

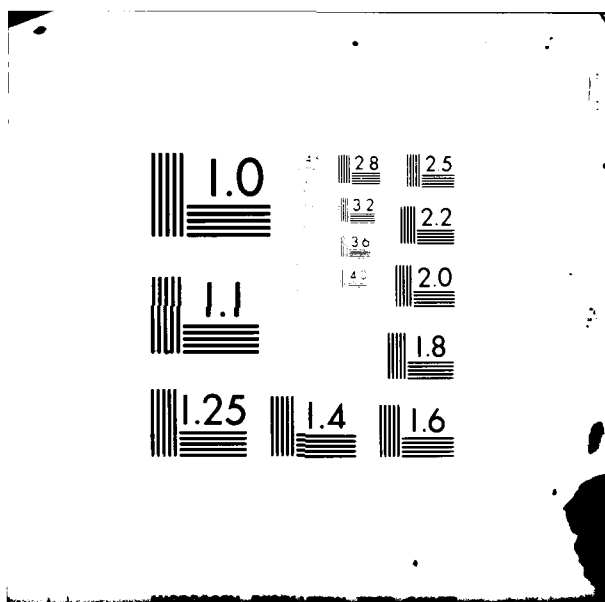
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CONSTRUCTION NORMS AND REGULATIONS. PART III. SECTION I. CHAPTE--ETC(U)
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CONSTRUCTION NORMS AND RULES
Part III, Section I

[Palchikov, I.V., Medovikov, I.M., Pchelkin, M.G., Ofshtepi, M.D.; Stroitelnye Normy i Pravila; State Publishing House of Construction, Architecture and Building Materials Literature, Moscow, 29 April, 1963; 31 pages; Russian]

ABSTRACT

Chapter SNiP III-I.1-62 "Hydraulic engineering works for maritime and river transportation. Rules of construction organization and acceptance for service" was prepared by the Union Maritime Research Project of the Ministry of the Navy of the USSR, the State Institute for Planning in River Transportation of the Ministry of Inland Water Transportation of the RSFSR with participation of the Central Scientific Research Institute and the Construction Planning Office of the State Working Committee on Transportation Construction, the State Institute for the Planning of Fishing Industry Establishments, the State Committee on Fisheries of the Council on the National Economy of the USSR, the S.YA. Zhuk Hydraulic Engineering Project of the State Working Committee on Energy and Electrification of the USSR. With the ratification of Chapter SNiP III-I.1-62, Chapter III-C.1 SNiP of 1955 is rescinded.

Introduced by the Academy of Construction and Architecture of the USSR, Ministry of the Navy, USSR and Ministry of Inland Water Transportation, RSFSR	Ratified by State Committee on Construction Affairs, USSR 29 April, 1963	Effective as of 1 September, 1963
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	Construction norms and rules	
State Committee on Construction Affairs of the USSR (Gosstroy USSR)	Hydraulic engineering works for maritime and inland water transportation Rules of construction organization and acceptance for service	Replaces Chapter III-C.1 SNiP of 1955

1. GENERAL INSTRUCTIONS

1.1. The rules of this chapter apply to the organization of construction, the performance of jobs and the acceptance for service of hydraulic engineering works for maritime and inland water transportation in maritime, inland and fishing ports, ship canals, shipbuilding and ship repair yards, naval bases and harbors.

1.2. Construction and assembly jobs during erection of hydraulic engineering works as set forth in Item 1.1. must be done according to the rules established in the SNiP chapters and the supplementary rules of this chapter.

Note: 1. The laying of foundations on ground subject to subsidence must be in compliance with the requirements of Chapter SNiP III-B.10-62 "Construction on ground subject to subsidence. Rules of production organization and acceptance of work."

2. Construction in earthquake-prone areas and areas where permafrost is found shall be done in accordance with specially developed plans allowing for the specific features of the construction sites.

2. BASIC STATUTES ON THE ORGANIZATION OF HYDRAULIC ENGINEERING CONSTRUCTION

2.1. The organizational and technical preparation for the construction of hydraulic engineering works must comply with the provisions of Chapter SNiP III-A.6-6 "Organizational-technical preparation for construction. Basic statutes."

2.2. Construction of a complex of structures for maritime and inland water transportation must occur within a sequence and term guaranteeing the most rapid and feasible startup of the installations.

The layout of the complexes and the construction sequence and term must be established in the plan in compliance with the rules of Chapter SNiP III-A.3-62 "Norms of construction term of establishments, launching complexes, shops, buildings and installations."

2.3. Construction of maritime and river ports and ship canals must be accomplished with the use of coordinated mechanization of construction and assembly jobs, maximum pre-assembly, mass factory production of standardized parts, construction elements, monoliths and systems, and methods for producing in large lots.

2.4. The erection of hydraulic engineering works for maritime and inland water transportation during construction on water areas must utilize special floating equipment, machines and mechanisms; during construction on dry land - before reservoirs and ship canals are filled, and also with protection of dams by drainage, lowering water levels, artificial freezing, etc. - ordinary machines and mechanisms shall be used.

Methods of construction and performance of work must be based on a technical-economic comparison of variants in the plan for construction organization.

A calendar construction plan must be designed with schedules for water level, sea disturbance, ice formation, ice drifts and other specifics.

