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MOLOTOVSK SHIPYARD NO. 402 IN MOLOTOVSK ARCHANGEL OBLAST

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FOREWORD

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MOLOTOVSK SHIPYARD NO. 402 IN MOLOTOVSK ARCHANGEL OBLAST*

Summary and Conclusions

Molotovsk Shipyard No. 402 in Molotovsk, Archangel Oblast, is the most important shipyard on the north coast of the USSR. The design and arrangement of facilities indicate greater emphasis on construction than on repair. Naval vessels of all classes and types ranging in size from small coastal craft to battleships or large carriers and submarines can be built.

With existing facilities and one 8-hour shift, the shipyard is capable of annually producing 38,750 standard displacement tons (SDT)** of naval construction, which is equivalent to 1 cruiser, 4 destroyers, 6 oceangoing submarines, and 15 subchasers. The shipyard is also capable of producing annually 73,400 gross register tons (GRT)*** of merchant ships equivalent to 15 medium-size cargo vessels, if shipyard facilities were used for this type of production. These estimates are based on

* The estimates and conclusions contained in this report represent the best judgment of the responsible analyst as of 1 June 1954.

** Standard displacement of a surface vessel is the displacement (in tons of 2,240 pounds) of the vessel, complete, fully manned, engined, and equipped ready for sea, including all armament and ammunition, equipment, outfit, provisions and fresh water for crew, miscellaneous stores, and implements of every description that are intended to be carried in war but without fuel or reserve boiler-feed water on board. Standard displacement of a submarine is the surface displacement and is similar to the standard displacement of a surface vessel but without lube oil, fresh water, or ballast water of any kind on board.

*** Gross register tonnage is a measure wherein the entire internal cubic capacity of the vessel is expressed in register tons (100 cubic feet to the ton). Certain spaces are not included in the measurement such as peak and other tanks of water ballast, open forecastle, bridge and poop, hatchway excess, certain light and air spaces, anchor gear, steering gear, wheelhouse, galley, cabins for passengers, and other minor spaces specified by law.

a normal construction program utilizing all facilities rather than the maximum-size vessel on each building way. Production on this basis would seriously limit any simultaneous repair activities.

Production in 1951, which was probably the peak year, amounted to approximately 19,900 SDT of naval vessels, 2,000 GRT of merchant vessels, and considerable production of components for other plants. Employment in 1951 is estimated at 15,000 workers.

Lower production in 1952 and 1953 probably can be attributed to the omission of this shipyard from the program of building coastal destroyers and destroyer leaders. Possible construction of submarines now may be under way.

Further continued development in this yard can be expected until it becomes capable of maintaining any northern fleet that the USSR is likely to establish, with the possible exception of repair of underwater damage to large vessels. It is believed that repairs would be carried out in the graving docks in Rosta in preference to dismantling masts and structure above the 112-foot line as would be required to dock vessels in Molotovsk. *

The location of the shipyard is of strategic importance. It is one of the few large shipbuilding centers that has access to open sea through Soviet-controlled waters. Except in the most severe winters the approaches can be kept open to navigation. Very little foreign trade passes through the port, because nearby Archangel is the principal seaport for the area. Any construction within the large covered shipbuilding docks remains hidden until nearly ready for trials.

* The height of the entrance to the large covered building docks is estimated at 124 feet. It is assumed that the keel of a cruiser when afloat is 10 feet above the dock floor and that there is a 2-foot clearance at the top. This leaves 112 feet which may be occupied by vessel structure and uprights.

The shipyard is well developed and well coordinated, but is vulnerable with respect to its physical location. It is located about 1,000 miles from the principal industrial centers of the USSR. Transportation to the shipyard consists mainly of the Archangel-Vologda railroad line and to a small extent the Baltic-White Sea Canal, which is open to navigation only 6 months of the year. Heat and power are obtained from the single plant adjoining the shipyard. For a full production program, industrial labor would have to be recruited from the central and southern parts of western USSR because there are few heavy industries in the area of Molotovsk. The chief economic hazard of the shipyard is the question of an assured flow of raw materials and components produced by other industries.

I. Introduction.

This report on Molotovsk Shipyard No. 402 is one of a series of Soviet shipyard studies made in an effort to better assess the capabilities and importance of the Soviet shipbuilding industry.

II. Name and Location. 1 /*

Molotovsk Shipyard No. 402, also known as Naval Dockyard No. 402, Molotovsk Naval Yard, Russia Naval Shipyard No. 402, or as Zavod No. 344, is situated north of the city of Molotovsk, Archangel Oblast, in Economic Region Ib.**

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* Footnote references in arabic numerals are to sources listed in Appendix C.

** The term region in this report refers to the economic regions defined and numbered on CIA Map 12048.1, 9-51 (First Revision, 7-52), USSR: Economic Regions.

The shipyard lies on the southern shore of the Nikol'skoye Ust'ye, which empties into the Dvinskaya Guba, the southeastern arm of the White Sea.

The harbor and shipyard are entered through a dredged channel with a length of 5 nautical miles and a width of 180 feet. Because of rapid silting, constant dredging is required to maintain a depth of 27 to 30 feet.

Tides are semidiurnal. Mean high water springs rise 3 feet and mean high water neaps rise 2.5 feet.

The shipyard, including the area of the main electric power plant, extends in an east-west direction along the Nikol'skoye Ust'ye about 9,600 feet and extends inland about 3,000 feet. It covers an area of approximately 566 acres.

It is believed that weather conditions are similar to those in Archangel, where the mean annual temperature is 32.3°F, with an absolute maximum temperature of 94°F in July and an absolute minimum of minus 49°F in January.

The shipyard is about 19 miles west of Archangel. A single-track railroad of standard Soviet gage leads to Isakogorka, about 20 miles southeastward on the Archangel-Vologda railroad line, where there are large classification yards. Another single-track railroad line, probably standard Soviet gage, leads eastward through Rikasikha to Archangel. The dirt road leading east to the Archangel area is usable in winter only. A 2-lane plant road connects the commercial port with the city. Other roads are unimproved and in poor condition.

III. History and Organization.

1. History.

The shipyard, the harbor, and the town of Molotovsk date from the middle 1930's. The shipyard and the harbor have been built on land largely reclaimed from the Nikol'skoye Ust'ye. Nothing previously existed in the area except a few fishermen's huts and the old Nikolsky monastery.

Construction of the harbor and shipyard began in 1937, probably as a result of a decision in 1933 to build a large Soviet Northern Naval Fleet. It is believed that the plans were to develop a shipyard for the construction of new vessels to support such a fleet. In view of the secret prewar collaboration with Germany, it is probable that the advice and technical assistance of German engineers who had experience in building the shipyard at Wilhelmshaven were placed at the disposal of the USSR for the building of Molotovsk Shipyard No. 402.

Following the war the shipyard at Wilhelmshaven was dismantled and its machinery transported to the far north in Soviet ships. There seems to be little doubt that the destination of part of this equipment was Molotovsk. 3/

Work on the shipyard continued until 1941, when it was halted by the war. During the war the town suffered some damage, but the damage to the shipyard was slight. Building resumed in the shipyard in 1947. 4/ Figure 1 and Figure 2* show the layout of the shipyard and the arrangement of facilities. The transverse building ways shown as points 21 and 39 on the chart of the shipyard were completed and in use before and during the war. The large covered building docks and launching basin shown as points 28, 29, and 35 were not complete and operational until 1949.

Labor camps of many political prisoners were set up nearby to supply the labor force. Following the war a few prisoners of war also were employed. It was reported that from 15,000 to 20,000 forced workers were employed in the expansion of harbor and shipyard installations after the war. 5/

Construction of new buildings and facilities may be under way. It is believed that development will continue until the shipyard is capable of maintaining any northern fleet the USSR is likely to establish.

2. Organization.

Before 27 April 1954 Molotovsk Shipyard No. 402 was under the

* Figures 1 and 2 follow p. 70.

jurisdiction of the Third Chief Directorate of the Ministry of Transport and Heavy Machine Building. 6/ The combined ministries were returned to their former status as individual ministries following the reorganization of April 1954. It is assumed that Molotovsk Shipyard No. 402 is again under the Ministry of the Shipbuilding Industry and subordinate to the chief directorate in charge of plants producing submarines and large warships.

IV. Importance.

Molotovsk Shipyard No. 402 is the largest and most important shipbuilding center on the north coast of the USSR. It was originally designed for the production of naval vessels and for work beyond the capacity of Rosta Shipyard in the Kol'skiy Zaliv (Kola Inlet). Except in unusual winters, approaches to the yard can be kept open to navigation. 7/

The Soviet Navy, required by geographic restriction to maintain a separate fleet for each coastal region, has developed separate basing, shipbuilding, and repairing facilities for each fleet. Construction and repair for the North Sea Fleet is handled, within its limitations, by Molotovsk Shipyard No. 402.

The covered and heated shipbuilding docks permit uninterrupted construction of large naval vessels of cruiser, battleship, or medium carrier size. These docks are the largest facility of their kind in the USSR, 8/ and, in terms of ability to handle large-sized ships and of equipment and facilities, the docks are probably the best in the USSR. Its foundries and shops produce hull and machinery components for ships built throughout the USSR.

