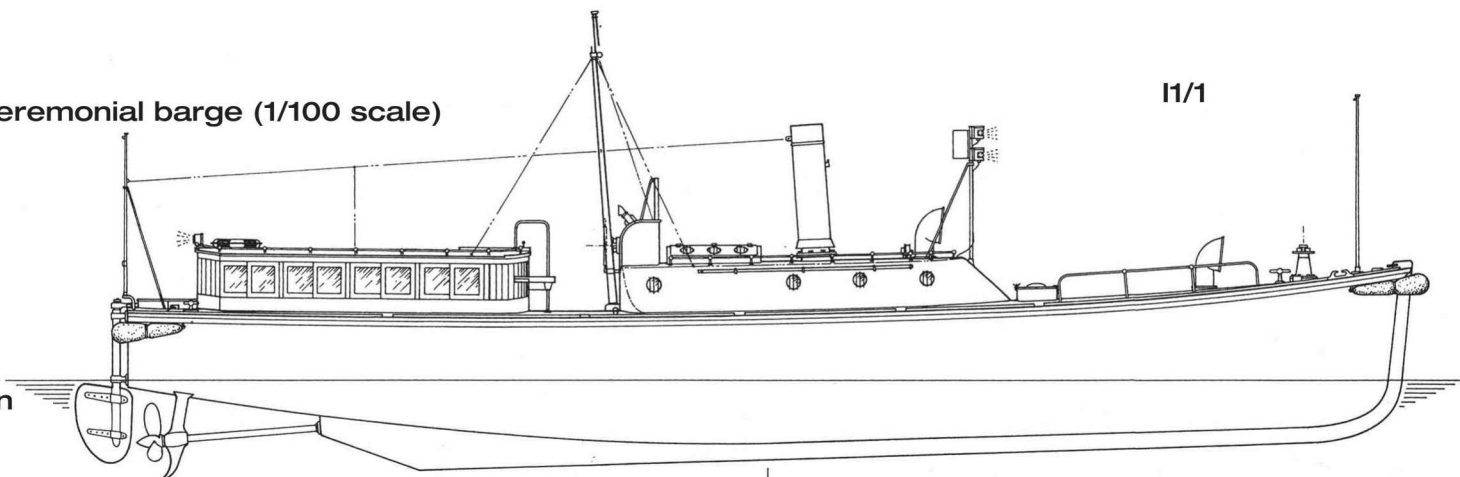
I1/6 Section - Frame 6
with view to stern

I1/7 Rear view

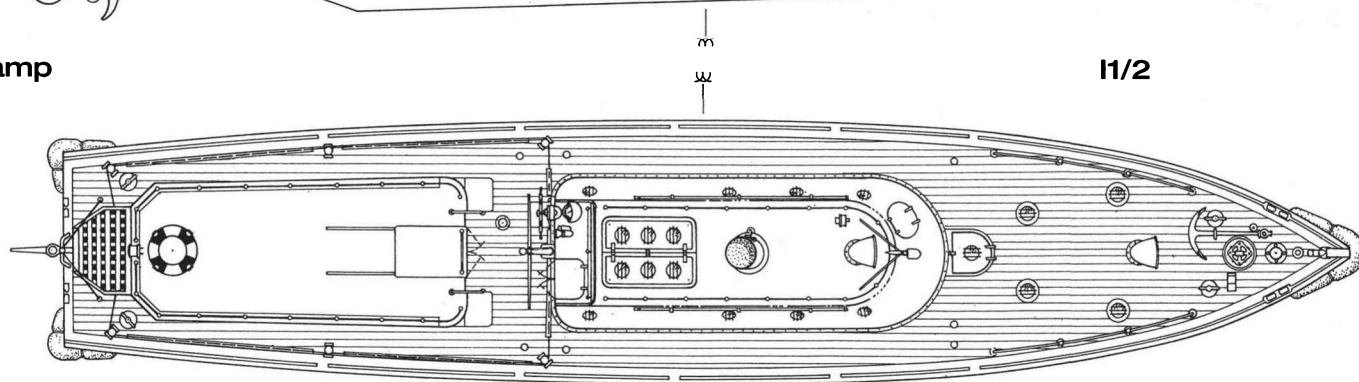
I1/8 Detail of hull edge

I1/9 Navigation lights and lamp

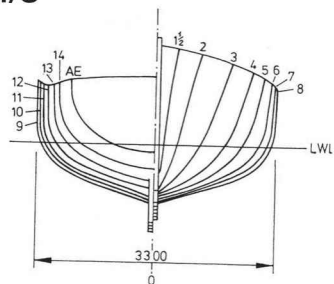
I1/1



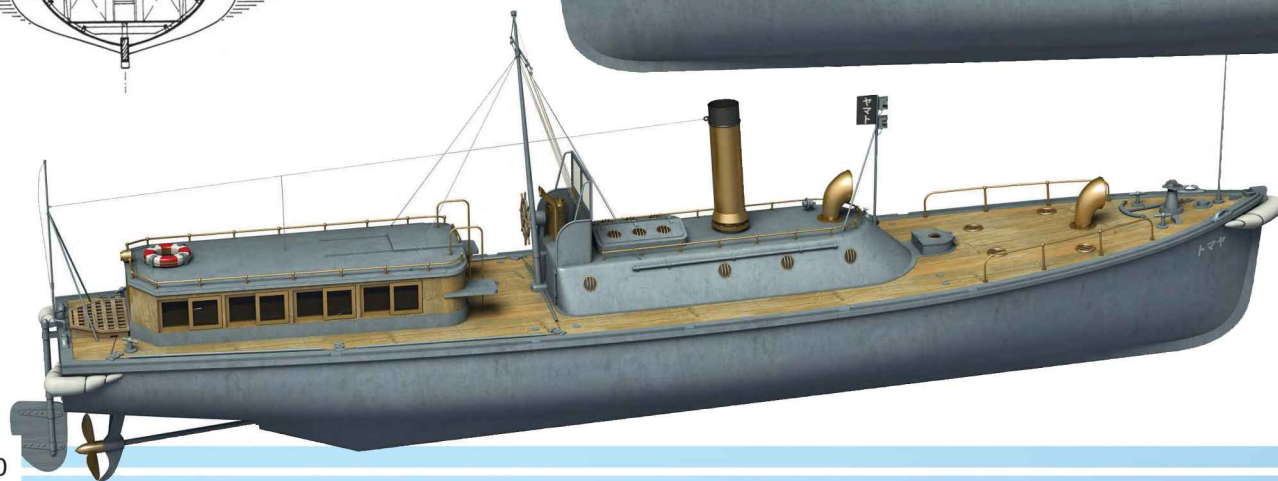
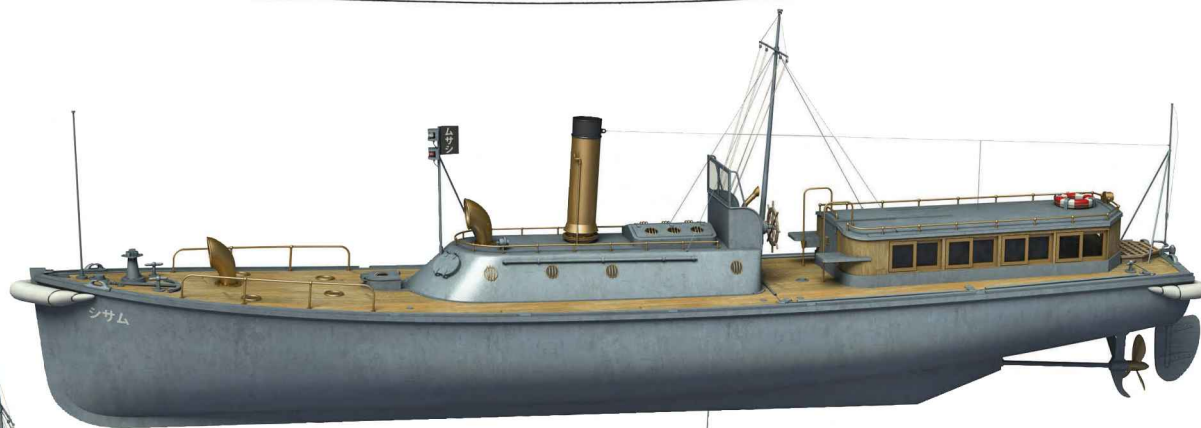
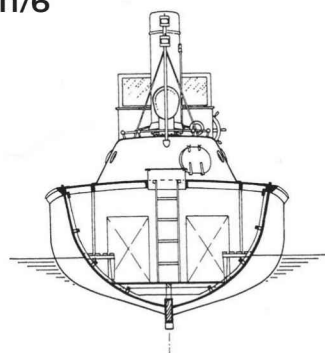
I1/2