2.5. The management of construction materials, pre-fabricated elements, equipment and other material and technical resources shall comply with the provisions of Chapter SNiP III-A.-62 "Materials and engineering management. Basic statutes." /4

The quantity of available building supplies, prefabricated parts and constructions shall be established with allowance made for interruptions in supplies due to gale conditions and the length of the period when navigation is suspended.

2.6. During work on unprotected water areas with the use of nonself-propelled floating equipment, the construction management plan shall provide for the necessary quantity of self-propelled tugs of sufficient power for possible towing of floating craft to shelter.

2.7. The use of self-propelled and nonself-propelled craft and of lifting-conveying, pile-driving, compressor and boiler equipment installed on such craft is permitted provided the specifications of the Register, Boiler inspectorate and other responsible authorities are met.

2.8. The construction of hydraulic engineering works shall be accomplished with measures taken to protect works under construction at their parts from potential damage resulting from high water, ice drift, rough seas, etc.

The erection of each of the above portion of construction shall occur only after the subsidence of its underlying portions has stabilized to within the design tolerances.

Note. Before the foundations are laid for the structures, they shall be inspected and any defects eliminated.

2.9. The scheme of passage of high waters and drifting ice through unfinished and temporary structures of ship canals shall be set forth in the construction management plan and specified in the work performance plan.

2.10. During construction of open waters, the construction management plan shall provide for priority erection of protective structures (breakwaters, moles) or their portions necessary to create safe working conditions on the water area and to protect installations under construction from erosion, destruction by waves, drifting ice, etc.

2.11. The navigable sections of waterways on job sites shall be marked with navigational markers illuminated at night.

2.12. In the event there are no local industries to serve as a supply and technical base for construction or such industries are inadequate, it shall be necessary to arrange for the production of prefabricated steel-reinforced concrete monoliths, piles, platings, elements for the super structure of embankments, etc. in the contractor's installations, equipping them with means of mechanization, power generating equipment, access roads, berthings, scaffolding and warehouses.

2.13. The construction site and the production capacity of the installation serving as a supplies base and technical base for the hydraulic engineering works must be chosen on the basis of a technical and economic analysis, allowing for the potential for carrying out construction in the basin, the assurance of convenient access of floating cranes, barges, tugs and other floating crafts, and the potential for transporting finished products as economically as possible to their installation sites.

3. BASIC REQUIREMENTS FOR CONSTRUCTION UNDER WINTER CONDITIONS

3.1. Jobs whose performance is necessary and feasible shall be planned for the winter season, allowing for the requirement of maximum efficiency in the use of construction mechanisms, building crews and the source of supplies and equipment throughout the year.

3.2. During the winter season, in the presence of a solid ice cover, the deck house and cribwork shall be constructed, and pile driving and installation of sheet piling shall be performed from from the ice; jobs associated with the placement of rubble mounds, shoulders on unloading prisms shall also be performed with the safety of persons and means of transportation assured on paths and approaches to the ice edge.

Rock bed leveling jobs are managed with the aid of on shore diving stations.

At above-freezing air temperatures, work on the ice is permitted only if the firmness of the ice is monitored.

3.3. The performance of work in winter with the aid of floating equipment (placement of concrete monoliths, piledriving, building rubble mounds, prisms, etc.) is permitted only on water areas not covered with a continuous ice crust. /5

3.4. Performance of dredging jobs, suction dredging on construction of hydraulic land filled structures during winter shall be permitted provided quality performance is guaranteed and technical-economic calculations prove these jobs are feasible.

A flood flanking in winter conditions shall be permitted only if drainable fillers are used (gravel, pebbles, coarse sand).

3.5. When jobs are performed in winter conditions, the possibility of

maneuvering and guiding them to shelter during storms must be guaranteed.

3.6. In the winter season it is necessary to maintain unfrozen patches of water (long cracks in ice) in an unfrozen state at all times around dredges by towing them with winches, using hydraulic or pneumatic equipment, ice breakers, etc.

Work during the winter season must be performed round the clock with exception of interruptions occasioned by storms and fog.

4. ORGANIZATION OF SURVEYING AND STAKE-OUT JOBS

4.1. The surveying and stake-out jobs involved in the construction of hydraulic engineering works must be performed to implement installation plans with precise location on site for both ground layout and vertical dimensions of the entire complex and the separate elements of the installation, performance of detail stake-outs guaranteeing locations according to plans and dimensions of installations, as well as performance of inspections and checks for deformations in the installations.

4.2. In the case of certain structure and installations erected under complex hydrogeological and hydrologic conditions, periodic checks shall be made for settling and horizontal shifts of the entire structure or its parts, and the state of adjacent sections of the territory and water area shall be monitored.

4.3. Surveying and stake-out jobs during the erection of hydraulic engineering works shall include:

- a) Laying the survey network (horizontal and ground elevation marks) on the construction site;
- b) Laying and securing the main lines, connecting them to points of a survey network (vertical and horizontal);
- c) Staking out and securing base lines of installations;
- d) Checking for proper erection of installations;
- e) Staking out individual elements of installations;
- f) Performance of jobs to prepare working drawings according to stakeouts.