This yard is one of the few large shipyards that has access to open sea through Soviet-controlled waters. The shipyard is exceptionally well screened from observation by commercial vessels trading in Molotovsk. Very little commercial shipping passes through the port, which is about 1 mile from the shipyard. Also, any construction under way in the covered ways remains hidden until it is nearly ready for trials.

V. Buildings and Facilities.

The charts of the shipyard, developed from enlarged aerial photography 9/ but revised to agree with various intelligence reports, are believed

to present a reasonably accurate picture. Some of the buildings plotted from aerial photography remain unidentified. A key to the buildings and facilities that have been identified will be found on Figure 1.

Construction of the shipyard began in 1937. For the most part the buildings are of permanent construction, with masonry walls, metal and composition roofs, steel-supported roof structures, and overhead crane supports. 10 /

Intrayard transportation is chiefly by railroad. As can be seen on the chart of the shipyard, the shops, shipbuilding ways, docks, and outfitting quays are well served by railroads. Trackage is generally standard Soviet gage so that freight cars may be shunted directly into shops, shipbuilding ways, and outfitting quays without transshipment of freight. The shipyard is protected on the land side by a fence. Reports as to the type of construction vary from masonry to wood topped with an electrified wire. All entrances are guarded by armed guards and entrance is by pass only. 11 /

Descriptions of the shipyard's building, equipment, and facilities were obtained from many reports. The equipment is listed as reported, even though it may be considered inadequate to perform the operations indicated by the designated use of the buildings. Although the majority of sources had very little knowledge of the installed equipment, it is believed that the designated use of the buildings is fairly accurate.

1.* Gasoline Storage Tanks.

The gasoline storage tanks are about 20 feet in diameter by 26 feet high. 12 /

* The identifying numbers for this section correspond to those found in Figure 1. Certain numbers have been omitted because nothing is known about the buildings they identify other than their probable use.

3. Pumping Station for Subterranean Oil Depot.

The pumping station for the subterranean oil depot is a single-story building equipped with diesel pumps.

4. Subterranean Oil Depot.

The subterranean oil depot is an undergound tank, approximately 196 feet long by 26 feet deep (width not given). It is used for the storage of oil. As the source mentioned a steam line in connection with the pipes attached to the oil depot, it is probable that the stored oil is fuel oil of the viscosity of bunker-c.

6. Pipe Shop.

The pipe shop contains a copper smithy, valve-testing equipment, pipe-bending equipment with sand-filling installation for pipes, an electric welding department, a plumber's shop, several small forges, lathes, two overhead trolley hoists in each b bay, and pipe racks. In bay a there are administrative offices, the foreman's office, tool issue rooms, material issue rooms, an electric shop which occupies part of three floors, and the mess hall. The plant is equipped with steam, compressed air, and water service. The shop produces valves and pipes, and it has been reported that crew lockers were manufactured and that some joiner work was done here. 13/

11. Pumping Station for Launching Basin.

The pumping station for the launching basin is a 2-story building containing six 200-horsepower (hp) electrically-driven pumps, which are reported to be capable of filling the basin to its maximum capacity in 18 hours. 14/

15. Launching Basin Gate.

The clear width of the entrance to the launching basin is estimated at 150 feet. A single-piece floating caisson is warped into position to form a watertight lock so that the basin may be flooded to a height necessary to launch or dock vessels in the covered building docks. The caisson is approximately 70 feet high and 12 feet wide at the top. In each of the basin wall ends, which form the piers to receive the caisson, are located 3 rows of 2 openings each in the west face of each pier and the same number within the entrance, facing north and south, respectively, but located west of

the caisson. These openings are about 6 feet by 8 feet by an unknown depth. Electric motors of 100 horsepower were installed in some of the openings. 15/ It is believed that some of these openings are for the purpose of draining the flooded basins and that others house the motors that operate the flood gates and possibly the warping winches which position the floating caisson.

21. Transverse Building Ways.

The approximate length of the transverse building ways is 925 feet. The inland depth is difficult to determine. It was reported that 10 ways, each 820 feet long, were planned, of which only 7 were completed by 1944. 16/ Apparently these ways were planned for the serial construction of destroyers and smaller craft. The 1944 aerial photographs show that 3 parallel building areas exist, which would give an effective building width of 55 feet between the rail tracks and the water and 70 feet between rail tracks for each of the 2 inland areas. The rail tracks crossing the building ways could also serve mobile cranes. Vessels constructed on these ways are side launched directly into the water.

Before the completion of the large covered building docks and the large launching basin in 1949, these ways, together with the one at point 39, were the only areas in which ships were constructed. It is not known whether or not they still exist, but it seems reasonable to believe that small craft still may be built or submarine sections assembled during the summer months. No heavy lifting facilities have been observed in this area. Two 2-arm mobile cranes of unknown capacity were observed in 1949, which are believed to have been used also in conjunction with the outfitting quay, point 16. 17/

26. Open Area.

The open area at point 26 was reported to be swampy and overgrown with reeds. 18/ There was no indication of yard expansion in this area, although, the building of graving docks or additional covered building docks north of the existing covered area is considered logical.

27. Large Basin Walls.

For the most part the walls of the large basin are an earthen dam sloping on both sides and surfaced on top for a width of 20 feet with

precast concrete slabs. The outside slope of the dam is seeded, probably to prevent erosion and the inside slopes are faced with rock. The top of the dam is estimated to be about 33 feet above the level of the southern floor of the basin, point 29. Reports conflict as to the existence of a gate in the eastern wall, opposite the main basin entrance. The construction of this eastern wall is somewhat different. It is reported to have been made up of a network of wooden beams, but the existence of a gate is doubtful. The part of the wall forming the main entrance piers, point 15, and the slots into which slide the gates of the covered building docks are of concrete. The earthen dam was begun before World War II and completed in 1948. 19/

28. Launching Basin, North.

The final excavation of the north launching basin was made in the summer of 1948 although the sand bar lying to the west and in way of the basin entrance was not removed until the summer of 1949. The basin was excavated to a depth of about 33 feet below the water level of the Nikol'skoye Ust'ye. The floor of this basin was covered with gravel 12 inches thick. 20/ This basin is normally flooded level with the Nikol'skoye Ust'ye except during launching or docking operations, during which the water level is raised to the required height.

29. Launching Basin, South.

The floor of the south launching basin is about 7 feet below the shipyard ground level and about 7 feet above the water level in the north basin. The floor of this basin is sloped slightly toward the north basin. In front of the building docks, however, it is practically level with the dock floor. This basin is dry at all times except when the basin is flooded for launching or docking vessels.

From a point near the entrance to the southern half of the south building dock and running westward for the full length of the basin floor are 2 sets of steel rails set in concrete about 12 feet apart flush with the basin floor. These rails carry the launching cradles on which vessels differing in size but including destroyers are moved from inside the south dock into the launching basin. (See point 30). The remainder of the basin floor is covered with gravel. 21/

North and south of the cradle tracks and at right angles to them are installed concrete skids or bearers surfaced with 12-inch-thick timbers. The height of the bearers above the basin floor is about 20 inches. On the south side the bearers are about 13 feet long, and those on the north are about 78 feet long. Their use is not known, but it is thought that they may be used for temporary docking and possibly for multiple launchings by skidding newly built vessels onto the bearers before flooding the basin. (See point 32.)

As both the north and south docks were used to construct vessels in 1951, it is probable that similar launching cradle tracks were installed to serve the north dock.

The layout of the 2 basins, points 28 and 29, would indicate that a wider use of the south basin was contemplated than the floating of vessels into and out of the building docks. It is considered feasible that this basin may be developed to dock vessels for underwater inspection and repair of hull, propellers, and tailshafts and, with the installation of lifting facilities, to effect repairs.

30. Tracks for Launching Cradle.

See the description under 29, above.

31. Bollards.

Secured to the top of the basin wall are a number of bollards.

32. Bearers.

See the description under 29, above.

35. Covered Shipbuilding Docks. *

The covered shipbuilding docks are the largest facility of this kind in the USSR. The main building is about 1,240 feet long by 450 feet wide with an over-all height excluding skylights of 150 feet. The building

* See Figure 2, following p. 70.

is heated so that work can proceed during the winter months uninterrupted by extreme weather conditions. At the eastern end there are two annexes, d and e, which probably contain light machine and assembly shops on the first floor and administrative and engineering offices on the upper floors.

The main building is divided into 3 main divisions, the 2 shipbuilding docks a and b, and the subassembly area c. Each of the shipbuilding docks is surrounded on 3 sides by a concrete wall approximately 30 feet high. The fourth side or entrance can be closed by a watertight gate. Each dock is watertight and can be flooded to the top of the wall. Both docks can be flooded simultaneously or singly, as required. Section c is a subassembly area approximately 230 feet wide. Four railroad tracks run the full length of the building, 2 between the docks and the outside walls of the building and 2 through the center passage between the docks. Crane rails are installed on top of the dock walls and continue over similar support for the length of the subassembly area ahead of the building docks. Each building dock and assembly area is served by 2 gantry cranes, 1 of 100-ton capacity and 1 of 25-ton capacity. Twelve trolley hoist tracks run the width of the building, one under each skylight. Each track is mounted by two 8-ton trolley hoists.