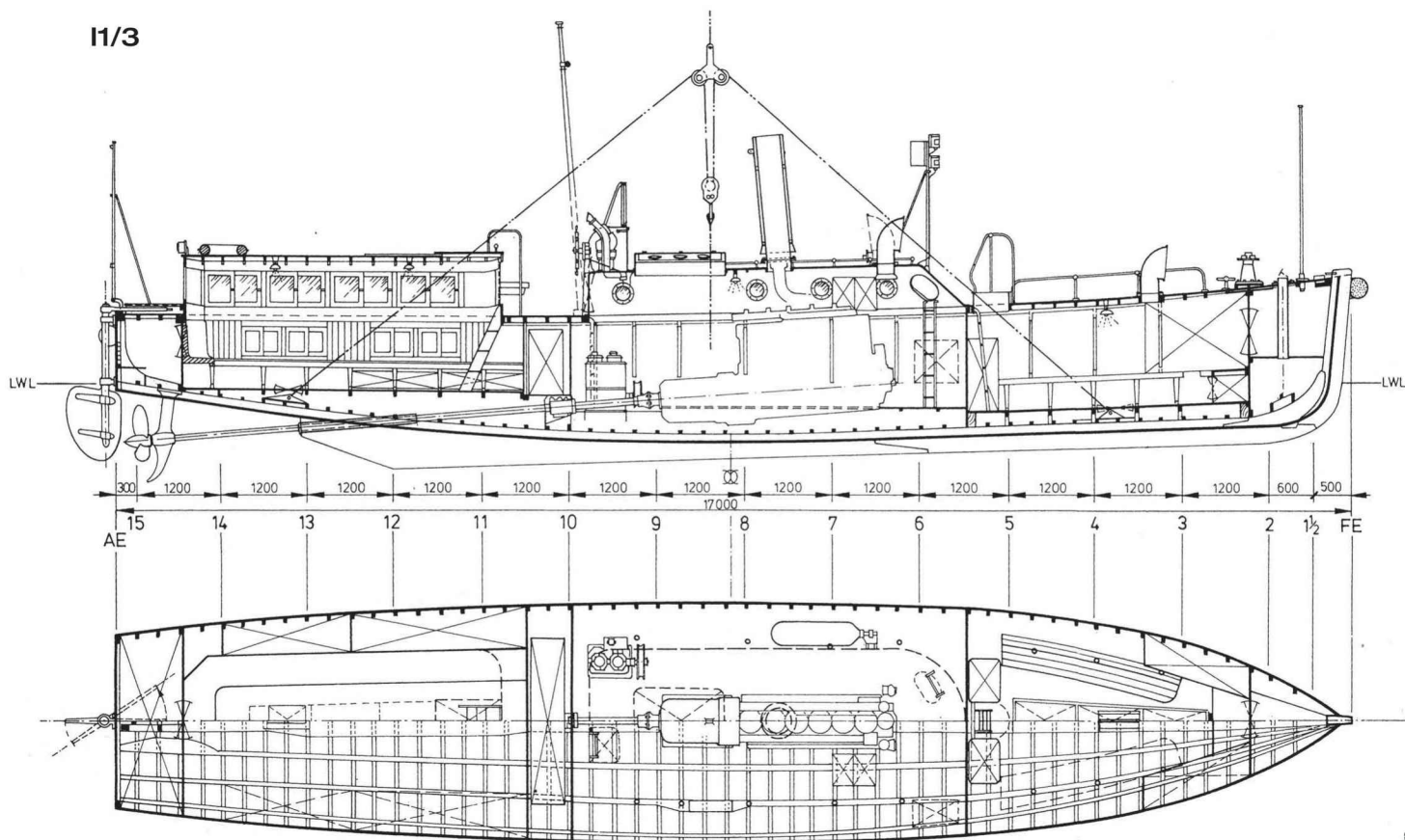
I1/5



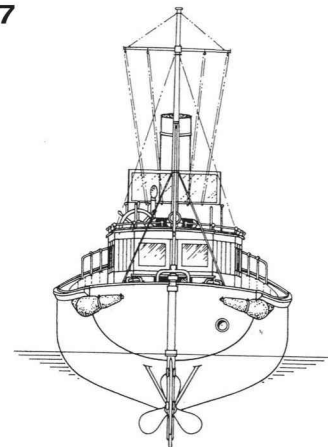
I1/6



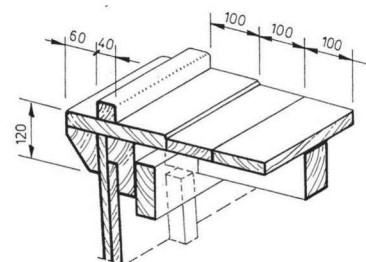
11/3



11/7



11/8



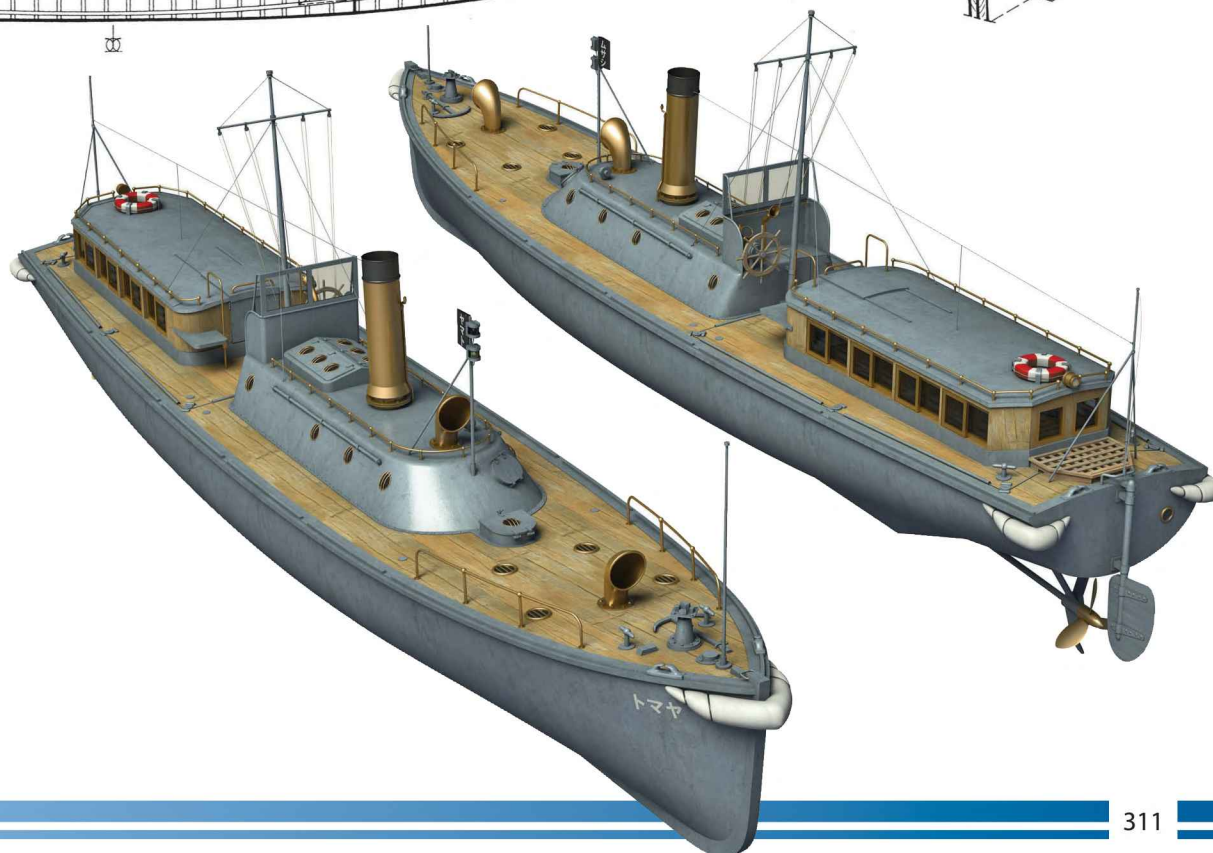
11/4

11/9



Upper light white,
Lower light – half green glass on
starboard, red glass on port
Rear lamp – black with white
Katakana letters: YA-MA-TO or
MU-SA-SHI

ヤ - YA ム - MU
マ - MA サ - SA
ト - TO シ - SHI



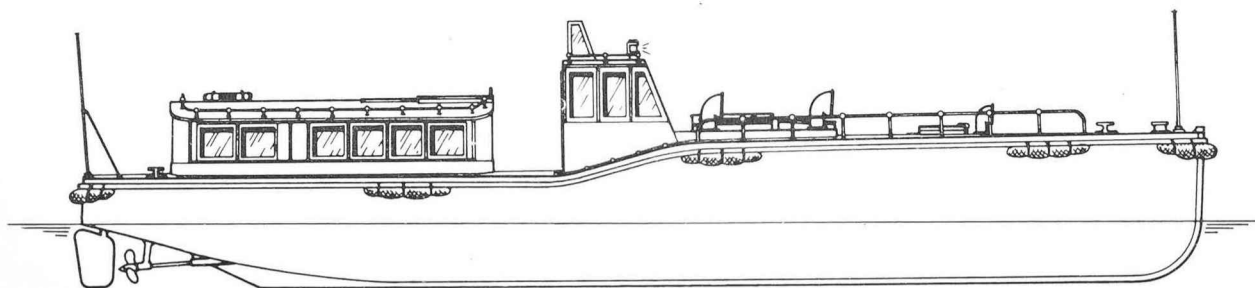
I Boats

15m / 150hp Motor Boat – ceremonial barge
(1/100 scale)

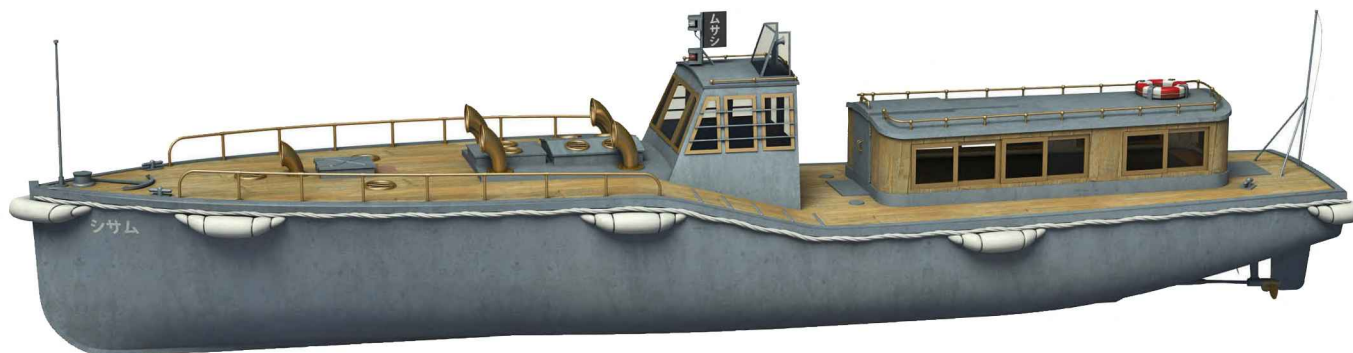
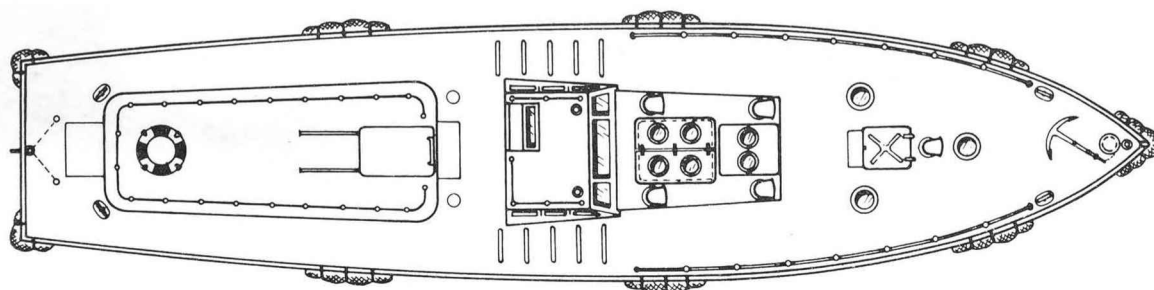
I1/10 Profile

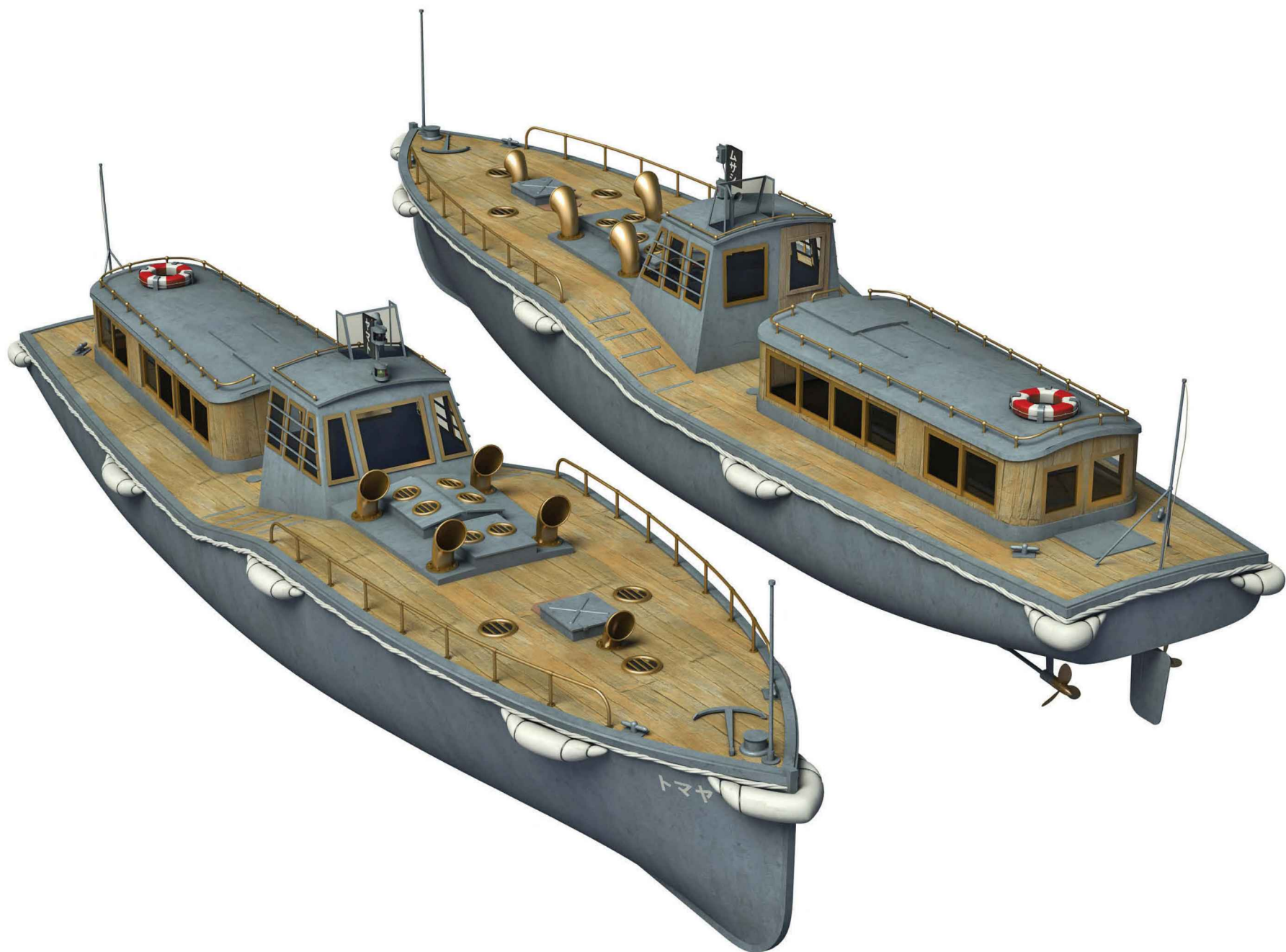
I1/11 Plan

I1/10



I1/11





I Boats

11m/60hp Motor Boat (1/100 scale)