4.4. Before construction begins, the client shall turn over the survey network to the contractor, staking out and securing (with elevation marks) the base lines: axes of dams, locks, cordons lines, moorings etc., and, along linear structures, the lines of the structures (marking out the angles of rotation and main curve points, axes of bridges, sagpipes, etc., of man made structures), centers of piers shaft foundations, and like.

4.5. The ground elevation marks shall be placed outside the area of the construction jobs, foundations and supplies transportation zone in areas not subject to settling, landslides, erosion and the action of drifting ice.

4.6. For a precise determination of the water level in the water area of the construction site, the presence of a port tide gauge or a specially-designed tide gauge is necessary, the accuracy of which shall be guaranteed under any sea conditions. Immediately on the construction site, water board gauges shall be set up for approximate determination of the water level. It is permissible to use existing tide gauges and water board gauges installed during the performance of surveying jobs.

The tide gauge and water board gauges must be calibrated to the zero point adopted in the construction plan. The installation is recorded in a commissioned document. The stability of the water gauges shall be checked on the basis of bench marks no less than once a month. If a shift in these water gauge is noted, they shall be secured immediately according to the bench marks.

4.7. For structures with symmetrical cross sections, their longitudinal axial line shall be adopted as the reference line. For breakwaters with obviously asymmetric cross-sectional shapes and for embankments of solid concrete, the lower facade line of the structure shall be adopted as the base line for reference. /6

For structures on individual supports and for top parts of breakwaters, the staking out of the base shall consist of securing the centers and main axes of each support or top.

The cordon line of the installations shall be adopted as the basic reference line staked out for the erection of berthing.

4.8. Apart from the securing of the base lines during the staking out of details, facade and battle lines shall be staked out and secured before the placement of concrete monoliths, borders and edges of foundations, cuts, beds, rubble mounds, berms, etc., the longitudinal and cross sectional axes of rows of piles, supports, clusters, pile moorings, boxes, mooring bollard centers, etc.

The horizontal and verticle positions of submerged surveying marks shall be determined according to submerged surveying lines stretched under water with the aid of surveying instruments.

4.9. The securing of main lines and base lines on site shall be performed on dry land with concrete bollards with pins, columns, transit lines, wall-mounted reference points and marks; on water areas, it shall be accomplished with piles, buoys, and beacons instrumentally connested with stationary marks on shore.

It shall be permissible to secure other surveying lines with light-weight markers (on constructions: with wooden columns, marker posts, pins, provided with reference marks; on water: with beacons, floats, spar buoys and piles; underwater: with templates, narrow-gauge rails, wire stretched along sections or pins).

4.10. During the stake out work, the following permissible deviations from the plan shall not be exceeded:

Distribution of base line ends horizontally:	
For berthing and coast protection systems	
For breakwaters	50 mm
Direction of surveying line:	
For berthing and coast protection systems	250
For breakwaters	1 min
Elevation marks:	2
For main lines	1 mm
For surveying base lines	3
For other surveying lines	10

4.11. The positions of the surveying lines and reference points and the correctness of the elevation of survey points shall be checked no less than once a month. In the presence of conditions causing doubt as to the preservation of the initial position of any surveying mark, an immediate check shall be made. In particular, lines stretched over a water area shall be checked after every storm, dry docking, etc.

4.12. Reference points, marks, and signs used in horizontal and verticle staking out shall be preserved throughout the construction period and conveyed to the plant when the work is turned over for use according to specifications, together with a scheme showing the positions of marks (sketch), a description and photographs.,

4.13. All documents concerning horizontal and verticle stake outs, checks of survey marks, determinations of level marks of construction elements and checks of actual dimentions of structures (documents, drawings, log books of survey jobs, calculations, etc.) shall be kept on file until the construction's completed and the installation is ready for use.

4.14. A detailed stake out of the elements of structures shall be performed by the technical personnel of the construction and assembly organization according to working drawings of individual parts of the structures or special layout schemes secured to the axes of the structure.

5. ORGANIZATION OF CONSTRUCTION INSPECTION

5.1. A construction engineering staff and the client's representatives and project administration shall, in the sequence of the author's inspection during a construction process, perform constant surveillance to guarantee proper quality of the work and compliance with the planned requirements.

5.2. The condition and quality of the hydraulic engineering works to be erected shall be systematically monitored throughout the construction term by external examination, instrumental monitering and under water examination.

During interruptions in the construction, inspections must be made after completion of jobs and before they are resumed.

5.3. As separate parts of the structure are completed which cannot be accessible for inspection, the volume and quantity of jobs performed must be confirmed by a document for undisclosed jobs prepared with the participation of the client's representative.

5.4. During the erection of the structures, it is imperative to make systematic checks for settling of the structures and for the curve of settling as a function of time during construction and after completion. Inspections shall be made after completion of a separate stage of the work (laying of blocks in courses, construction of above-water structures, etc.).

In the event of factors that alter the normal working conditions of the foundation (sudden increase or decrease in load, appearance of cracks, deformations, etc.), unscheduled measurements of settling shall be made.

Documents characterizing the foundation quality shall be prepared on the basis of observations of the settling of the structure.

All data observed on settling during the construction period are included in the documents pertinent to the structure's starting service and are filed together with the results of subsequent observations of settling made by the organization the structure.