The entrance to each dock, point f, is 150 feet wide by 124 feet high. The entrance doors are probably sectional in construction. The lower section is in 1 piece 30 feet high by 150 feet long and designed, when closed, to form a watertight end of the dock. This lower section, when opened, slides on 3 rails into concrete slots in the basin dam. The upper section of each door is about 94 feet high by 150 feet wide and is suspended from overhead tracks.

Entrance into the building docks from the passages and subassembly area is by means of watertight openings, eight in each dock.

The launching and docking of vessels is a somewhat unusual procedure although it is similar to the procedure of the Komsomol'sk Shipyard on the Amur River. There are two procedures used in launching. The first is used when one or more vessels are constructed in one dock and all are ready for launching. Then the basin gate, point 15, is closed, and basins 28 and 29 and the shipbuilding dock are flooded to a height sufficient to float the vessel or vessels. Each vessel is then moved from the shipbuilding dock to basin 28, where it remains until the water level is lowered equal to that of the outside channel. The basin gate, point 15, is then removed,

and the launching procedure is completed. The second launching procedure is used when 2 or more vessels are building in 1 dock and are in various stages of completion. The construction schedule is set up so that the vessel occupying the southwest corner of the dock is the most advanced. When this vessel is ready for launching, it is moved from its position in the building dock to basin 29 by means of a launching cradle mounted on the steel rails, point 30. The cradles are towed by cables which run over the drums, mounted on top of the basin wall, point 33, to the winch house, point 13. The gate of the building dock then is closed and made watertight, and basins 28 and 29 are flooded to a height sufficient to float the vessel. The vessel then is moved out of the basins as described before.

39. Transverse Building Ways.

The "Artillerist" class subchasers, which are about 160 feet long, were built on the transverse building ways during World War II. One report indicates that the caisson gate for the large launching basin, No. 15 on layout, was constructed at this point. 22/

40. Workshop.

The two-story building at point 40 on the chart is probably a workshop or an assembly shop for vessels under construction on transverse ways, point 39.

43. Wharf.

The wharf may possibly be used for the loading and unloading of stores and cargo, where they are handled by the ship's own facilities. No wharf-stationed lifting facilities have been reported.

75. Fabrication and Subassembly Shop.

The fabrication and subassembly shop is the principal hull steel fabrication shop in the shipyard. Small subassemblies are made here and transported by rail to the shipbuilding docks and ways. 23/ Radio and radar equipment shops also are located in this building. It is believed that a mold loft may be located on an upper floor.

107. Machine Shop.

Section a of this shop probably contains small shops and tool rooms on the first floor and administrative offices on the second and third floors. Section b contains an electric repair shop, the chief mechanic's office, milling machinery, steam hammers, and a forge. Section c contains several lathes for machining propeller shafts up to 40 feet long, drill presses, a number of smaller lathes, and a ship fitters shop. Section d is a loading and unloading area. One or 2 small 7- to 15-ton capacity overhead traveling hoists serve each of the b and c sections. 24/

109. Machine Shop.

The southern transverse section houses the mechanics', the electricians', and carpenters' shops on the first floor, the mess hall on the second floor, and the administrative offices on the third floor. The main shop houses milling machines, drill presses, and a number of small lathes. The main shop is divided into 5 sections, each of which is served by one or two 7- to 15-ton capacity overhead traveling cranes. 25/

110. Machine Shop.

The machine shop at point 110 is probably also used as a dressing shop for castings. One report states that anchors and propellers are finished here. 26/

112. Forge and Machine Shop.

The south end of the building listed at point 112 is two stories high and houses administrative offices. The main shop is a forge and machine shop containing a number of lathes and boring machines, most of which are new and of German manufacture. Large BITIER lathes installed in this shop are reported to be capable of machining naval gun barrels. This shop is reported to be capable of producing naval guns of small caliber up to 7.1 inches. It is also reported that flanges, turbines, and electric generators are produced here. 27/ It is believed that turbines and generators may be assembled rather than manufactured here.

113. Boiler and Machine Shop.

The boiler and machine shop was built after the war. The southern end contains administrative offices. The western half of the main shop is an assembly area with a wood-surfaced concrete floor. The eastern half has about 30 heavy machinery installations. The north end is a loading and unloading area. The main shop and loading areas are served by overhead traveling cranes of 45-ton capacity in the loading area and 17-ton and smaller capacity in the main shop. 28/

114. Steam Plant with Probable Machine Shop Addition.

The northern part of the steam plant houses the steam generating and compressed-air machinery. The southern part is believed to have been constructed since the war.

116. Foundry and Forge.

The building at point 116 contains two coke-fired melting furnaces. It also contains reheating furnaces and steam presses which forge propeller shafts. 29/

117. Foundry.

The foundry was probably completed in 1951.

118. Fabrication Shop.

The shop at point 118 was reported to be a rolling mill. 30/ It is possible that steel plates and shapes are rolled here, but it is believed unlikely because of the great distance from steel ingot production. The source may refer to plate-straightening or bending rolls, in which case the shop may have reheating furnaces. The shop is probably a hull-fabrication shop.

130. Electric Power and Heating Plant.

The capacity of the electric power and heating plant is reported to be 50,000 kilowatts. 31/ Although this plant appears to be separate from the shipyard proper, it has been included among the facilities because it is the chief source of electric power and possibly of steam heat for the shipyard.

Cranes.

Very little information has been received relative to lifting facilities for the outfitting piers, points 16 and 2, for the transverse building ways, point 21, and for general use throughout the shipyard. A 10-ton floating crane and two 2-armed cranes, however, were observed near point 16. It has been reported that two floating cranes are stationed at the commercial port. One is a self-propelled crane of 150-ton capacity and the other of 50-ton capacity is mounted on a dumb barge. 32 / These floating cranes could very well serve the shipyard also because it is doubtful that commercial trade through the port requires the full-time use of the cranes.

VI. Production.

There are no data available that can adequately reflect the capability of the shipyard or of the associated shops during the period 1949-54 to produce either naval or merchant vessels. The construction of this new shipyard began in 1937 and with the exception of the war years, during which all construction practically ceased, has been in a progressive state of development.

A. Ships.

Until the summer of 1949 the only building ways from which ships could be launched were the transverse ways shown at points 21 and 39 on the shipyard chart. On these ways no ship larger than the O-class destroyer was built. Although no confirmation is available of the number of ships, the following types of vessels were reported to have been built on these ways: destroyers (probably O class), subchasers (probably Artillerist class), submarines (probably SHCH and M classes), and medium and small war and merchant vessels. In 1949 it was reported that a series of "escort vessels," 50 to 65 feet long by 16-to 20-foot beam each having 2 propellers were being constructed in the shipbuilding dock. The construction time of these vessels was reported as 3 months each with a reported planned program of 16 per year. 33/ It is believed that the reference is to the transverse building ways rather than to the large covered shipbuilding docks, shown as point 35, because the report refers to the large shipbuilding docks as the "concrete drydock."

In the summer of 1949 the launching basin to the large covered shipbuilding docks was completed and made operational. This development enabled the shipyard to extend its capacity to the building and launching of vessels of battleship or carrier size. Before the completion of the basin, no vessel could be launched from the large building docks. Several reports, however, state that 2 battleships were laid down in these docks, 1 in 1940 and 1 in 1941. Other reports state that only 1 battleship of 45,000 to 50,000 SDT was under construction and that it was building in the south dock. It is believed that the latter reports are probably true, because the 25- and 100-ton gantry cranes had not been installed in the north dock until 1949. After the war the USSR apparently abandoned the battleship program, and the hull in the south dock was completely dismantled by the early part of 1948. 34/

Following the dismantling of the battleship, the Molotovsk shipyard, along with 3 other shipyards, one in each major fleet area, began the construction of an improved class of destroyer known as the "Modified O" or "Skoryy" class.

Table 1* shows what is believed to be the principal naval and merchant vessel production, modernization, and repair at the Molotovsk shipyard from 1948 to the date of this report. Tonnage figures reported are an estimate of tons produced within each 12-month period and are not necessarily synonymous with the number of vessels delivered.

The nature of the work listed in Table 1 and the apparent completion date of each vessel indicate that the work was accomplished inside the heated covered building docks. Several reports state that destroyers were under construction in the south dock in 1948 and 1949.

In addition to the projects listed in Table 1 there are reports of other production.

[redacted] 36/ These are unidentified projects which may be small craft construction or repair contracts. As stated earlier in this report, such work as small craft construction and possibly barge building would probably be done on the open transverse building ways in the northern part of the shipyard.

* Table 1 follows on page 21.

The production listed in Table 1 was derived from an analytical study

that the Molotovsk shipyard was one of the four shipyards building the Skoryy class destroyer. Also it showed that this program continued over the period shown in Table 1.

Using the date of the first appearance of a destroyer as evidence that the vessel had been delivered by the shipyard, together with a knowledge of the building facilities within the shipyard, provided the basis whereby production rates were determined. With the exception of the four destroyers delivered in 1949, the production time required for each destroyer is estimated as 12 months. The two railroad car ferries built by the shipyard are believed to be the Chulim and the Severny, which made the trip from Archangel to the Black Sea in October 1953. 37/ the destroyer modernization program, was similar to the program under way during the same period in Plant 202, the shipyard at Vladivostok. The class of destroyer or the number involved is not known. The modernization is believed to be quite extensive as considerable time was allotted to this project.