I1/12 Profile

I1/13 Plan

I1/14 Internal profile

I1/15 Internal plan

I1/16 Body plan

I1/17 Sheer elevation

I1/18 Waterline plan

I1/19 Section 'A':

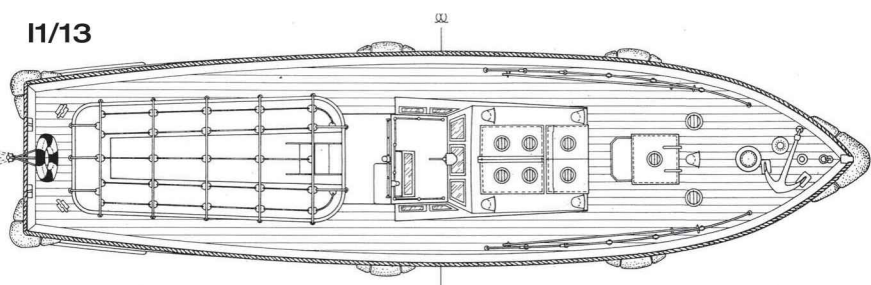
I1/20 Section 'B':

I1/21 Section 'C':

I1/22 Section 'D':

I1/23 Hangar cradle

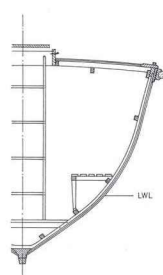
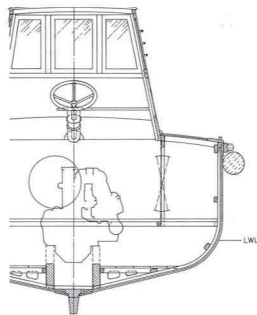
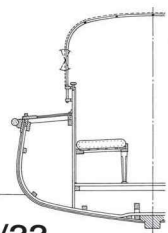
I1/13



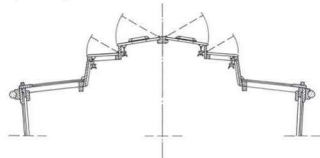
I1/19

I1/20

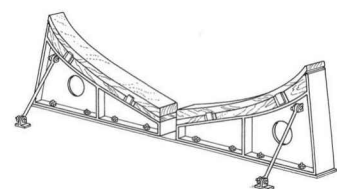
I1/21



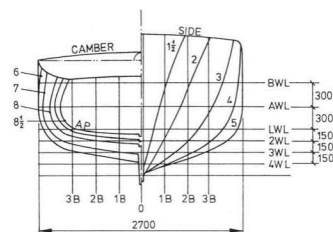
I1/22



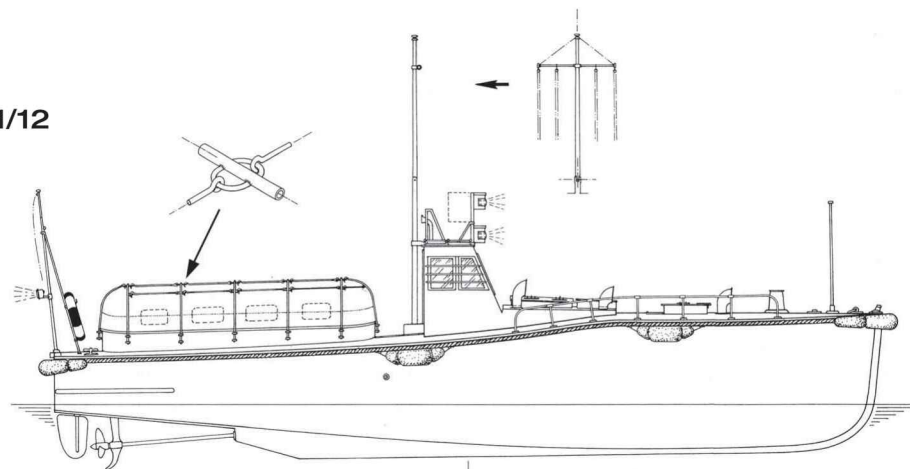
I1/23



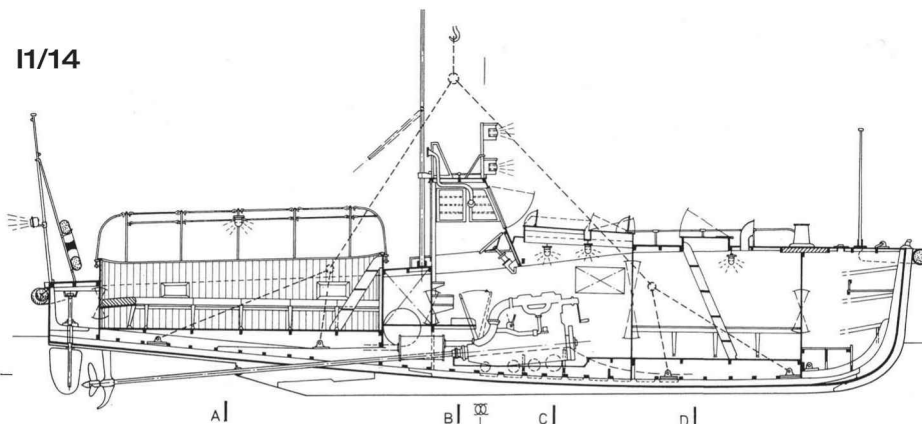
I1/16



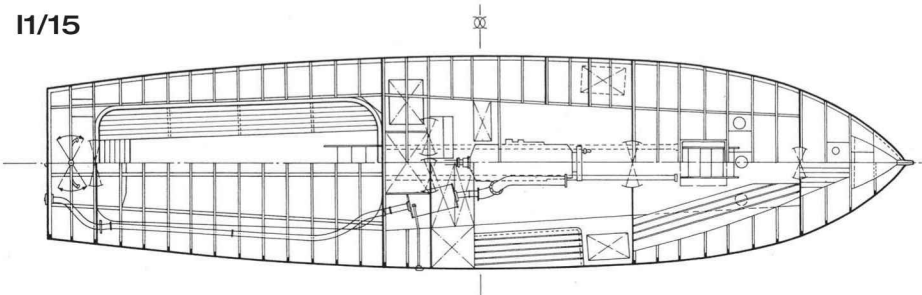
I1/12



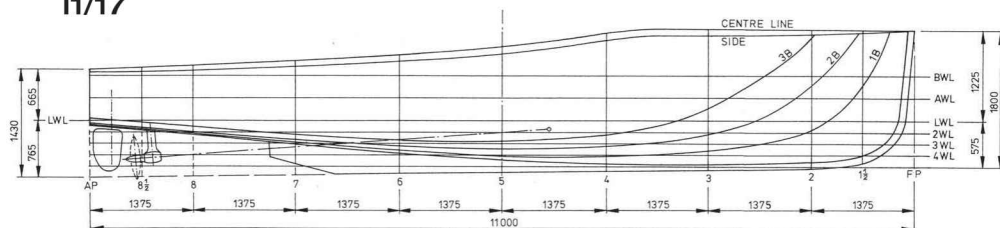
I1/14



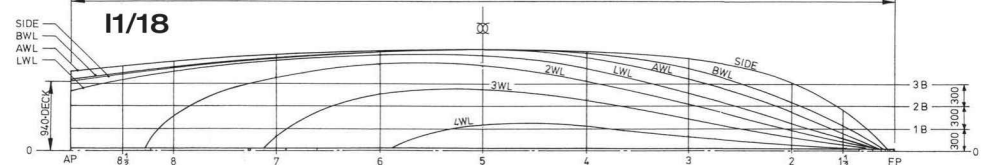
I1/15



I1/17



I1/18





I Boats

12m /30hp Motor Launch (1/100 scale)

I1/24 Internal profile

(canvas rack was used sporadically)

I1/25 Plan

I1/26 Body plan

I1/27 Sheer elevation

I1/28 Waterline plan

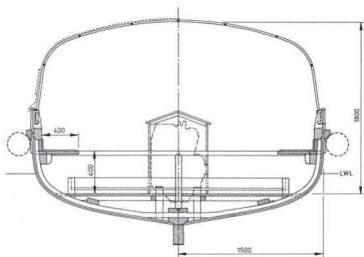
I1/29 Section 'A-A'

I1/30 Section 'A-A' enlarged x 2

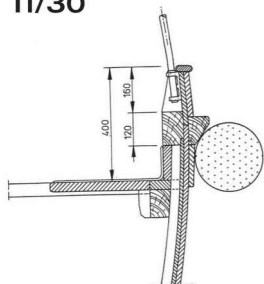
I1/31 Section 'B-B'