5.5. A systematic observation of all cracks and deformed portions shall be accomplished according to lighthouses, to which their number and date of establishment shall be conveyed. All cracks or deterioration of joints shall be logged, showing: the date of occurrence of the defect, its nature and the probable cause of damage. The logs shall also include drawings of deformed portions.

GEODETIC MONITORING DURING CONSTRUCTION

5.6. When checking the condition of a structure, the following shall be established:

a) Compliance with design dimensions, location and tolerances for the structure to be erected;

b) Overall extent of settling of the structure, its uniformity and periodicity.

Before checking the state of structures, careful instrumental monitoring of inspection starting points (centers, transit marks, reference marks) and stake-out marks shall be performed to determine their stability.

The results of the checks and observations shall be documented and prepared as starting material for the preparation of working drawings when the structure is declared ready for service.

6. UNDERWATER ENGINEERING WORKS

6.1. During the construction of hydraulic engineering works, underwater works shall be performed with the use of diving stations.

The number of diving stations on site, the necessary equipment, amount of materials and instruments, shall be established in the construction management plan in accordance with the amount of diving work.

6.2. Essentially the following shall be done with the aid of diving work:

Underwater earth moving and rock moving jobs and the clearing of the bottom by divers;

The leveling of rockbeds by divers;

The laying of ordinary concrete blocks, reinforced-concrete monoliths and cribwork, assembly of underwater elements of prefabricated structures and laying of pile foundations;

Welding and cutting metals under water;

Underwater concrete pouring.

6.3. During performance of diving jobs, safety rules and provisions of chapter SNip III-A.11-62 "Safety Techniques in Construction" shall be observed.

DIVER EXAMINATION OF WATER SITE BOTTOM AND UNDERWATER PARTS OF HYDRAULIC ENGINEERING STRUCTURES

6.4. Diver inspection of jobs shall be performed according to schedules prepared by the planning administration with the participation of a diving specialist approved by the client.

The schedule for diver inspection work shall include:

- a) List of structures and construction elements subject to inspection;
- b) Basic duties and requirements for diver inspection and information obtained from the inspections;
- c) Sequence and deadlines for inspection work.

Note. For small underwater inspection jobs, the schedule shall be prepared by the chief construction engineer.

6.5. The main data from underwater inspection shall be confirmed by repeated random-sampling dives with the same mission performed by another diver. When conflicting data are obtained, a diving specialist shall check and clarify them.

Note. During the inspection of underwater parts of the structure, it is recommended to use underwater still and motion picture photography.

6.6. All objects observed on the bottom shall be marked with spar buoys or buoys; the characteristics of the objects and their numbers shall be logged in the survey logbook on the basis of records and sketches made by the diver just under water. In extreme cases, records can be kept by telephone, and in no case may the diver's memory be relied upon.

6.7. After the rockbed under the structure is completed, it shall undergo surveillance by divers for the following purposes:

a) To measure the width of the bed foundation (according to cross-sections staked out at intervals of no less than 5 m);

b) To check the incline of rock mounds;

c) To check the cross-sectional gradient of bed surfaces;

d) To inspect condition of rockbed and insufficient or excessive rockfill, local landslides or washouts in slopes, silt deposits, if considerable time has elapsed since the fill was made.

6.8. During erection of structures made of concrete blocks, the position of each block, the size of joints and berms shall be checked after each course is laid.

After the blocks are laid, an underwater inspection shall be performed to determine the state of the blocks and the bed on the whole and to make sure there are no deformations (shifts, bulges).

6.9. When structures are erected with large pieces of rubble, inspections shall be performed to determine the position of their borders, absence of individual blocks falling out of the structure, and the cross-section and axial section of the structures.

The cross-section and axial sections of structures built by mounds of large blocks are determined by measurements with the aid of gauges at 5 m intervals along the structure and 3 m intervals across it. Under complicated conditions interfering with measurements by gauges, a level shall be used.

6.10. For instructions built of large reinforced-concrete blocks and cribwork, the following shall be established:

a) Width and condition of rockbed berms on both sides of the structure or cribwork;

b) Precisions of fit of large block or cribwork with components laid earlier;

c) Size of joints between components;

d) Position of cribwork relative to the vertical position.

6.11. During the construction of pile structures and structures with sheet-piling walls, the following shall be established:

a) Presence and extent of deviation of pile tops from the vertical axis;

b) Condition of underwater joints between piles, presence and precision of placement, reinforcement, precision of joints;

c) Condition of underwater part of overwater structures;

d) Condition and inclination of slope under berthing;

e) Condition of sheet-piling wall along the entire structure, presence of bulges, cracks between sheet piles;

f) Presence and dimensions of fill washouts between cracks in sheet-piling wall.

Note. Inspection of structures on piling foundations shall be according to the transverse row of pilings.

6.12. During and after performance of underwater inspections, they shall be strictly and systematically reported and logged.

After underwater inspections, the results shall be recorded. The record shall include sketches, schemata, drawings prepared on the basis of data from the underwater inspection working log, notes and memoranda of the diver performing the inspection, and photographs and motion picture frames if available.

UNDERWATER EXCAVATION AND CLEARING THE BOTTOM BY DIVERS

6.13. Unless underwater excavations can be done by other technical means, they shall be done by divers with the aid of small-scale hydraulic excavation equipment, hydraulic giants, nonreactive hydraulic hoses, hydraulic elevators, airlifts, etc.