Sufficient information is not available to state conclusively that submarine construction is an actuality. It is highly probable that ocean patrol submarines of either or both the "Z" or "W" classes will be constructed at Plant 402, as this program is under way in the three other major fleet areas.

Up to the date of this report, with the exception of the dismantled battleship, no construction larger than the Skoryy-class destroyer has been reported under construction at any place in the shipyard.

Vessels of destroyer size and smaller built in the covered shipbuilding docks can be essentially completed before launching. Because of the great height of the entrance to the docks, such items as the stacks, superstructure, and masts, can be erected before launching. It is believed

that complete fitting out including all naval ordnance is accomplished within the dock. Immediately following the floating of the second destroyer in the south basin, smoke was observed coming from the stacks, indicating that steam was being generated, and the conclusion may be drawn that only dock and sea trials remained to be accomplished. 38/

B. Repair of Ships.

There is little indication of extensive ship repair activities. During the years 1946 to 1949 a vessel of cruiser size was undergoing an undetermined amount of conversion at the fitting-out quay, point 16 on Figure 1. The destroyer Gremyashchiy, probably a Gnevnyy-class destroyer, reported burned out during the war, was also rebuilt in the shipyard. This destroyer was moved into the north dock of the large covered shipbuilding docks in October 1949. 39/

No heavy lifting facilities were observed at any of the quays to indicate that major repair or fitting out could take place in the open.

The only facilities which can adequately accomplish major hull and machinery repair or overhaul are the large covered docks. Large vessels can be docked in the covered docks only after all top masts and structure above the 112-foot line have been dismantled.

C. Shops.

The shipyard is well equipped with machine shops, fabrication and assembly shops, foundries, and forges. All hull fabrication, including submarine hull fabrication is believed to be accomplished in the shipyard. 40/

In addition to supporting the shipbuilding and ship repair activities of the shipyard, the various shops produce much equipment for other shipyards and industrial installations. Table 2* lists the more important production for outside consumers.

The production shown in Table 2, , probably reflects only a portion of the over-all plant support of other shipyards and industrial installations. Much of the equipment furnished Plant 199 for the Skoryy destroyer program, the coastal destroyer program, and the car ferries, was in connection with the Interfactory Cooperation Plan (Mezh

* Table 2 follows on page 27.

Zavodskoye Kooperirovaniye -- MZK).

no information is available on which to assess the component production for the western Soviet shipyards. The principal products furnished by Plant 402 for the Skoryy program at Plant 199 were hull components consisting of stem and stern frame castings, propeller struts and shaft tubes, rudders, and chain and hawse pipes. It is highly probable that Plant 402, under the MZK plan for the Skoryy program, furnished the 31 destroyers built in Plants 190 in Leningrad and 445 in Nikolayev with specialized products such as it furnished for the 40 destroyers built in its own plant and at Plant 199.

indicate that Plant 402 will furnish Plant 199 with components for within the same general category as those furnished for the Skoryy destroyers.

The shipyard has fine machine shops, and its progressive development indicates that the yard will assume a greater portion of the manufacture of the end products than previously possible. Therefore, past production records are of relatively little importance in assessing the over-all value of the shipyard.

VII. Labor.

Reports up to late 1949 as to the number of shipyard employees range from 5,000 to 14,000 employees. 41/ During this period the shipyard was engaged in producing ships, erecting shops, installing machinery, and building the large launching basin.

The employees in the immediate postwar years were mainly forced laborers, many of whom were women, and a few prisoners of war. A small number of Soviet free civilians were employed as engineers in charge of shipbuilding.

Three shifts, composed of 1,200 employees each, were used in the large, covered shipbuilding docks in 1949, when 4 destroyers were under construction in the south dock and no work was under way in the north dock. Each shift included 150 naval personnel, most of whom were skilled workers; 16 apprentices; 30 free civilians who were in charge of shipbuilding; and 1,000 forced laborers. Work in most of the production

Table 1

Production, Modernization, and Repair of Principal Naval and Merchant Vessels of Molotovsk Shipyard No. 402 1948 to April 1954 42/

Year	Type of Work	Production	Production in Equivalent Vessel Units	Vessels Completed and Delivered	Remarks
1948	Destroyer Construction	3,000 SDT	1.0	0	Four destroyers were laid down in 1948.
1949	Destroyer Construction	12,000 SDT	4.0	4	Four destroyers laid down in 1948 were delivered and 4 new keels laid down.
	Destroyer Reconstruction				The Gremyashchiy, a war-damaged destroyer, was being rebuilt.
1950	Destroyer Construction	16,200 SDT	5.4	4	Four destroyers laid down in 1949 were delivered and 7 new keels laid down.
	Destroyer Reconstruction			1	Gremyashchiy probably completed.
1951	Destroyer Construction	19,900 SDT	6.6	6	Six destroyers laid down in 1950 were delivered. The completion of the seventh destroyer was believed delayed for unknown reasons. Four destroyer keels were laid down

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Table 1

Production, Modernization, and Repair of Principal Naval and Merchant Vessels of Molotovsk Shipyard No. 402
1948 to April 1954 42/
(Continued)

Year	Type of Work	Production	Production in Equivalent Vessel Units	Vessels Completed and Delivered	Remarks
1951	Railroad Car Ferry Construction	1,925 GRT	0.7		Keel for one car ferry believed laid down in early 1951
1952	Destroyer Construction	9,900 SDT	3.3	5	Five destroyers were delivered -- four laid down in 1951 and 1 probably delayed from 1950. Probably three destroyer keels were laid down.
	Railroad Car Ferry Construction	2,751 GRT	1.0	-	One car ferry was believed completed and the keel of a second one believed laid down.
	Destroyer Reconstruction			N.A	Believed to be a destroyer-type vessel or vessels undergoing extensive modernization.

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Table 1

Production, Modernization, and Repair of Principal Naval and Merchant Vessels of Molotovsk Shipyard No. 402
1948 to April 1954 42/
(Continued)

Year	Type of Work	Production	Production in Equivalent Vessel Units	Vessels Completed and Delivered	Remarks
1953	Destroyer Construction	5,000 SDT	1.7	3 (probably)	The three destroyers believed laid down in 1952 were probably delivered in late 1953.
	Railroad Car Ferry Construction	825 GRT	0.3	2	The second car ferry probably completed.
	Destroyer Reconstruction			N.A.	modernization was probably completed late in year; number of vessels involved in this program unknown.
	Submarine Construction (Possible)			N.A.	Submarine construction of unknown number of vessels is believed to have gotten under way in last half of year.
	Submarine Outfitting		3.0	3	The Gor'kiy-built ocean patrol submarines received final outfitting in late 1953.

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Table 2

Production Other Than Ships of Molotovsk Shipyard No. 402
to April 1954 43/ a/

Year	Plant Receiving Item	Item	Remarks
Through 1948	No. 199, Komsomol'sk	Anchors, heaters, pressure regulators for turbo-oil pumps, propeller shaft stern tube bushings, propeller shaft bracket tubes, propeller shaft brackets, stem and stern frame castings, chain pipes, chain pipe covers, and miscellaneous shipboard equipment and hull components.	With the possible exception of the anchors, heaters, and pressure regulators, the items listed are believed to be furnished for the 3 Skoryy-class destroyers under construction at Plant 199.
	No. 201, Poti	Composite rollers.	Identification and use unknown.
1949	No. 199, Komsomol'sk	Oil coolers, copper and steel tubing, deck plates, quick release fastenings, oil filters, watertight hatch covers, hawse pipes, propeller shaft stern tube bushings, propeller shaft brackets, rudders, stem and stern frame castings, turntables, miscellaneous shipboard equipment, and hull components.	Evidence indicates continued production for the Skorry-class destroyers, of which 5 are under construction at Plant 199.
	No. 369, Sretensk, Kokui	Cranes and watertight hatch covers.	Probably used on small merchant vessels.
	No. 83, Khabarovsk	Steam engines and boilers.	Plant 83 was under contract to Plant 1950 in Leningrad to build railway cranes. Steam engines and boilers for these cranes were furnished Plant 83 by the Molotovsk shipyard. From a transport and geographical point of view this seems highly uneconomical.
	Antarctic Flotilla (Shipped to Odessa)	Shaft.	Unidentified shaft for whaling vessel Slava No. 10.

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Table 2

Production, Other Than Ships, of Molotovsk Shipyard No. 402
to April 1951 43 / a /
(Continued)

Year	Plant Receiving Item	Item	Remarks
1950	No. 199, Komsomol'sk	Chocks, couplings, quick release fastenings, oil filters, hinges, hull castings, propeller shaft brackets, rudders, shock absorbers, shoes, and miscellaneous shipboard equipment and hull components	Evidence indicates continued production for the Skoryy-class destroyer, of which 6 are under construction at Plant 199.
	No. 369, Sretensk, Kokui	Cranes and miscellaneous shipboard equipment	Probably used on small merchant vessels.
	No. 263, Sovetskaya Gavan	Cranes	End use not known.
	No. 368, Khabarovsk	Shock absorbers	End use not known.
	No. 83, Khabarovsk	Steam engines and boilers	Evidence indicates that more than 17 sets were required of the Molotovsk shipyard. Some of these may not have been produced until 1951.
1951	No. 199, Komsomol'sk	Shaft coverings	It is believed that Plant 402 continued to produce the components listed earlier in this table for the 4 Skoryy-class destroyers under construction in Plant 199.