I1/32 Cradle

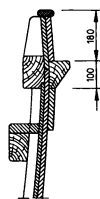
I1/29



I1/30



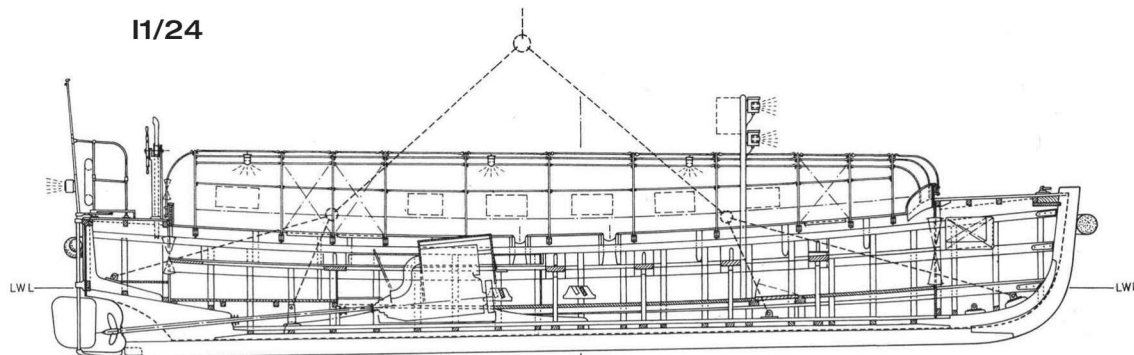
I1/31



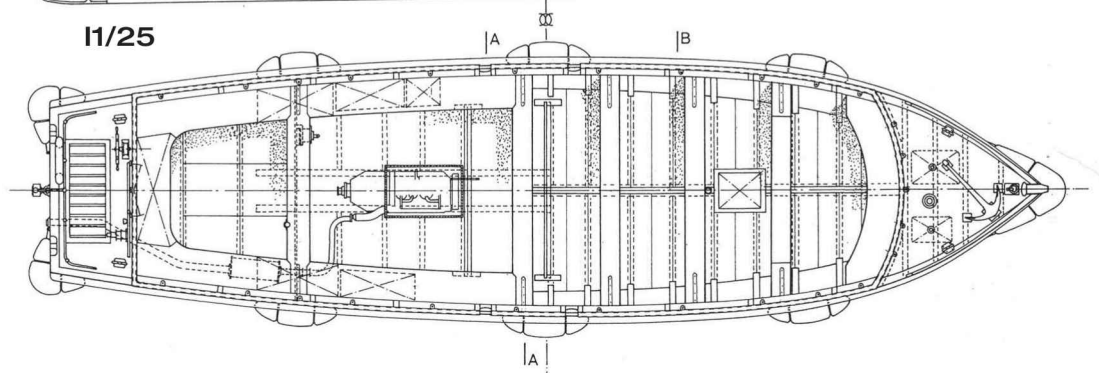
I1/32



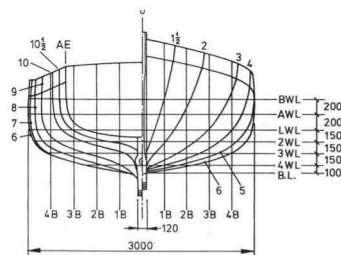
I1/24



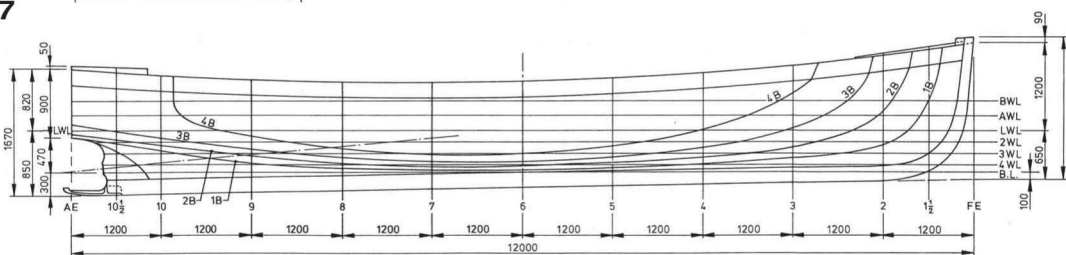
I1/25



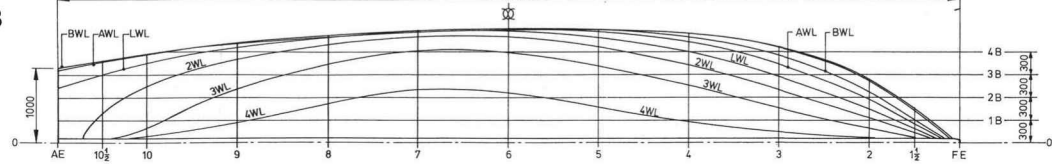
I1/26

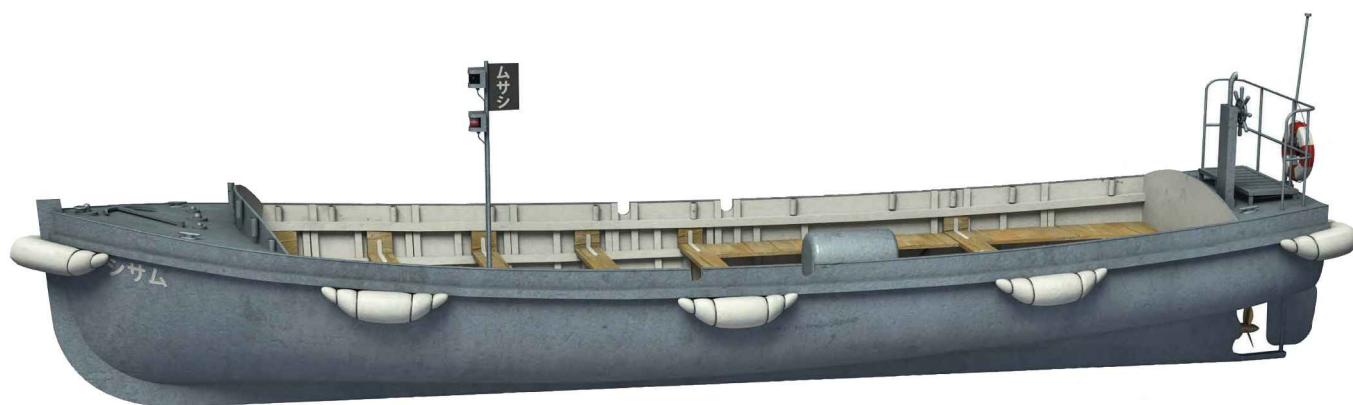


I1/27



I1/28





I Boats

9m Cutter (1/100 scale)

I1/33 Profile view

I1/34 Internal profile

I1/35 plan

I1/36 Body plan

I1/37 Sheer elevation

I1/38 Waterline plan

I1/39 Section 'E-E'

I1/40 Section 'F-F'

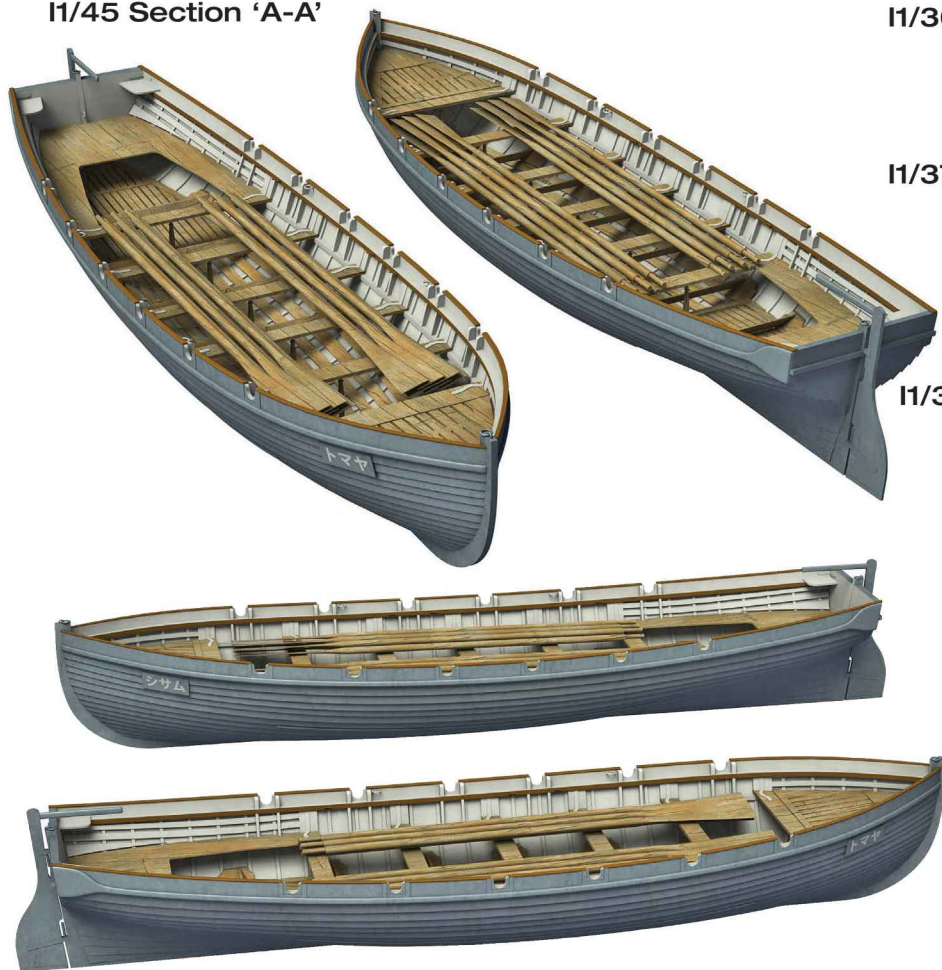
I1/41 Section 'G-G'

I1/42 Section 'B-B'

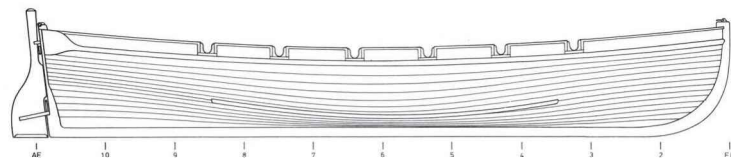
I1/43 Section 'C-C'

I1/44 Section 'D-D'

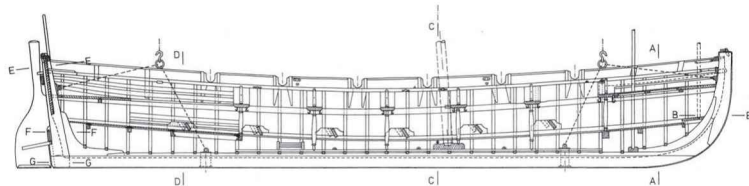
I1/45 Section 'A-A'



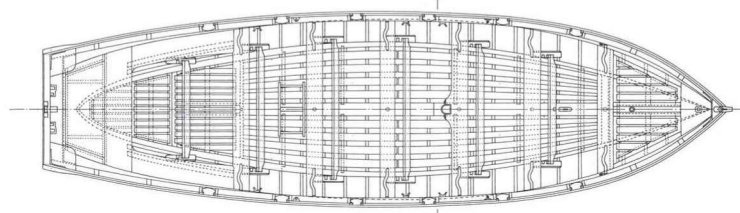
I1/33



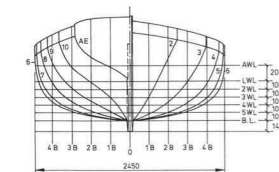
I1/34



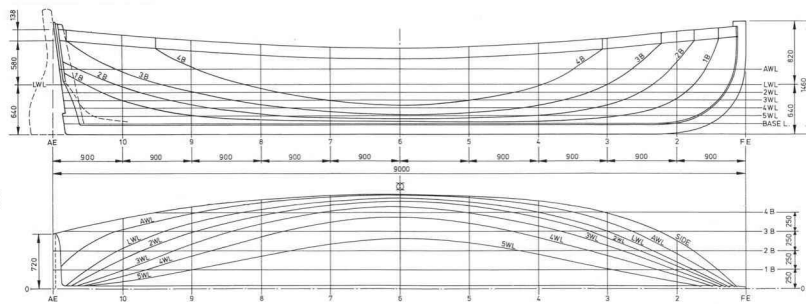
I1/35



I1/36

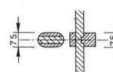


I1/37

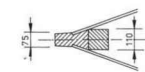


I1/38

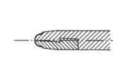
I1/39



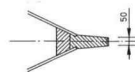
I1/40



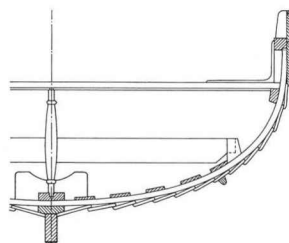
I1/41



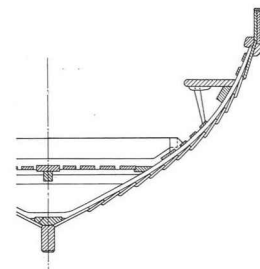
I1/42



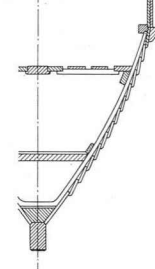
I1/43



I1/44



I1/45



8m (26ft) Sampan (1/100 scale)

1/46 Profile view

1/47 Internal profile

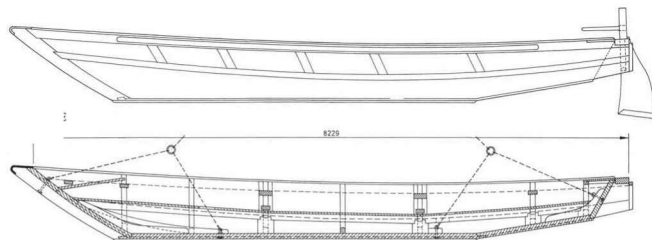
1/48 Plan

1/49 Rudder

1/50 Section of middle part



1/46

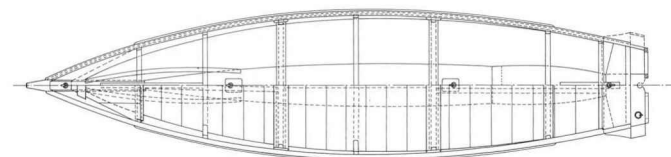


1/47

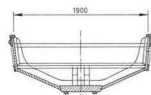
1/49



1/48



1/50



I Boats

6m (20ft) Sampan (1/100 scale)