6.14. The handling of solid bottom rock and the dismantling of remnants of wooden, metallic, stone and concrete construction for removal shall be performed with a pneumatic tool and explosives.

6.15. During detonation work near existing structures and structures under construction, the detonations shall be accomplished in series by individual charges of set sizes. In areas where these limitations do not exist, all charges shall be detonated simultaneously.

Note. The detonation of explosives shall be performed only electrically.

6.16. During the clearing of a sand or clay bottom, extraneous objects shall be—with the approval of the planning administration—buried at great depths in the bottom.

LEVELING ROCKBEDS WITH THE USE OF DIVERS

6.17. During the laying and leveling of rockbeds with the aid of a diver, the following jobs shall be performed:

- a) Clearing bottom surface used as foundation or rockbed from clay, loose sediment, jetsam, etc.;
- b) Vertical and horizontal stake-out of the bed;
- c) Check for quality of bed structure;
- d) Level bed;
- e) Take check measurements for serviceability of completed bed sections.

6.18. When stone is laid in a bed, systematic check measurements and underwater diving inspection of the dumped portions shall be accomplished before starting to level the bed surface.

6.19. The alignment of the bed shall be started as soon as one of the sections (20-25 m along) is headed up to the full planned cross-section. A distance guaranteeing safety of the diving work shall be maintained between leveling sections and dumping sections.

6.20. The following deviations in surface marks are allowable for the leveling of a bed:

- a) Rough leveling: ± 200 mm;
- b) Careful leveling: ± 80 mm;
- c) Very careful leveling: ± 30 mm.

6.21. Finished careful and very careful leveling of a bed segment shall be checked by a level along a 2 x 2 m network.

6.22. For acceptance of a stone bed, the following must be checked:

- a) Actual horizontal and vertical dimensions;
- b) Basic characteristics of stone used (compactness, size, etc.);
- c) Settling of dumped stones;

d) Type of leveling actually performed;

e) Volume of dumping actually performed and actual percentage of vacancies.

LAYING LARGE CONCRETE BLOCKS IN CORRECT ALIGNMENT
WITH THE AID OF DIVERS

6.23. Just before starting to lay the first course of block, check measurements and inspection of the bed shall be performed. Washouts shall be filled with dumped stone, and the bed shall be releveled. Clay sediment must be removed. The readiness of the bed for laying blocks shall be certified.

6.24. The first block of the wall shall be placed on the "battle" line, at the beginning of the structure, at the keyed expansion joint of the wall at the place of abutment with the existing structure. The first large concrete block of the foot or head of the structure shall be laid on the corner or the center of the foot or head.

6.25. The laying of each course of blocks shall be certified by the following documents:

a) A layout drawing of the course in question with the stock number of each block, its date of manufacture and the date it was laid and covered;

b) A scheme showing the horizontal position of each block relative to the "battle" line (for the first course) and relative to the lower-lying blocks (for the remaining courses);

c) The log and drawing of all levelings performed;

d) Documents with all technical conditions present during the laying of the first course (laying of blocks, dumping of stone bed, etc.);

e) If possible, photographs of the courses taken randomly—about one or two per section.

6.26. Protective blocks shall be placed on the berms and slopes of the bed after the first course of wall blocks is laid in each segment of the structure with preliminary checks of the condition of the berm and slopes requiring covering by protective blocks. The blocks may be laid on berms and slopes of the bed of block walls without stake-outs.

DIVING JOBS FOR ERECTION OF STRUCTURES BUILT OF
LARGE REINFORCED-CONCRETE BLOCKS AND CRIBWORK
AND CONSTRUCTION OF PILE FOUNDATIONS

6.27. To lay large concrete-reinforced blocks or cribwork, they shall be immersed in water to such an extent that the lower part is close

7.5. It shall be prohibited to let hopper barges stand or to load them over prepared segments of cuts.

7.6. Working measurements shall be performed before the excavating equipment has been moved to the next segment and no later than 10 days after completion of the work.

Note. The measured cross-sections shall be extended to the limits of the working cuts to a distance of no less than 50 m (to the area where the slopes are formed).

8. STONE WORK

8.1. The regulations of the present paragraph are applicable to the construction of stone prisms, beds, filters, protective rubble mounds and other components of structures consisting of dumped material and to stone laying and stone fills of cribwork and reinforced-concrete blocks in compliance with the regulations of Chapter SNip III-B.4-62 "Stone Structures. Rules of Performance and Acceptance of Work."

8.2. To check for settling of dumped rubble and stone fill into the ground throughout the performance of the rock dumping work, it shall be mandatory to conduct systematic check measurements in all segments, accounting for rock consumption. The results of the final check measurements shall be kept on file.

Comparative volumes of rock dumped on a given section shall be recorded and filed in accordance with the rock acceptance documents and with calculations for cross-sections of rubble mounds actually constructed; explanations shall be given for any substantial discrepancies.

8.3. The sizing of the rock for rubble mounds shall be performed in the quarry as a rule.

8.4. A decrease in the planned incline of slopes may be permitted in dumped rubble mounds as follows:

- a) Up to 7% for an underwater slope on the external side;
- b) Up to 5% for the same on the water side;
- c) Up to 5% for the above-water slope on the external side;
- d) Up to 3% for the same on the water side.