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Table 2

Production, Other Than Ships, of Molotovsk Shipyard No. 402
to April 1954 43/ a/
(Continued)

Year	Plant Receiving Item	Item	Remarks
1951	No. 199, Delivery Base of Komsomol'sk at Vladivostok	Life Rafts	Skoryy-class destroyers built at Plant 199 receive final outfit at the delivery base in Vladivostok. These rafts were designated for this program.
	No. 202, Vladivostok	Propellers	Probably refers to ship propellers.
1952	N.A.	N.A.	No information is available indicating ship production. The Skoryy-class destroyer program was completed in Plant 199, and 2 new destroyer types and a class of railroad car ferries were begun. It is believed that Plant 402 continued as a supplier of components for this new program as indicated by several messages in 1953. Three coastal destroyers, [redacted] and one or more car ferries were laid down in Plant 199.

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Table 2

Production, Other Than Ships, of Molotovsk Shipyard No. 402. to April 1954 43/ a/
(Continued)

Year	Plant Receiving Item	Item	Remarks
1953	No. 199, Komsomol'sk	Steering engine, stern frames, brackets (possibly propeller shaft brackets), and unidentified ship components	Plant 402 supplied equipment for a class of coastal destroyer, and for a class of railroad car ferries currently building at Plant 199. Four additional Pro'ekt 50 vessels are under construction in Plant 199.
	No. 340, Delivery Base at Baku	Set of KVS-10 boiler tubes	Believed for , a class of large subchasers.
1954	No. 199, Komsomol'sk	Propeller struts	For a new class of destroyer, possibly destroyer leader.

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shops and covered building docks during the years 1946 through 1949 was reported being carried on in 3 shifts. 44/

Shipboard electrical work including marine communications is done by two trusts which apparently operate independently of but coordinate their work with the shipyard. These two trusts, the Marine Electrical (Elektromortrest -- EMT) and the Marine Communications (Svyaz'mortrest -- SMT) are responsible for specialist work and maintain their own labor units.

A theoretical but realistic program for the construction of naval vessels in the shipyard (see Table 10*) indicates that 38,750 tons can be completed annually. This production would require a labor force of 13,000 direct** employees on a 1-shift basis. Assuming that this direct force is 75 percent of the total employment, the total shipyard force required would be 17,400.

In calculating the number of direct employees, the figures in Table 3 showing the number of man-hours required in the US to construct certain types of naval vessels were used. 45/

Table 3

Man-Hours Required to Construct Naval Vessels in the US

Type of Vessel	Tonnage (SDT)	Total Man-Hours per Vessel	Man-Hours per SDT
Subchaser	240	200,000	833
Cruiser	14,000	7,465,000	533
Destroyer	2,600	2,160,000	830
Submarine	1,480	1,400,000	945
Submarine	587	600,000	1,022

* Table 10 follows on p. 55.

** Direct employees are personnel whose labor is directly chargeable to a specific ship; indirect employees are personnel engaged in management, clerical work, maintenance, and the like.

The productivity of the free Soviet shipyard worker is assumed comparable to that of the US worker. No factor of relative efficiency was therefore used. The continued use of forced labor in Soviet production shops and shipbuilding facilities would, however, make doubtful the estimated production rates and the adequacy of the estimated total number of employees.

The working year (man-year) in the USSR is 278 days or 2,224 working hours. On this basis the direct labor required to yield the possible production of 38,750 SDT of naval construction is shown in Table 4.

Table 4

Estimated Number of Direct Employees Required to Construct Soviet Naval Vessels

Type of Vessel	Class	Tonnage (SDT)	Direct Employees
Submarine	Z	5,250	2,226
Submarine	W	3,120	1,327
Subchaser	Artillerist	4,500	1,685
Cruiser	Sverdlov	14,000	3,355
Destroyer	Skoryy	12,000	4,478
Total		38,750 to 38,870	13,071

A probable program for the construction of cargo vessels in the shipyard (see Table 11*) indicates that 73,400 GRT can be completed annually. Using a US factor of 175 man-hours required to produce 1 GRT of cargo construction, the annual program would require 5,800 direct

* Table 11 follows on p. 56.

employees working on a 1-shift basis and a 2,224-hour man-year. The total labor force for the yard would be 7,700 employees.

As no information is available as to the total number of current employees, an estimate is made in Table 5* of employment for the year 1951. This year was selected because the greatest known tonnage was produced in that year, and therefore employment would represent availability and may possibly represent current employment.

Table 5

Estimated Number of Employees at Molotovsk Shipyard No. 402
1951

Type of Work	Tonnage (GRT)	Direct Employees	Total Employees
Destroyer Construction	19,900	7,426	
Car Ferry Construction	1,925 a/	216	
Other b/		1,346	
Total		8,978	15,000

a. An estimated 250 man-hours per GRT was used instead of 175 man-hours per GRT as these car ferries are more complex than straight cargo vessels.

b. Fifteen percent of the total of direct employees have been estimated to be engaged in the production of components for other plants, miscellaneous repair and small craft construction, capital construction, and the like.

A shipbuilding technical school in Molotovsk offers 4-year courses to both sexes from 14 to 35 years of age. This school trains students to become technicians, mechanics, and technologists in shipbuilding, ship machinery, and metalworking. 46/

VIII. Sources of Power and Materials.

Oceangoing freighters call at the port of Molotovsk, but no estimate of actual tonnage handled by the port is available. Inadequate cargo transfer facilities and poorly supervised and inexperienced personnel frequently delay cargo unloading. The bulk of freight moved into the shipyard is by rail. 47/

Shipyard imports from the interior mainly must be shipped over the double-track Archangel-Vologda railroad line or by inland waterway over the Baltic-White Sea canal, which also connects with the Volga waterway system at Shcherbakov. This inland waterway system is open to navigation from May to October. 48/

1. Power.

Electric power and probably some steam heat is supplied to the shipyard from the municipal power plant located at the eastern end of the shipyard, point 130 on Figure 1. The capacity of this plant is reported to be about 50,000 kilowatts. The estimated consumption of the shipyard is 65 million kilowatt-hours per year with a coincident peak load of 15,000 kilowatts based on a 50-percent load factor. This plant supplies the shipyard, the city of Molotovsk, and part of the city of Archangel with electric power. This power plant is not connected with any major grid system. It is tied in with a small generating plant at Archangel. 49/

2. Materials.

No data are available indicating the amounts of raw, semifinished, or finished materials received by the shipyard. Coke, steel plate, cement, and wood are received in large quantities by rail. Foundry pig iron, steel for forgings, steel plates, and shapes are probably obtained from the Urals and possibly from Moscow and Leningrad. Armor plate is obtained from the Izhora/Kuybyshev Plant at Kolpino. Coal is probably received by rail or water from the Pechora Basin and by water from Novaya Zemlya. 50/

the majority of steel, electrical and electronic equipment, and heavy machinery came from western USSR. Marine boilers were probably produced by the Baltic shipyard in Leningrad, which furnished boilers to Plant 199; propulsion turbines were probably furnished by the Kirov turbine plant in Leningrad, which also furnished turbines to Plant 199. Considerable lighter machinery and much shipboard equipment was furnished by plants in the Far East. Of these plants, Plant 199, the Amur shipyard in Komsomol'sk, was by far the heaviest supplier.

Table 6 * lists the more important items, supplied to Plant 402. Table 6 is not meant to suggest that the items listed were the only items supplied from plants outside the Molotovsk shipyard or that a single reference constitutes the total supply of an item. There is reason to believe that the supplier of each item listed furnished that item for each ship of the same class built at Molotovsk.

Additional suppliers of components, for the Skoryy-class destroyers, may be found involving Plant 199. the Amur shipyard at Komsomol'sk.

the pattern of component supply under the MZK plan would indicate that each of the four shipyards received components from the same plant. The plants listed in Table 7** are listed as possible suppliers only.

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* Table 6 follows on page 40.

** Table 7 follows on page 48.

Table 6

Plants Supplying Molotovsk Shipyard No. 402 with Raw, Semifinished, and Finished Material 51/

Year	Plant Supplying Item	Item	Remarks
Through 1948	Plant at Stalinsk (Kermovo)	Angles and Bars	End use unknown
	Plant at Taganrog imeni Andreyev	Sheet Metal	End use unknown
	Plant at Zestafoni Ferroalloy Plant	Manganese and Electroferro Manganese	End use unknown
	Plant at Leningrad, imeni Vyborzhets	Nonferrous Metal (Probably Copper)	End use unknown
	All-Union Fluorspar Combine, Turga	Fluorspar	Foundry
	No. 651 at Prokop'yevsk, imeni Taraichev	Armatures Motors, Type PN 28.5	Probably for use in EMT Shop
	No. 199, Komsomol'sk	Shipboard Equipment, Preheaters Pumps, Spare Parts	For Skoryy-class destroyers
	No. 231, Ural'sk	Rope (3 tons, 27 mm)	End use unknown. Probably wire ropes approximately 1 inch in diameter.