I1/51 Profile view

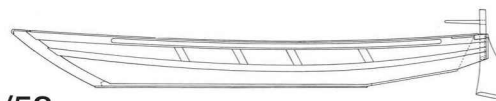
I1/52 Internal profile

I1/53 Plan

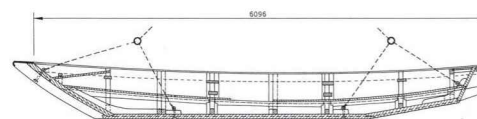
I1/54 Section of middle part

I1/55 Rudder

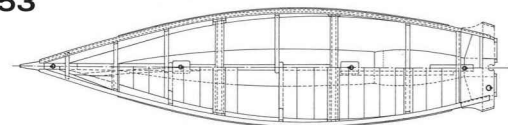
I1/51



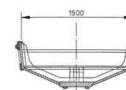
I1/52



I1/53



I1/54



I1/55

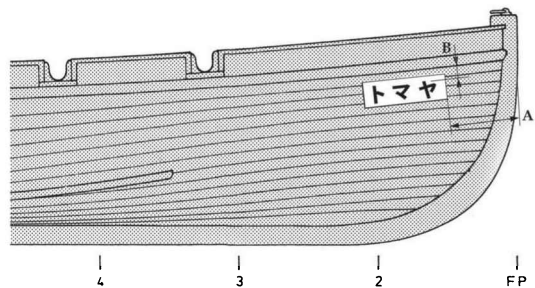


I1/56 Katakana inscription on boat sides

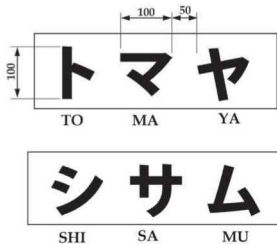
I1/56

I1/57 Boat stowage on upper deck (UD)

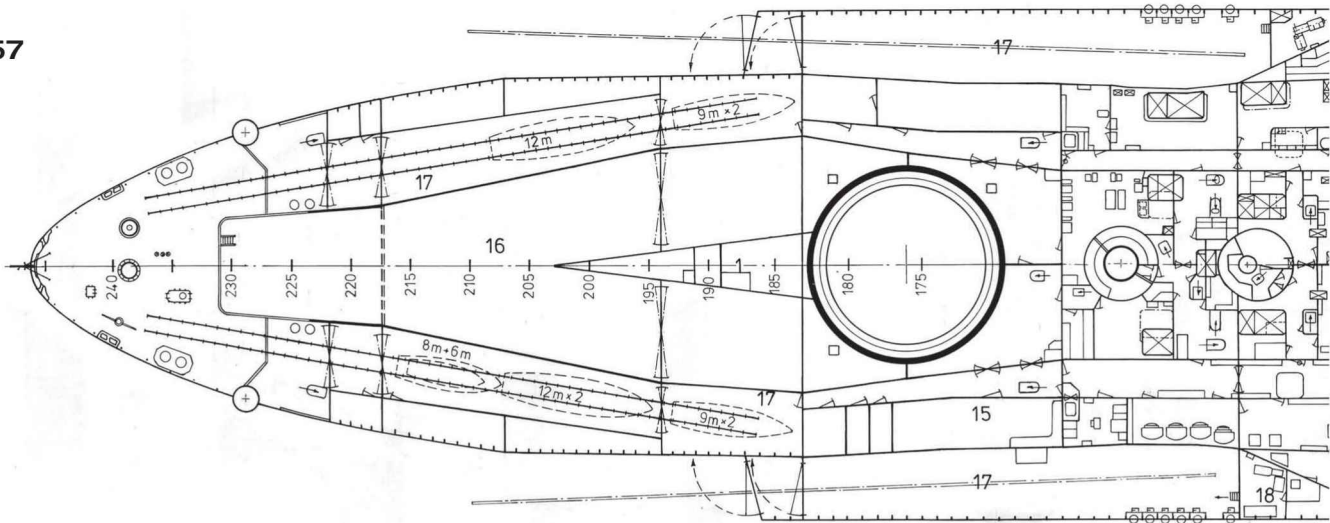
I1/58 Boat stowage on middle deck (MD)



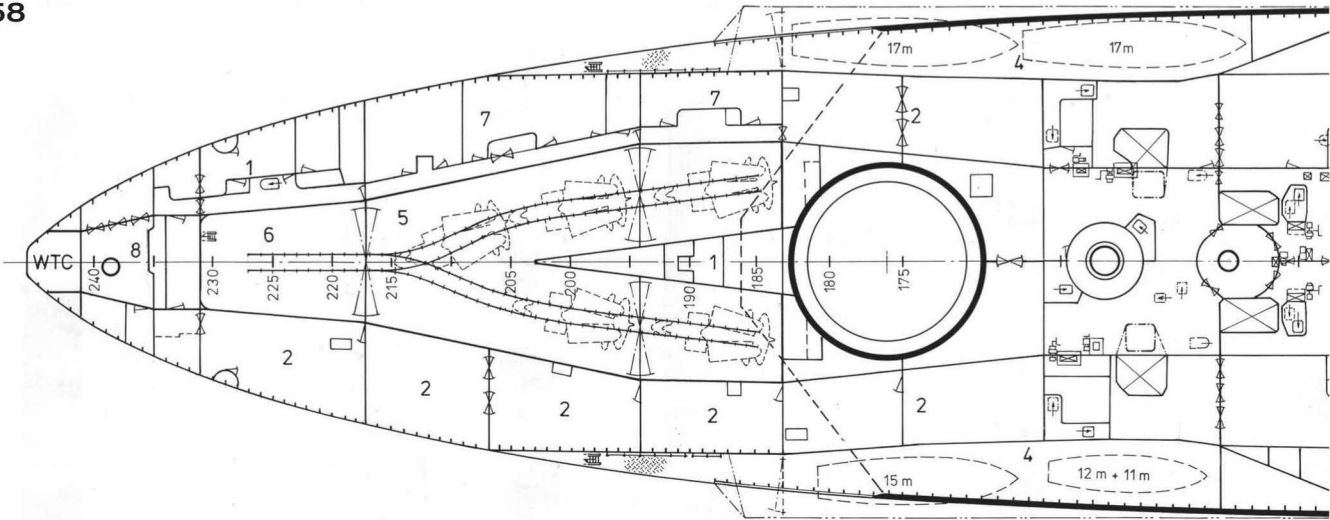
BOAT	A	B
12 m	650	150
9 m	500	130
8 m	450	55
6 m	450	40



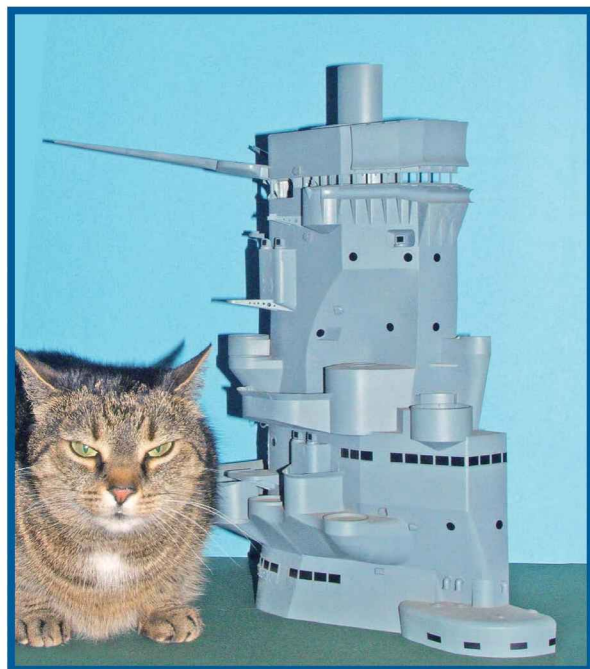
I1/57



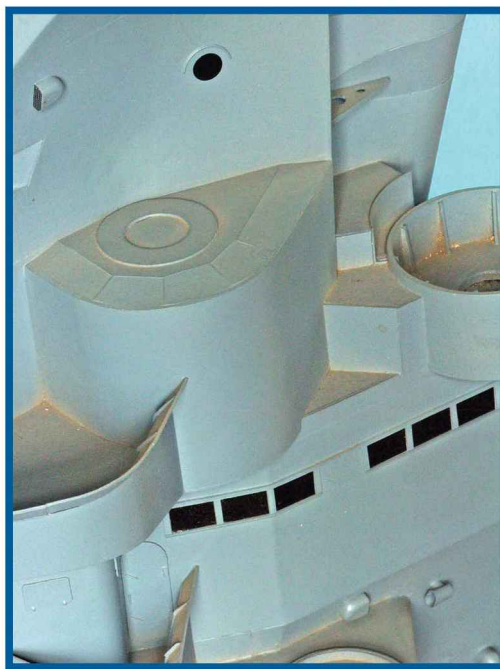
I1/58



AUTHOR'S CONSTRUCTION MODEL



Study model at 1:50 scale of *Yamato's* tower bridge and my assistant Pieszczołka the cat



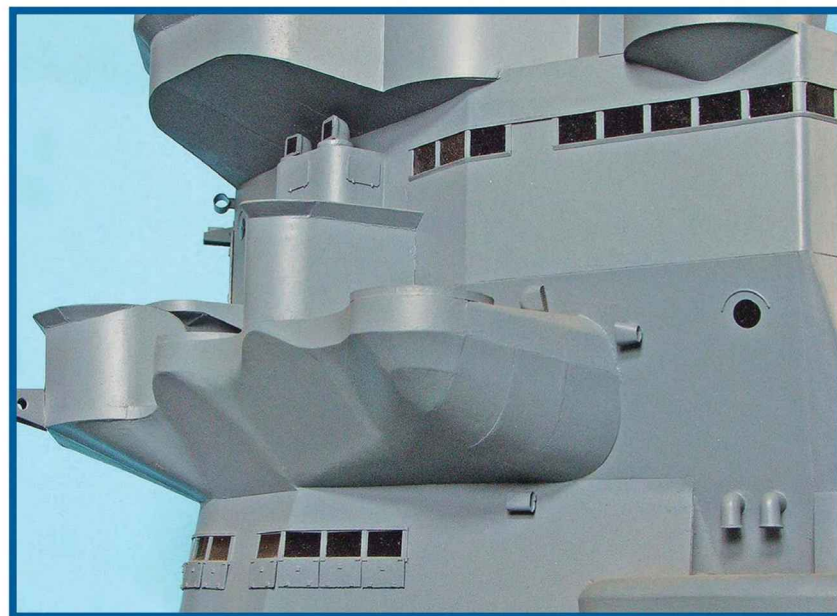
View of the tower bridge's lower LA director
Type 98 'Hoiban' – level + 16,755



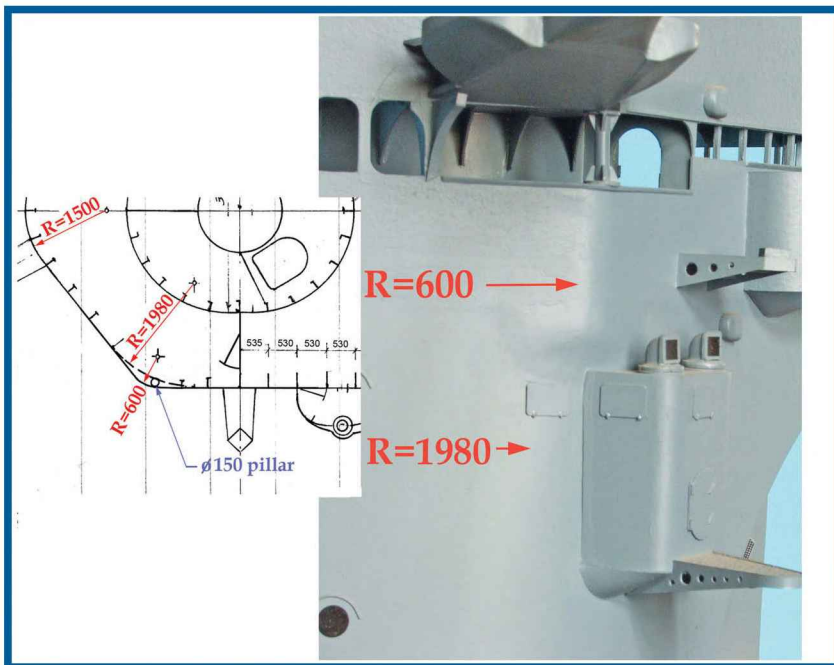
View of upper starboard part of the tower bridge