Note. No increase in the incline of slopes shall be permitted.

8.5. The planned amount of vacancies shall be checked by experimental rubble dumping performed under working conditions.

to the bed; the diver shall then be lowered to check the tightness of the fit in the adjacent reinforced-concrete block or crib and measure the width of the bed berm on each side. After the correctness of the reinforced-concrete block or crib position has been ascertained and the diver has returned to the surface, the reinforced-concrete block or crib shall be loaded with ballast and placed on the foundation.

6.28. If the positioned block or crib is improperly positioned after it is laid, or the diver finds a poor fit between the bottom of the block and the bed, the ballast shall be dumped to raise the component to the surface.

After the reinforced-concrete block or crib is raised, it is imperative to check the foundation and ensure correction of the defects, repositioning the block or crib.

6.29. After drilling a hole below the blade of the tubular pile, it is prohibited to lower a diver into the hole. All work on the tubular pile shall be suspended while the diver is in place.

DIVING JOBS DURING UNDERWATER CONCRETE LAYING

6.30. Jobs involved in underwater concrete laying at a depth of over 2 m shall be performed in accordance with the regulations of Chapter SNip III-B.2-62 "Concrete and Reinforced-Concrete Monolithic Constructions, Special Regulations for Performance and Acceptance of Jobs" with the participation of divers to ensure proper quality control.

UNDERWATER WELDING AND CUTTING OF STEEL

6.31. During the organization and performance of jobs for underwater welding and cutting of steel, it is mandatory to comply with the provisions of Chapter SNip III-B.5-62 "Metal Structures. Rules of Fabrication, Assembly and Acceptance," and SNip II-A.11.62 "Safety Techniques in Construction" and the pertinent chapters of the first part of SNip.

6.32. For underwater welding of steel, it is imperative to use dc arc welding with direct polarity (minus on the electrode), using a metal electrode with water-proof elastic covering.

6.33. For underwater cutting of steel, it is imperative to use electric arc cutting for metal thicknesses up to 20 mm and gasoline-oxygen cutting for thicker constructions.

6.34. To maintain the cutting direction in poor visibility, it is necessary to use wooden guides; during transverse cutting of an underwater pipeline, a fiber rope shall be used.

6.35. The absence of omitted portions in a cut shall be checked by feeler gauges or by illuminating the cutting line with an underwater lamp on the opposite side.

6.36. The underwater cutting of steel shall be accomplished according to the work schedule with a cutting volume of more than 10 linear meters and no more than 5 cuts, and for the division of structures whose parts thereby acquire freedom of movement.

6.37. During the welding and cutting of steel under water, the effective rules of underwater engineering works and the safety rules for electric arc and gas welding shall be valid.

DREDGING AND SUCTION DREDGING

7.1. The organization, performance and acceptance of excavation work during the construction of marine inland water transportation structures shall be performed in compliance with the above rules established in Chapter SNip II-B.1-62 "Earthen Structures. General Rules of Performance and Acceptance of Work."

During the performance of hydraulic excavating and dredging jobs, compliance is required with Chapter SNip III-B.2-62 "Earthen Structures. Rules of Performance and Acceptance of Hydraulic Excavating and Dredging" and present section.

7.2. Before starting dredging jobs, the following shall be checked:

- a) Actual depths provided for in the plan; it shall be required to level the bank and prepare a plan for the structure;
- b) Correctness of the marking out of the cut, establishment of transit marks, marker posts and water gauges; pertinent documents shall be prepared.

7.3. During the progress of dredging work, the following shall be checked systematically:

- a) Dredge productivity;
- b) Condition of surveying stakes and water gauges;
- c) The characteristics of the dredged bottom (according to samples);
- d) Depth of the cut;
- e) Width of the working cut according to measuring surveys between the lower lips of the excavation.

The results of the checks shall be logged or documented.

7.4. The dumping of the discharge shall be permitted only in the dumping places established by the plan and properly laid out. The sequence of dumping on individual segments of the dump shall be established in the work performance plan.

8.6. The layer of sand or clay deposited on the foundation before the start of stone rubble dumping or on the surface of dumped rubble during forced suspensions of work shall be removed before dumping stone (resumption of work).

8.7. In structures exposed to the action of waves, in the event part of the berms and slopes remain uncovered by reinforced-concrete blocks, the top (cover) layer shall be constructed of large stone.

8.8. The dumping of stone (gravel) on the bed of a structure shall be performed directly from means of transport without load transfers.

The performance of stone dumping jobs with load transfer can be permitted only under special conditions that interfere with the normal organization of the work.

8.9. Levelling marks in completed rubble mounds for structures and their components (core filling) should not deviate from design value by more than 30 cm.

8.10. Hopper barges with bottoms that open up should not be used for pouring out stone into the upper (1 m) layer of seabed or scarp.

8.11. In order to effect careful and thorough alignment of the stone bed, frames of special size and shape are to be used, placed into the bed while observing required accuracy in surface plane and elevation measurements.

Careful alignment is to be accomplished using rigid metal rods (narrow-gauge rails) that are placed on the level of the top of the bed.

For rough alignment the metal rods are to be used only for aligning the lengthwise scarps. Rough alignment in other instances may be accomplished using the tide gauge.