Table 6

Plants Supplying Molotovsk Shipyard No. 402 with Raw, Semifinished, and Finished Material 51/
(Continued)

Year	Plant Supplying Item	Item	Remarks
1948	No. 515, Arsen'ev	Water Gage Columns	applies to shipboard equipment for Skoryy-class destroyers.
	No. 517, Balkhash	Brass sheet	1,875 kg, 2mm thick End use unknown.
1949	Pump and Compressor Plant, Katajsk	Pumps, Type ESN8 (Drinking Water Pumps)	For Skoryy-class destroyers.
	No. 199, Komsomol'sk	Preheaters, Pipe Sleeves, Manholes (probably with covers), Shipboard Equipment Capstans, Scuppers, Gate Valves Kingston Valves, Ventilator Heads, Dozernye Pumps (ESKN-1) with Electric Motors and Controls	For Skoryy-class destroyers. 1 bow and 1 stern capstan, sher 8, installed on each destroyer.
		Flap valves	For barges

Table 6

Plants Supplying Molotovsk Shipyard No. 402 with Raw, Semifinished, and Finished Material 51 /
(Continued)

Year	Plant Supplying Item	Item	Remarks
1949	No. 4, Krasnoyarsk	Machines	These machines are 37-mm naval guns. There are seven on each Skoryy-class destroyer.
	Marine Electrical Trust Vladivostok	Machine Tools	Probably for use in EMT shop.
	No. 83, Khabarovsk	Jacks	End use unknown. Probably shop equipment.
		Ventilating Fans, type LE 10	For Skoryy-class destroyers.
		Winches with Electric Motors and Controls	
	No. 105, Khabarovsk	Blowers, type TVK-2 and 2A	Probably turbine-driven blowers for boilers in Skoryy-class destroyers.
	No. 446, Nikolayev	Boxes (Yaru)	Probably electrical equipment for Skoryy-class destroyers.

Table 6

Plants Supplying Molotovsk Shipyard No. 402 with Raw, Semifinished, and Finished Material 51/
(Continued)

Year	Plant Supplying Item	Item	Remarks
1949	No. 515, Arsen'ev	Shipboard equipment, Spare Parts	For Skoryy-class destroyers.
		Welding Generators	Probably for general use.
	No. 838, Tomsk	Tachometers, Type TS-100	Probably for Skoryy-class destroyers.
1950	No. 199, Komsomol'sk	Calcium Carbide, Transformers No. 3, 3,000 /100 Volts	For general use.
		Shipboard Equipment, Sea Chests, Bow and Stern Capstans, Air Preheaters, Dozernye Pumps (ESKN-1) with Electric Motors and Controls	For Skoryy-class destroyers.
	No. 83, Khabarovsk	Shipboard Equipment, Ventilating Fans, Gears u/i	For Skoryy-class destroyers.
	No. 77, Barnaul	Diesel Generators	Capacity not given. May be generators for Skoryy-class destroyers.

Table 6

Plants Supplying Molotovsk Shipyard No. 402 with Raw, Semifinished, and Finished Material 51/
(Continued)

Year	Plant Supplying Item	Item	Remarks
1950	No. 105, Khabarovsk	Blowers, Type TVK 2 and 2A	Probably turbine-driven blowers for boilers in Skoryy-class destroyers.
	No. 4, Krasnoyarsk	Machines	Type of Naval gun probably for Skoryy-class destroyers.
	No. 515, Arsen'ev	Shipboard Equipment, Spare Parts	For Skoryy-class destroyers: r
	No. 252, Serpukhov	Apparatus	unidentified electronic equipment. Probably for Skoryy-class destroyers.
	No. 189, Leningrad	Propellers	For Skoryy-class destroyers.
1951	No. 199, Komsomol'sk	Shipboard Equipment	May be class of unidentified surface vessel.
	No. 83, Khabarovsk	Shipboard Equipment, Drinking Tanks	For of railroad car ferries.

Table 6

Plants Supplying Molotovsk Shipyard No. 402 with Raw, Semifinished, and Finished Material 51/
(Continued)

Year	Plant Supplying Item	Item	Remarks
1951	No. 515, Arsen'ev	Shipboard Equipment, Spare Parts	For Skoryy-class destroyers.
		Shipboard Equipment	F·
		Shipboard Equipment	For ' of railroad car ferries.
	No. 105, Khabarovsk	Blowers	Probably turbine-driven blowers for boilers in Skoryy-class destroyers.
1952	No. 83, Khabarovsk	Winches, Type LE 10	For Skoryy-class destroyers.
		Steam Engine	End use unknown.
	No. 105, Khabarovsk	Blower, Type TVK-2A	Probably turbine-driven blowers for boilers in Skoryy-class destroyers.
	No. 515, Arsen'ev	Probably Shipboard Equipment	For l ; may be unidentified vessels.

Table 6

Plants Supplying Molotovsk Shipyard No. 402 with Raw, Semifinished, and Finished Material 51/
(Continued)

Year	Plant Supplying Item	Item	Remarks
1952	No. 199, Komsomol'sk	Steam Pipe Fittings	For Skoryy-class destroyers.
1953	No. 515, Arsen'ev	Connecting Pipe Couplings	For barges 237-239.
		Sleeves and Connecting Pieces	For , unidentified vessel.
		Probably Shipboard Equipment	For Unidentified project; may refer to submarine construction.
		Columns and Stopcocks	drawing indicates Storyy-class destroyers.
	No. 83, Khabarovsk	Probably Shipboard Equipment	indicates that Plant 83 had supplied item for which documentation is required. Plant 83 may have supplied items during the entire period was under construction.
	No. 105, Khabarovsk	Probably Shipboard Equipment	Unidentified vessel.

Table 6

Plants Supplying Molotovsk Shipyard No. 402 with Raw, Semifinished, and Finished Material 51/
(Continued)

Year	Plant Supplying Item	Item	Remarks
1953	No. 105, Khabarovsk	Probably Blower, Type TVK-2	Type used on Skoryy-class destroyers.
1954	No. 83, Khabarovsk	Soda-washing Tank	For unidentified vessel

Table 7

Possible Suppliers of Components for Skoryy-Class Destroyers Built at Molotovsk Shipyard No. 402 52/

Plant	Item
No. 206, Leningrad	Analyzers, gas Sonar Fathometer Photo-Electrical Cell Smoke Indicators
No. 199, Komsomol'sk	Anchor Windlass Trawling Winch
No. 706, Moscow	Electronic and Electrical Equipment Gyros, Variometers Fire-Control Equipment

Table 7

Possible Suppliers of Components for Skoryy-Class Destroyers Built at Molotovsk Shipyard No. 402 [2] /
(Continued)

Plant	Item
No. 189, Leningrad	Boilers and Boiler Fittings Automatic Feed Regulators Propellers Shock Absorbers
No. 105, Khabarovsk	Main Battery Housings and Base Rings
No. 103, Leningrad	Steam Compressors Electric Compressors Valves
Kirov Plant, Leningrad (possibly)	Condensers Main Steam Turbines
No. 444, Nikolayev	Davits, Boat and Rotating Paravane Winches
No. 337, Bolshoi Tokmak	Diesels (Power Unit of Diesel-Generator Set)
No. 252, Serpukhov	Gun Directors, Assemblies for Fire-Control Equipment Transformers
No. 209, Leningrad	Gun Directors, Assemblies for Fire-Control Equipment
No. 192, Moscow	Gun Directors, Assemblies for Fire-Control Equipment
No. 83, Khabarovsk	Electric Motor for Paravane Winch

Table 7

Possible Suppliers of Components for Skoryy-Class Destroyers Built at Molotovsk Shipyard No. 402 52/ (Continued)

Plant	Item
No. 708, Kazan'	Fathometers
No. 709, Moscow (possibly)	Torpedo Tubes Torpedo Tube Fittings
Reiner Firm (u/i)	Unit of a Diesel Generator Set
Elektrosila Plant (u/i)	DC Generator of Diesel Generator Set
No. 703, Moscow	Possibly Radar Equipment and Other Electronic Equipment
No. 75, Yurga	122-mm Guns, Type B-2-LMT Ordnance Assemblies
Starokoamatorsk Machine Building Plant, Kramatorsk	122-mm Guns, Type B-2-LMT Ordnance Assemblies
No. 8, Iset	55-mm Guns
No. 92, Gor'kiy	55-mm Guns
Izhorsk Plant, Kolpino	Director Sight Ordnance Equipment
No. 349, Leningrad	Gun Sights
No. 651, Prokop'yevsk	Electric Motors, Type PN-28.5 and PN-145 for 122-mm Guns Electric Motors for Ventilating Fans

Table 7

Possible Suppliers of Components for Skoryy-Class Destroyers Built at Molotovsk Shipyard No. 402 52/ (Continued)

Plant	Item
No. 68, Nev'yansk	Electric Oil Pumps Turbo Fuel Oil Pumps Turbo Lube Oil Pumps
No. 76, Sverdlovsk	Turbo Main Circulating Pumps Turbo Condensate Pumps Possibly Main Turbine Reduction Gears
No. 237, Kazan'	Range Finders
No. 221, Stalingrad	Shafting, Stern Tube
No. 337, Leningrad	Gun Sights
Leningrad Metals Plant, Leningrad	Possibly 150-kw Generators
Khar'kov Electro-Mechanical Plant Khar'kov	Electric Motors for ESKN-2 Pumps (Dozernye)
Chelyabinsk Pipe and Rolling Mill, Chelyabinsk	Boiler Tubes
Kirov Plant, Leningrad	Main Steam Turbines

IX. Personnel.

Principal personnel associated with the shipyard, are listed in Table 8.*

* Table 8 follows on page 51.