Another view of the rear pulpit



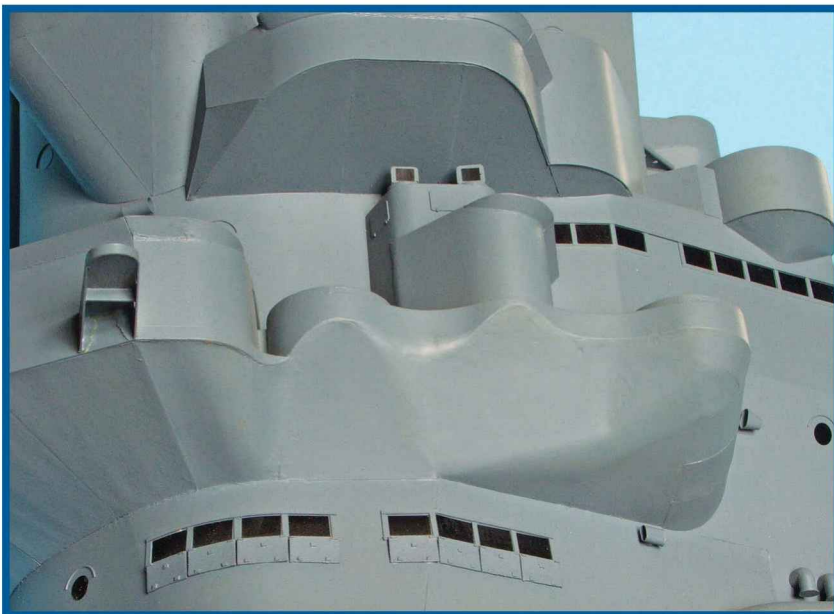
View of the 'pulpit' support of searchlight control towers on the ship level
+ 14,000



Details of the upper part of the tower bridge



View of the compass bridge with the base of the MG control tower and the base of the 1.5m navigation rangefinder



The 'pulpit' of rear two searchlight control towers and platform on the ship's level
+ 16,755

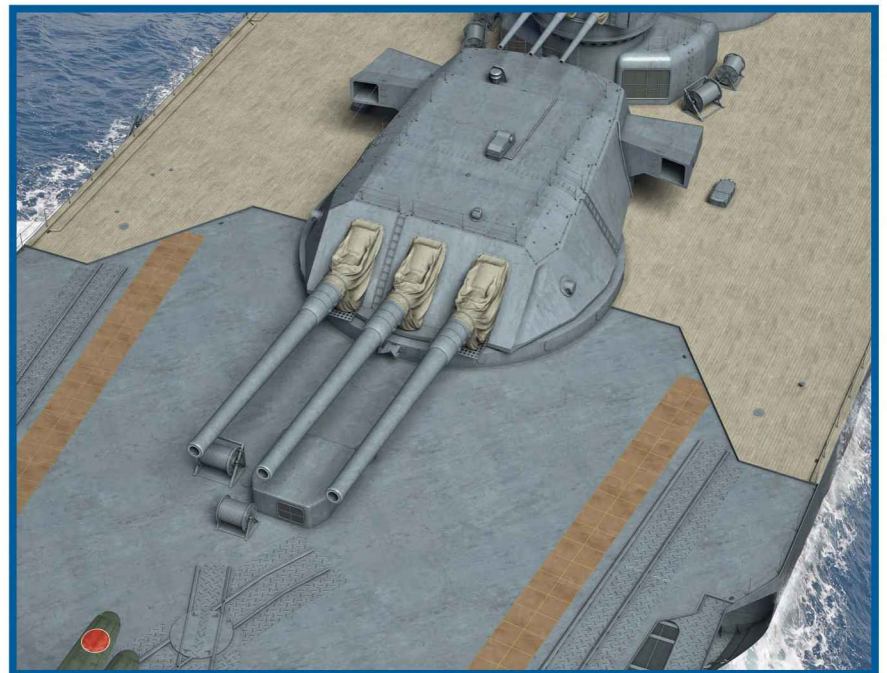


Another view of the rear pulpit

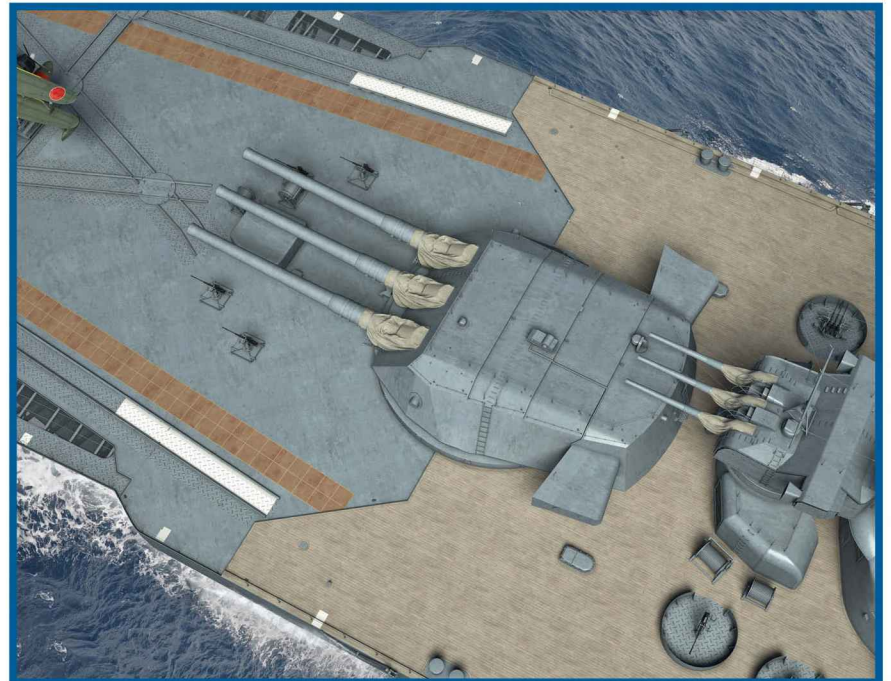
YAMATO AND MUSASHI AT SEA

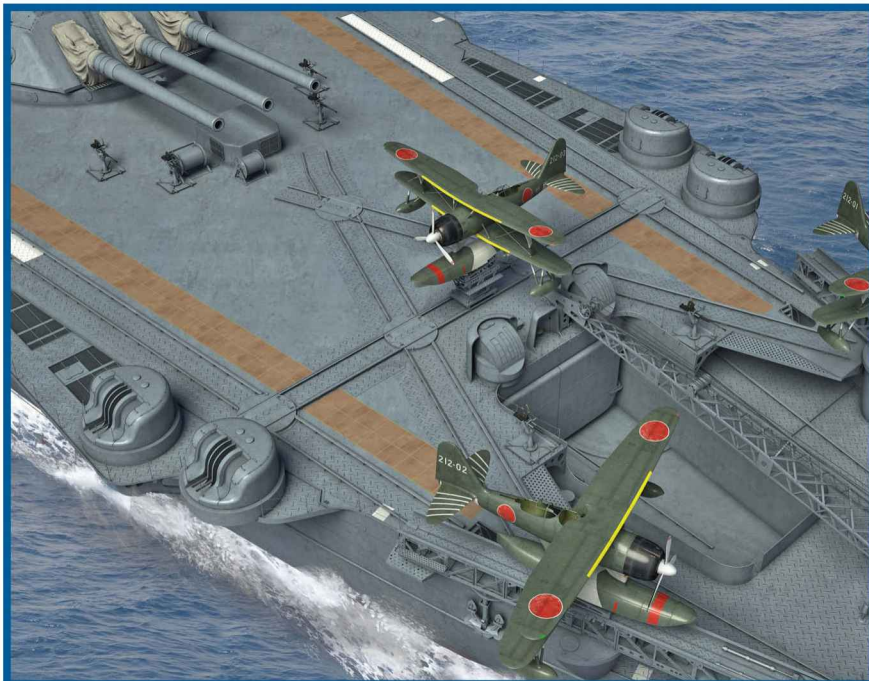
Yamato 1941



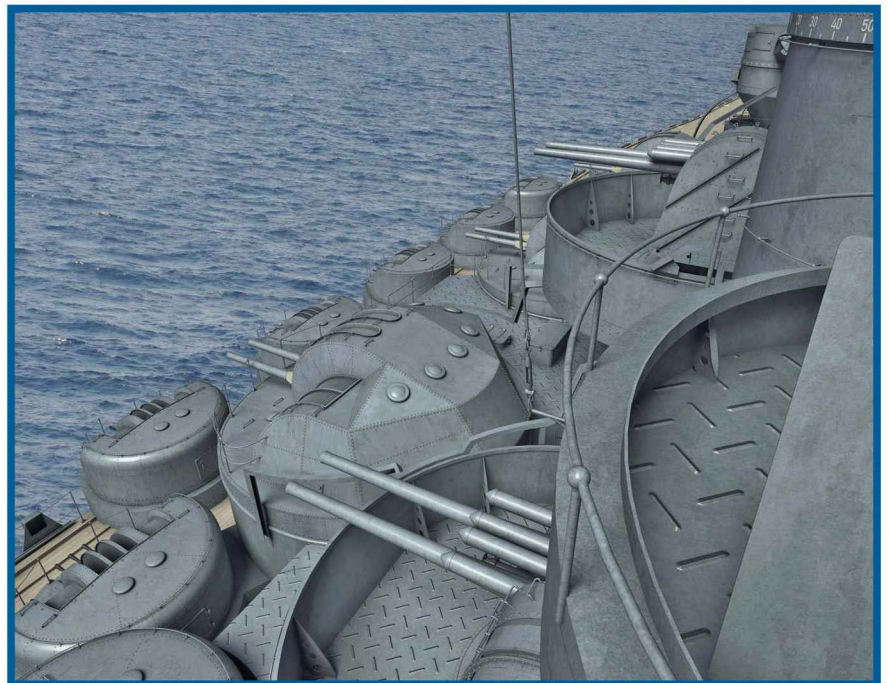
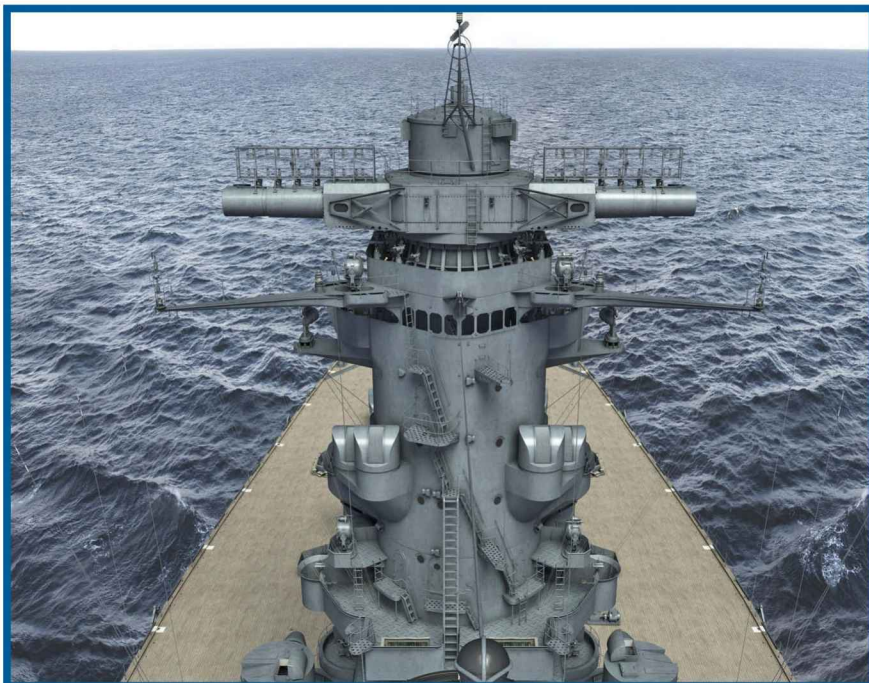
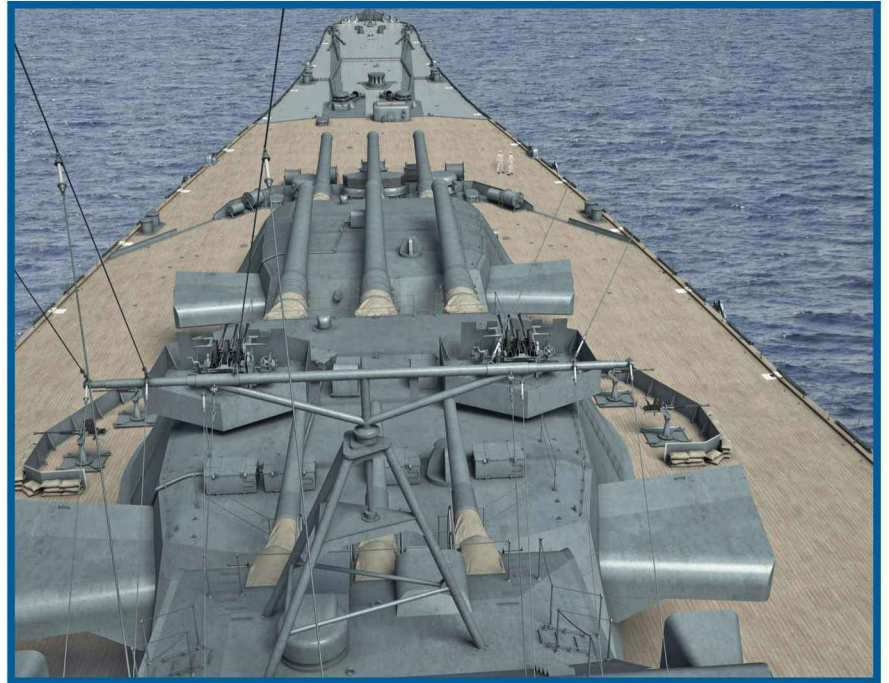