8.12. Sections of the bed where alignment is completed, as well as core fill of the structure are to be checked by levelling and by tide gauge measurements (check by sounding lead is not permitted); underwater inspection is to be made by technical personnel trained in diving skills. Measurements are to be taken when there is no sea agitation.

Upon completion of this work and elimination of defects, actual profiles of the bed or core are to be plotted on working drawings.

8.13. A detailed marking-off of the core of the structure (axes of the upper and lower edges) is to be conducted immediately prior to beginning work in pouring out the stone.

8.14. Ungraded stones of varying size from a layer of quarry slack should be used in pouring in the core of the structure. The finest stone should be poured into the lower and central portions of the core.

8.15. Deviation in area dimensions of the stone-fill transverse sections of the structure should not exceed 5% of design value in observing design levels for the top of the fill.

8.16. The following items are to be checked with respect to acceptance of stone fill:

- a) working plans of the sections being accepted;
- b) transverse and longitudinal sections of the structure, and the results of observations of settlement;
- c) data as to the dimensions and shape of the stone, results

of laboratory research in stone materials;

- d) data concerning actual hollowness of the fill;
- e) intermediate acceptance certification for work in foundation layout, marking off, etc., completed prior to beginning the fill or regular laying;
- f) log books for observing settlement;
- g) other log books.

For intermediate acceptance of stone beds and other stone-fill structures, the following items are to be checked:

- a) strength, frost resistance and size of the stone being used;
- b) settlement of the rubble mound;
- c) forms of alignment accomplished;
- d) volume and hollowness of the fill;
- e) completion of loading;
- f) actual dimensions of the rubble mound in the surface plane and in profile.

8.17. Pouring out the stone into the discharge prism should be accomplished only after completion of work on erecting and loading the wall, and after its intermediate acceptance.

8.18. Pouring out the stone into the discharge prism is to be accomplished while simultaneously conducting systematic monitoring of settlement and deformation in the structure. In case any settlement or deformation is found which exceeds that provided for in the plans and specifications, the pouring-out process must be halted. Procedures for continuing the work should be established with the agreement of the project organization.

8.19. Ungraded stone is used for filling up the prism along with crushed rock by-products. While individual ships make delivery of stone of one size to the project site, larger stone is to be poured into the lower layers of the prism.

8.20. Work in setting up the discharge prism is to be carried out on a wide front; the structure is to be marked off into sections and the prism gradually readied in each section, up to the profile of the project.

8.21. In locations subject to the effects of waves and wave overflow across the wall, laying of the uppermost crushed-rock layer of the prism and counter-filter is not permitted prior to setting up the above-water construction in order to avoid wave damage to the layer of crushed rock and counter-filter.

8.22. Fill-in of the counter-filters is to be carried out using gauges mounted in locations of changing filter elevation, but not more sparsely than every 20 m.

8.23. Work in setting up the counter-filter can be begun only after acceptance of the stone discharge prism.

8.24. Before pouring out the counter-filter layer, a coarse alignment of the scarp and berm of the stone prism is to be accomplished.

Fill-in of the underwater portion of the counter-filter is to be monitored by systematic measurements of the transverse profile of the counter-filter.

8.25. Protective fills are to be accomplished under the piling grills upon completion of dredging operations, and driving and unfastening of the piles.

8.26. Delivery of stone and crushed rock (or gravel) by water route is accomplished on barges using containers whose volume corresponds to the cargo list capacity of the cranes on hand.

8.27. In setting up the discharge prism and counter-filters, instrumental photography is to be used to check the actual dimensions of the constructed prism or counter-filter, and the actual profiles are to be plotted on the working drawings. The following items are to be checked as well:

- a) quality of materials being used;
- b) design and actual work volume;
- c) work-accomplishment log book and its entries;
- d) observations of settlement and deformations while working on setting up the discharge prism, counter-filters and rubble fill;
- e) special technical circumstances encountered during work accomplishment.

Stone Filling of the Underwater Cribwork and Reinforced-Concrete Monoliths

8.28. Stone filling of the underwater cribwork, the reinforced-concrete monoliths and also the barrier pilings is to be permitted only after checking how their position corresponds to the design position, and after checking correctness of the fit between the exterior walls and the bed along the perimeter.

The filling should be accomplished uniformly over the entire area while taking measures to avoid damaging the cribwork, the reinforced-concrete monoliths or the barrier pilings. Asymmetric loads are not permitted.

Filling in the casing of the reinforced-concrete monoliths should be accomplished only after their submergence at the location of installation.

The filling in should be accomplished in equal measure over the entire area while taking measures to avoid against damaging the cribworks, the reinforced-concrete monoliths and the barrier pilings. Asymmetric loads are not permitted.

Filling in the cover shell of the reinforced-concrete monoliths should be accomplished only after their flooding at the installation site.

8.29. For works in open water areas the duration of the cribwork installation into the structures and their loading with stone should not exceed 1.5 days [24-hour periods]. In this regard the weather forecast is to be taken into account and the sequencing of installation and loading of each crib is to be strictly observed. Extracting the cribworks for installation in place is to be accomplished only after loading of all of the ballast necessary for crib loading onto a barge. Installation of cribworks during rough seas (sea state greater than 2) is not permitted.