Table 8

Personnel Associated with Molotovsk Shipyard
No. 402 53/

Name	Position	Date of Las	Remarks
Bogolyubov	Director (August 1949)		
Volik	Director (September 1949 to May 1952)		Assumed directorship of Plant 199, Komsomol'sk 1 June 1952
Egorov	Director (June 1952 to present)		Assumed directorship 1 June 1952
Kamerskiy	Deputy Director		
Dubovichenko	Official		Possibly a deputy director.
			administrative, engineering, and expediting activities.
Kostyushko	Official		Possibly a deputy director.
			administrative, engineering, and expediting activities.

Table 8

Personnel Associated with Molotovsk Shipyard
No. 402 53/
(Continued)

Name	Position	Remarks
Vashantsev	Official	administrative and engineering activities
Sidorenko	Official	
Sokolov	Official	

Table 8

Personnel Associated with Molotovsk Shipyard
No. 402 53/
(Continued)

Name	
Kubintsev	a/
Bocharov	a/
Fomin	a/
Braun	a/
Korolev	a/
Pavlov	a/

a. Other personnel, believed to be of lesser importance.

X. Capabilities, Vulnerabilities, and Intentions.

The facilities of the shipyard will probably be used to their fullest extent for building naval vessels, with special emphasis on producing ships for the Northern Fleet. This shipyard has the capacity for building all types of naval vessels from the smallest patrol craft or submarine to battleships or carriers and merchant ships from barges to fairly large oceangoing passenger liners.

Facilities within the shipyard indicate that all new construction including vessels of destroyer size could be completed, including the installation of all naval ordnance. Cruisers and other large vessels built in the large covered shipbuilding docks could be completed up to a height of about 112 feet above the base line. Past production has not required fitting-out facilities for vessels larger than destroyers. It

would seem reasonable, however, to assume that should a program of large-vessel building be undertaken, fitting-out cranes would be installed as required. An alternative to expanding the fitting-out facilities would be to move large vessels to the Rosta Naval Dockyard near Murmansk for completion or possibly to the commercial quay in Molotovsk, where portal and floating cranes have been reported. 54/

A. Capabilities.

Based on a realistic appraisal of the support required by the Soviet Northern Fleet, Table 9 presents a theoretical program for the concurrent construction of naval vessels in Molotovsk Shipyard No. 402 that will utilize all known facilities.

Table 9

Theoretical Concurrent Construction Program for Naval Vessels in Molotovsk Shipyard No. 402 a/

Location	Type	Class	Number	Length (Feet)	Total Tonnage (SDT)
21	Submarines	Z	4	310	7,000
21	Submarines	W	3	250	3,600
21	Subchasers	Artillerist	8	175	2,400
35	Cruisers	Sverdlov	2	689	28,000
35	Destroyers	Skoryy	4	420	12,000
39	Subchasers	Artillerist	2	175	600
Total					53,600

a. The use of all known facilities to their maximum capability would permit the concurrent construction of 10 destroyers totaling 30,000 tons, 2 subchasers totaling 600 tons, and 2 battleships totaling 90,000 tons, or a grand total of 120,600 SDT. Annual production on this basis would be about 45,000 tons. A more realistic program is presented in Table 10 and therefore all capability estimates used in this report are based on Table 10.

There is little evidence of new construction being laid down on the transverse ways, points 21 and 39 on Figure 1, since 1946. It is believed, however, that these building ways would be made serviceable should the program demand.

B. Annual Naval Vessel Production Estimate.

Based on the construction listed in Table 9, the possible annual production in naval SDT is estimated in Table 10.

Table 10

Estimated Annual Naval Vessel Production Capacity of Molotovsk Shipyard No. 402

Number of Vessels	Type	Class	Total Tonnage SDT
3.0	Submarines	Z	5,250
2.6	Submarines	W	3,120
15.0	Subchasers	Artillerist	4,500
1.0	Cruiser	Sverdlov	14,000
4.0	Destroyers	Skoryy	12,000
Total			38,750 to 38,870

In computing the annual production the following estimates and assumptions were made:

1. The necessary material, labor, and power would be available.

2. Only one 8-hour labor shift would be employed.

3. Vessels would remain on the ways until essentially completed. The time required to complete the cruisers above the 112-foot line has been disregarded in this estimate, because the construction rate will not be affected.

4. Way time is considered to be the principal limiting factor of the production rate. Estimates have been made based on estimated and reported rates elsewhere in the USSR and modified according to the geographic location of the shipyard, weather conditions which would affect construction on the open ways, and the possible advantage gained by building inside the heated, covered building docks. Way time estimates are as follows: Z-class submarine, 16 months; W-class submarine, 14 months; Artillerist subchaser, 8 months; Sverdlov cruiser, 24 months; and Skoryy-class destroyer, 12 months. It is assumed that 1 cruiser and 2 destroyers could simultaneously be built in each dock.

C. Merchant Vessel Production.

In the event that the shipyard should be devoted to the production of merchant vessels, a probable program for the concurrent construction of self-propelled cargo ships is shown in Table 11. This program would fully occupy all known facilities.

Table 11

Probable Concurrent Construction Program
for Self-Propelled Cargo Vessels
in Molotovsk Shipyard No. 402

Location	Type	Number of Vessels	Length and Breadth (Feet)	Total Tonnage (GRT)
21	Cargo	6	425 x 57	30,000
39	Logger	1	130 x 24	350
35 a/	Cargo	8	425 x 57	40,000
Total				70,350

a. Four vessels can be constructed simultaneously in each of the two building docks.

Based on the construction listed in Table 11, the possible annual production of merchant vessels in gross register tonnage is estimated in Table 12.

Table 12

Estimated Annual Merchant-Vessel Production Capacity of Molotovsk Shipyard No. 402

Number of Vessels	Type	Total Tonnage (GRT)
14.3	Cargo	71,328
6.0	Loggers	2,100
Total		73,428

The estimates and assumptions made in calculating merchant tonnage were similar to those made for the calculation of naval tonnage.

1. The necessary material, labor, and power would be available.

2. Only one 8-hour labor shift would be employed.

3. The vessels would be essentially complete before launching.

4. Way time for the 425-foot cargo vessels was estimated at 13 months for those building on the transverse open ways and at 11 months for those building in the covered building docks. It was estimated that 6 loggers could be produced per year on the transverse open ways, point 39.

Output in both naval and merchant tonnage possibly may be increased by increasing the number of hours of the one shift, the repe-

titious production of a single design, improving technological processes, and adequate apprentice training. Assuming no bottleneck in the supply of material, output may be increased by working additional shifts. It is considered doubtful, however, that sufficient qualified supervision and skilled workmen could be made available to justify a material increase in the output estimate for the additional shifts.

Production of vessels at the foregoing estimated rates would seriously limit the yard's capability for vessel repairs. All docking facilities would be engaged by new construction and possibly all quays in fitting out the newly built vessels.

The supporting shops in the shipyard are believed to be adequate to produce the estimated tonnage assuming that all hull steel would be fabricated and assembled within the shipyard from rolled plates and shapes; all light and heavy castings and forgings, including propellers and propeller shafts, would be cast and machined within the shipyard; all machinery assembled and installed; boilers manufactured and installed; and probably all naval ordnance installed.

D. Vulnerabilities and Intentions.

Molotovsk Shipyard No. 402 appears to be very well developed and well coordinated but is vulnerable with respect to its physical location. Although located in the western part of the USSR it is still 700 to 1,000 miles from the main industrial centers. The lack of highway transportation lays the burden of supplying the shipyard largely on the double-track Archangel-Vologda railroad line. The Baltic-White Sea Canal is of secondary importance and is open to navigation only 6 months of the year.

Few industries are located in the general area of Molotovsk from which industrial labor could be drawn in case of rapid expansion.

The source of electric power and heat is the single large plant located immediately east of the shipyard. This plant is not tied in with any major power grid upon which it could call in case of power failure.