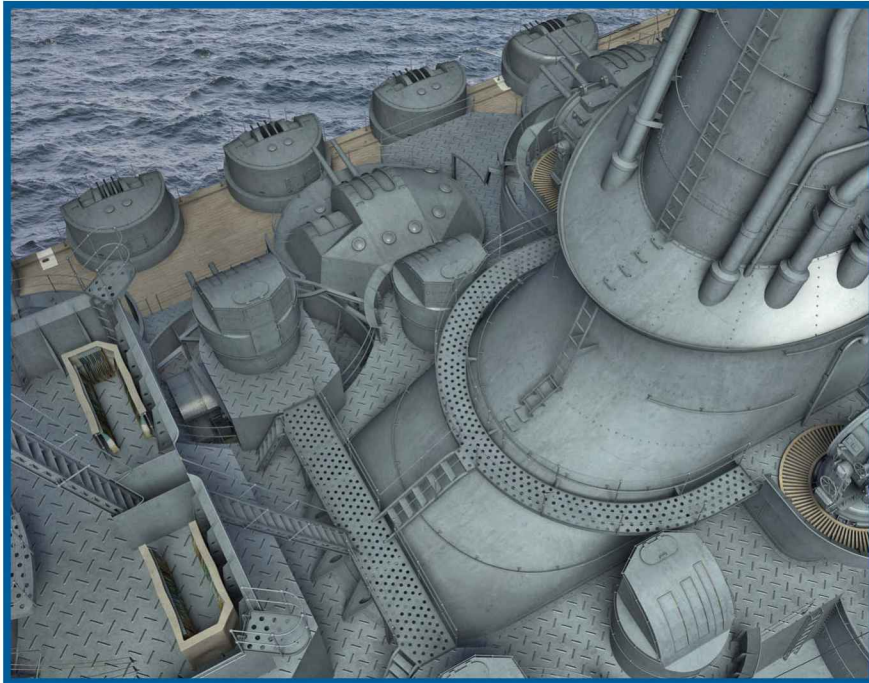
Yamato 1944





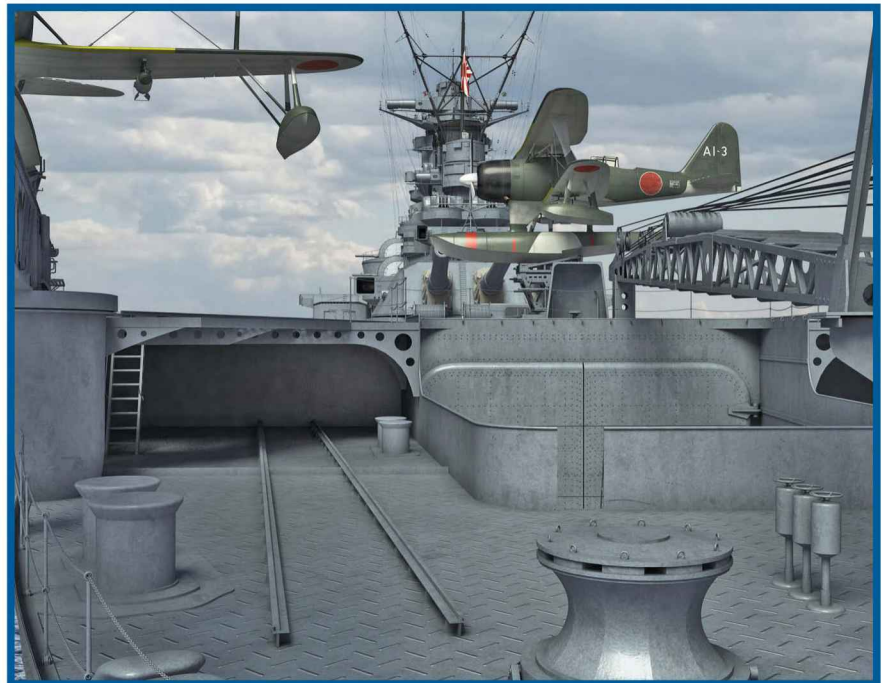
Yamato 1945



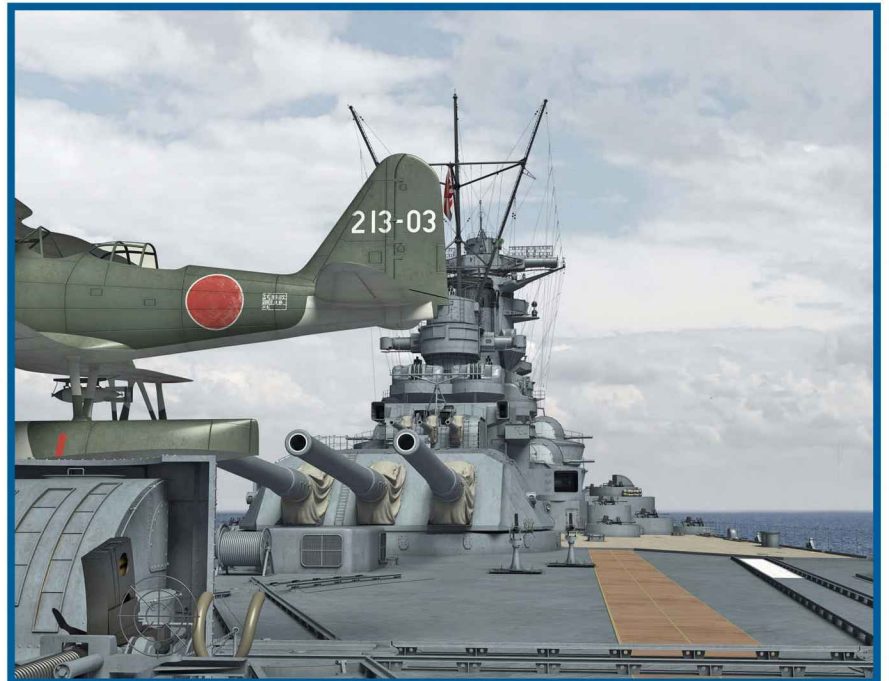


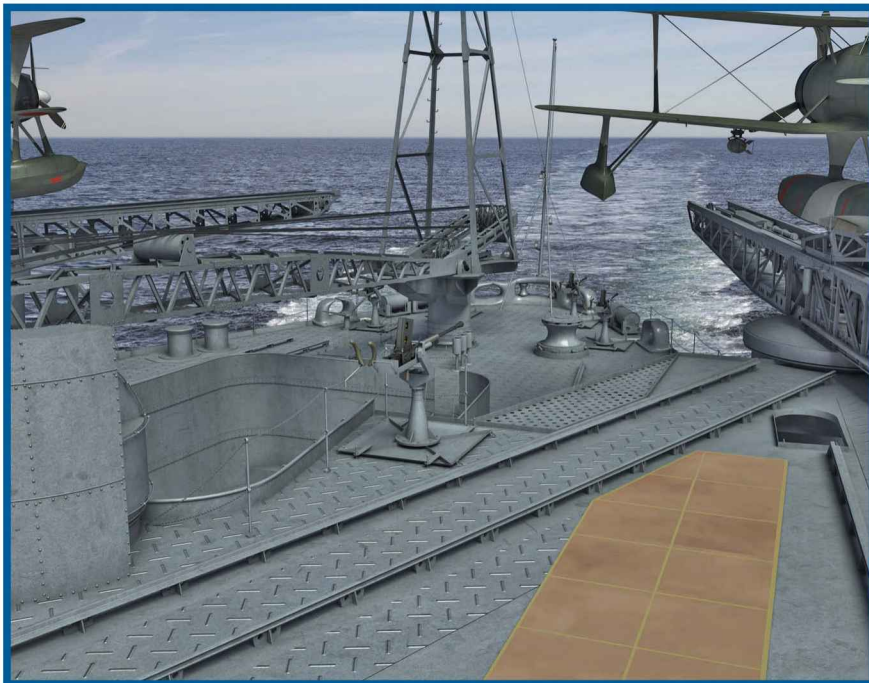
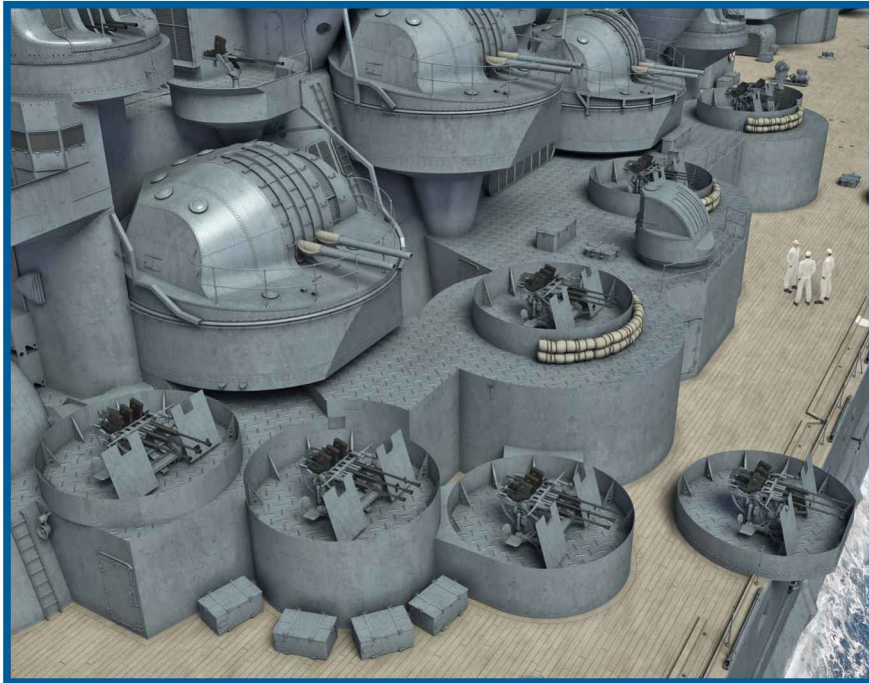
Musashi 1942





Musashi 1944





THE REMAINS OF YAMATO AND MUSASHI

EXPEDITIONS TO THE SUNKEN BATTLESHIPS

First expedition, 1985

On 1 August 1985, 40 years after the *Yamato* sank, a Japanese expedition, in the small research submarine *Research Submersible 2* (on loan from the UK), found the remains 345m below sea level and examined them carefully. They partly explained the secret of the *Yamato*'s last moments. Two huge and devastating explosions tore the ship apart leaving a large part of the hull (~170m long), the bow (~70m long) and some smaller fragments. Her remains have been slowly sinking into the sand ever since.

Second expedition, 1999

On 14 December 1999 the Japanese television station Asahi along with a French team and their research ship *Ocean Voyager* (that had, in 1998 investigated the wreck of *Titanic*) investigated the wreck once more. These expeditions discovered far more new information than the earlier ones. They concluded that after *Yamato* rolled over (listing 120°) there were two explosions – the first in the magazines of turrets No. 1 and No. 2 of 46cm guns with the magazines of the 15.5cm guns and probably AA gun ammunition, and the second explosion in the magazine of the rear 15.5cm guns. It caused a hole about 32m in diameter in the port side of the rear part of the hull. This is about 160m long and is now upside down. The fore part of the hull – from the bow to the 46cm gun tower barbette is about 90m long with a list to starboard of about 45°.

The top of the tower bridge stayed near the starboard side of the bow part of the hull and fragments of main mast stayed on the No.1 barbette. I think that these two parts of the hull must have locked together as the ship sunk, tearing off the mast and fragments of the tower bridge.

Third expedition

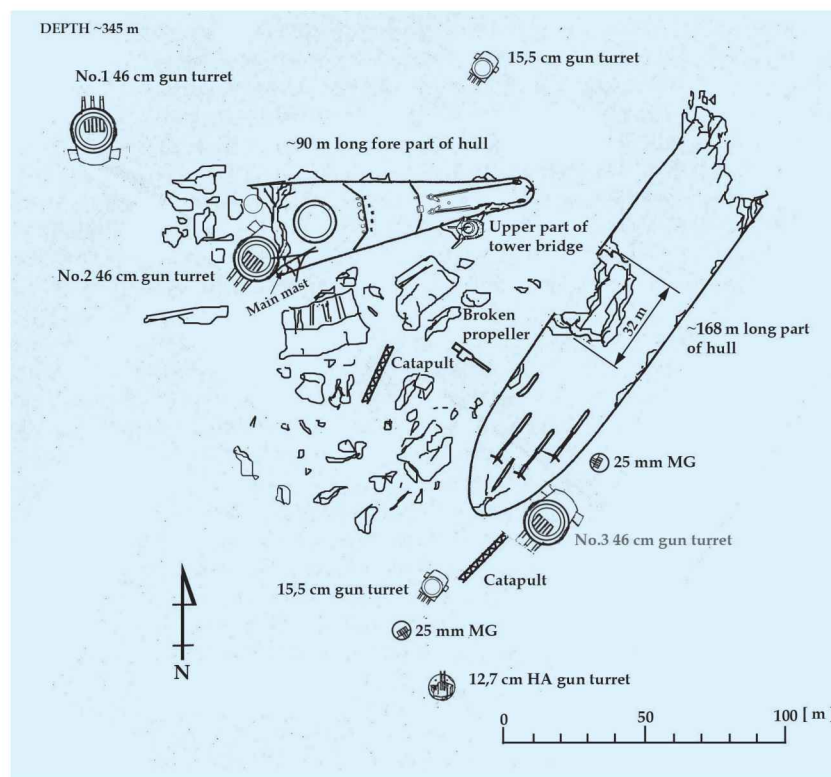
On 1 March 2015, after eight years of research, Paul G. Allen discovered the *Musashi* in the Sibuyan Sea. His M/Y *Octopus* found the remains of the *Musashi* in seas 1300m deep and with remains spread over a very wide field. Although *Musashi* sank as a complete ship with a list to starboard by the bow, moments after the sinking two huge underwater explosions were heard – caused, we can now say, by the fore and rear ammunition magazines. One or both of these blasts probably went on to completely flood the boiler and engine rooms and tore the midship area into smaller and larger pieces. As

on her sister ship *Yamato*, the largest fragments are the bow and rear part of the hull.

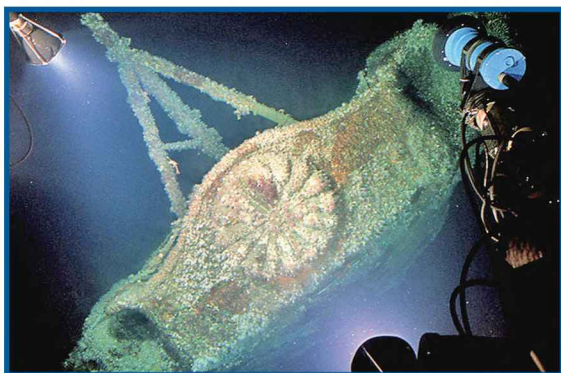
It is likely that the explosions on both battleships were ignited partly by 15.5cm, 12.7 and 25mm rounds, causing the explosion of the powder magazine and partly by the shells of the 46cm guns when the ships rolled over. With the explosion of *Yamato*'s aft magazines, it is possible that the fire that arose after the bomb struck the rear turret of the 15.5cm gun, was not extinguished.

Expedition to Yamato

The photos on the opposite page of the *Yamato* were taken during the First expedition by *Ocean Voyager* and Asahi TV in December 1999



The condition of the sunken *Yamato* as examined on 14 December 1999



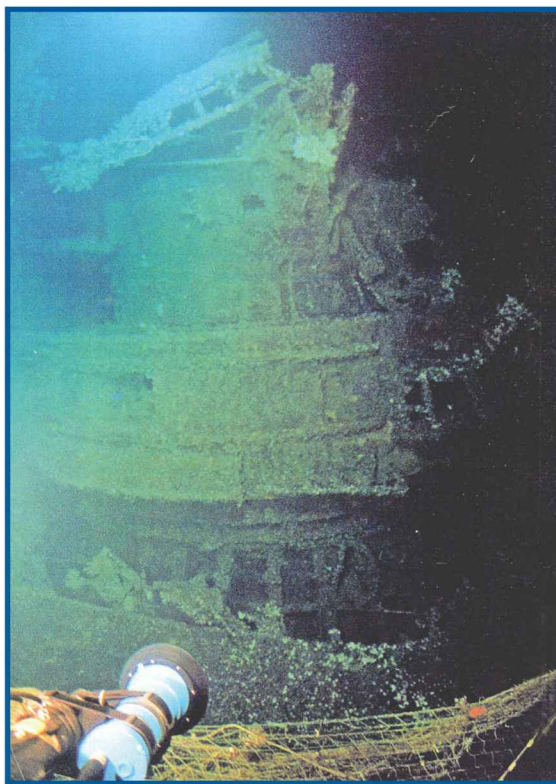
120cm diameter Chrysanthemum crest and the bow



View of the 'Hoiban' roof without the lost periscope turret and broken small mast



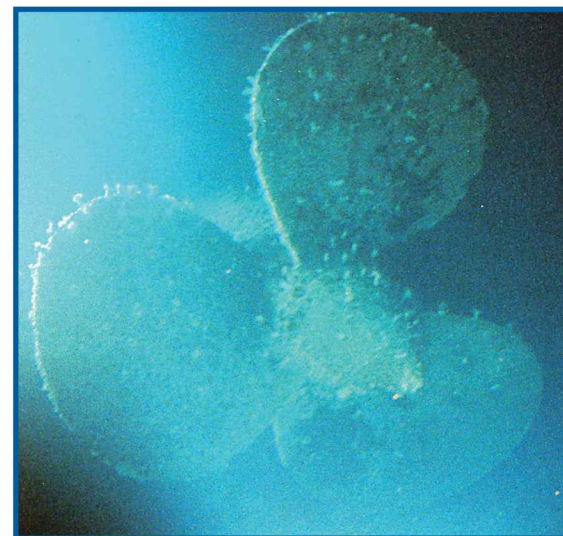
Sharp bend in the stern of *Yamato* probably caused by knocking the stern deck on the sea bottom (VHS)



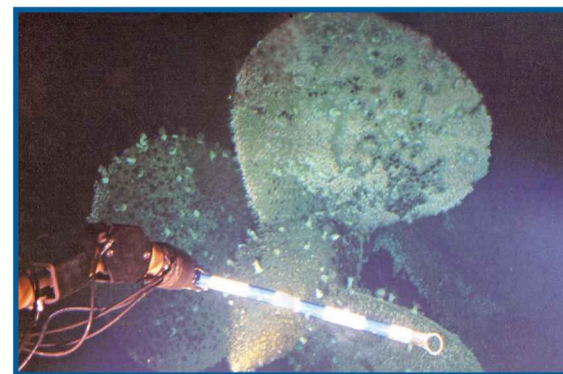
The 'Hoiban' tower, main rangefinder compartment and fragment of the aft part of air defence platform of tower bridge



46cm AP shells in the broken lower part of gun turret



5m diameter propeller



5m diameter propeller



25mm MG turret on sea bottom

Expedition to *Musashi*

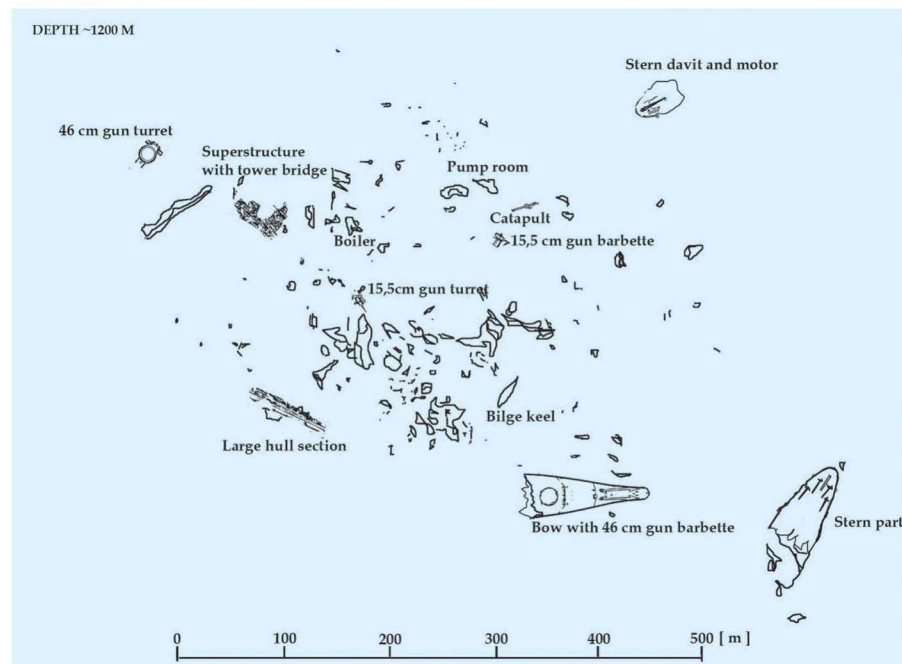
The photos on this page of the *Musashi* were taken by the Paul G. Allen expedition on 2 March 2015



The 'Hoiban' tower with the small rear mast and the aft wall of the 15.5m rangefinder with strengthening framework



Two starboard searchlight control towers from aft, middle part of tower bridge



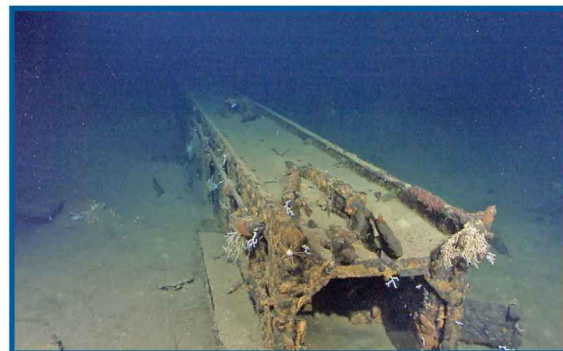
The condition of the sunken *Musashi* as discovered on 2 March 2015 and examined by the Paul G. Allen Expedition



The bow of the *Musashi* at a depth of ~1300m with her lost chrysanthemum crest



Starboard 15-ton anchor, the port anchor was dropped into the sea about two hours before her sinking, to attempt to reduce the list.



Rear view of the catapult