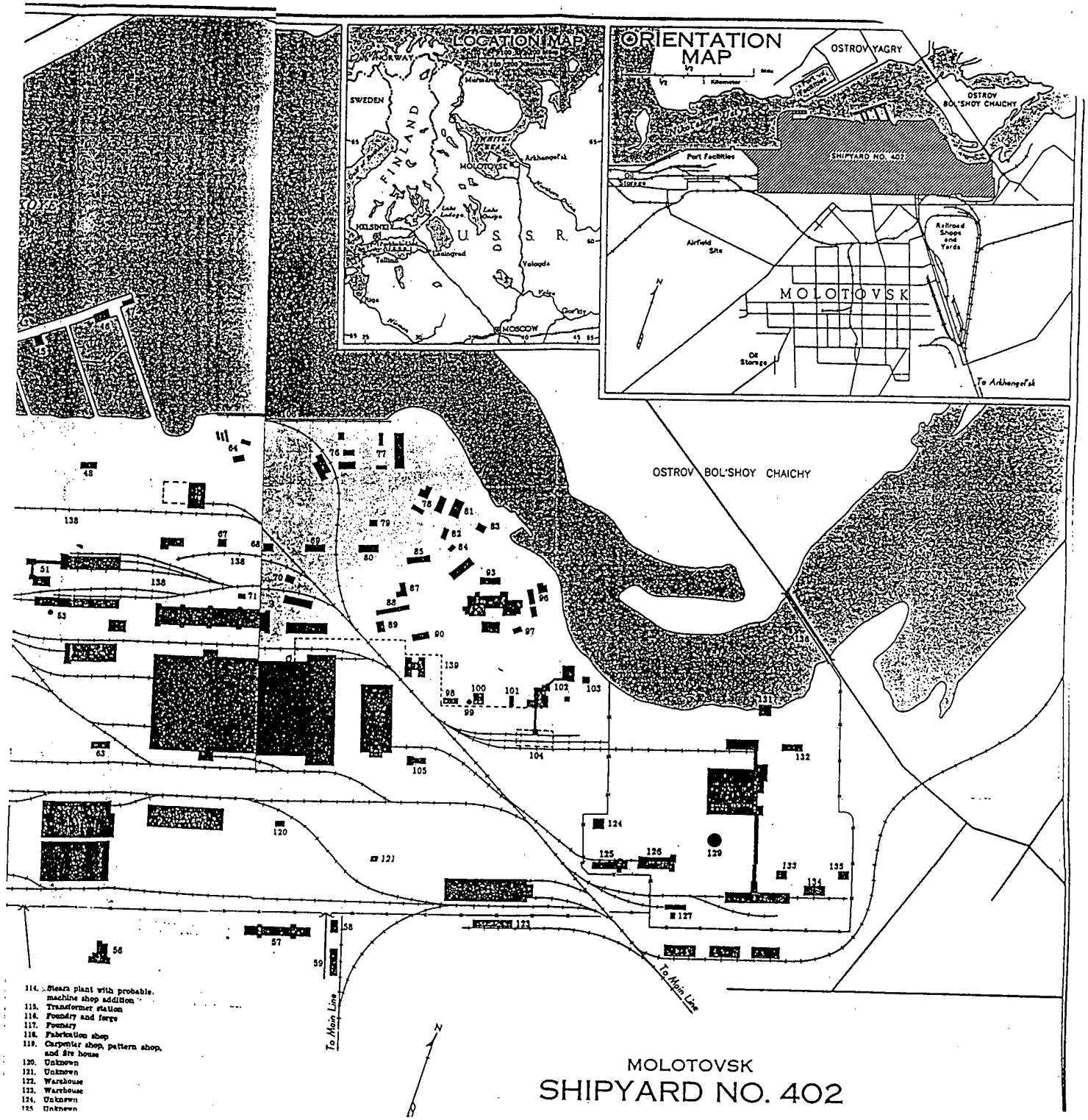
In general, the shipbuilding industry may be classified as a "value added" type of industry. Because of this type of operation, the chief economic hazard of the Molotovsk shipyard is the question of an assured flow of raw materials and components produced by other industries.

APPENDIX

A

APPENDIX B

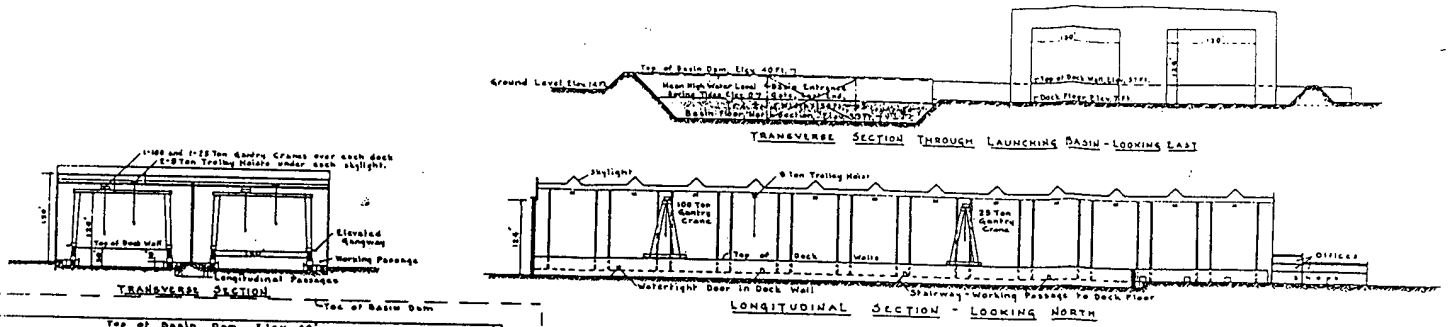
APPENDIX C



MOLOTOVSK

SHIPYARD NO. 402

SECRET



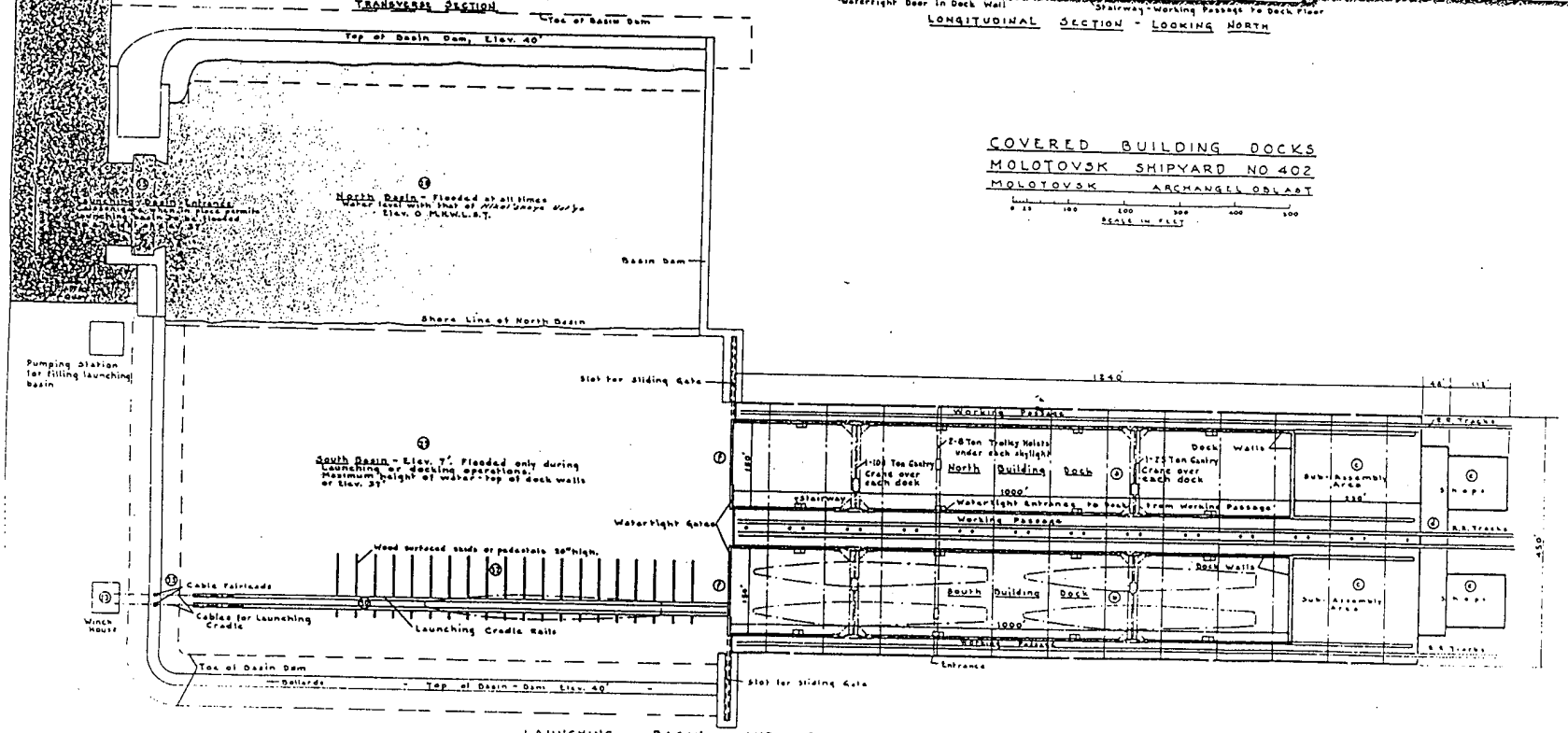
TRANSVERSE SECTION THROUGH LAUNCHING BASIN - LOOKING EAST

TRANSVERSE SECTION

LONGITUDINAL SECTION - LOOKING NORTH

COVERED BUILDING DOCKS
MOLOTOVSK SHIPYARD NO 402
MOLOTOVSK ARCHANGEL OBLAST

SCALE IN FEET



LAUNCHING BASIN AND COVERED BUILDING DOCKS

Showing position of 4 destroyers building in south dock together with 1 destroyer in south basin ready for launching.

SECRET