8.30. Recesses shall filled in only after loading the cribwork containers.

8.31. In loading the cribworks with stone, technical personnel must be monitoring the quality of stone and uniformity of loading individual banks, as well as of the uniform submergence of the cribworks without the crane.

8.32. Prior to final loading of the cribworks (concrete monoliths) with stone, the accuracy of its position in the structure is to be checked.

A certificate is to be made up for each constructed cribwork (concrete monoliths). This will record the cribwork number, date of installation, attesting data on the cribwork foundation, cribwork dimensions, inclination of the front plane plan from the planned design position, leveling marks, distance between the 2 butt-end faces of the contiguous cribworks; material and bulk weight of the cribwork filling, data and volume of filling.

Stone Works in Solution

8.33. Rubble works in the marine engineering structure are to be accomplished in accordance with the requirements of SNiP Chapter III-V.4-62 "Stone Construction. Regulations for Project Fulfillment and Acceptance" and addenda to this chapter.

8.34. Heavy (100 kg or more) facing stones are to be installed dry, on wedges having caulked seams and flooding to take place after caulking with cement mortar.

8.35. Laying within the borders of 2 contiguous sediment seams is to be accomplished uniformly in layers of a single height.

8.36. Laying mortar which is being accomplished in water areas not protected from the effects of waves, is to be accomplished in a protected framework, whose removal should be decided upon only upon achievement of the laying of the planned strength.

9. CONCRETE AND REINFORCED-CONCRETE PROJECTS

9.1. Concrete and reinforced-concrete projects in construction of marine engineering facilities are to be accomplished in accordance with SNiP-III-V.1-62 chapter entitled "Construction Using Concrete and Reinforced-Concrete Monoliths. General Regulations for Project Accomplishment and Acceptance"; III-V.2-62, "Construction Using Concrete and Reinforced-Concrete Monoliths. Special Regulations for Project Accomplishment and Acceptance"; III-V.3-62 "Prefabricated Concrete and Reinforced-Concrete Construction. Regulations for Assembly Project Accomplishment and Acceptance"; I-V.5-62 "Reinforced Concrete Articles. General Indicators"; I-V.5.2-62, "Reinforced-Concrete Articles for Structures" and the regulations of this chapter which supplement them.

9.2. Measures for speeding up hardening of the concrete should be selected depending on the engineering and economic indicators, the type of components being produced, and accepted production technology.

9.3. In manufacturing of items using quick-hardening cement, the items should be kept under natural conditions, without taking them off the bottom plate or from casting platforms prior to their attaining the required release strength.

9.4. Use of chemicals in speeding hardening is prohibited.

9.5. Allowable deviations in the dimensions of prefabricated reinforced-concrete structures and components (except pile, sheet pile and monoliths), for which the design is established with an accuracy rating of 9, should not exceed the amounts showed in Table 1.

Allowable deviations for prefabricated reinforced-concrete items, whose accuracy rating is envisaged by design to be other than class 9, are determined in accordance with the requirements of SNiP I-A.4-62 "System of Tolerances. Basic Provisions".

9.6. Allowable deviations of the dimensions of reinforced-concrete piles (sheet piles) from the design dimensions must not exceed the amounts indicated in the chapter of SNiP I-B.3-62 "Foundations and Supports Made of Piles and Cylindrical Casings. Prefabricated Structures".

Table 1

Deviation	Deviation size in mm
Deviation in linear dimensions (in length, width and height) in intervals of the design dimensions, mm:	
up to 1,500*	± 3
above 1,500 to 2,500	± 4
above 2,500 to 4,500	± 5
above 4,500 to 9,000	± 7
above 9,000 to 15,000	± 11
above 15,000 to 21,000	± 13
Maximal allowable indicator of curvature (of convexity or concavity) of faces occurring per 1 m length of width of prefabricated component:	
for faces that interface with other components	5
for free faces	10
Deviations in distance dimensions between lifting clamps (loops) when the distances between them is m are	
less than 3	± 30
greater than 3	± 50
*When the cross-sectional dimensions of the items are less than 1,500 mm, the allowable deviations of these dimensions are established according to the interval of the design dimensions of up to 1,500 mm.	

Fabrication and Installation of Concrete and Reinforced-Concrete Blocks

9.7. Consolidation of the concrete mixture in the framework corners, in the external surface of the concrete blocks, and on the first layer, is to be accomplished with special care and thoroughness. The upper face of the block is to be processed with a surface vibrator and then smoothed. Use of a layer of cement mortar or cement grout slurry for these purposes is not allowed.

9.8. After concrete placement and consolidation over the surface of each block, its number, type and date of fabrication is to be plotted according to the following model:

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9.9. Erection and transfer of concrete blocks is to be accomplished after the concrete has reached at least 70% of the design strength, which is established by the construction laboratory.

9.10. Laying of the blocks into the structure must be conducted after the concrete achieves the design strength.

9.11. During the acceptance of finished blocks the following should be written in their construction log-book:

- a) results of the exterior inspection;
- b) deviations in the actual dimensions of the blocks from the design;
- c) deviations from the design in the position, construction and dimensions of the layed parts and the shaft for erection;
- d) conclusions as to the quality of the blocks.

The allowable deviations in the construction of blocks must not exceed the values indicated in Table 2.

Table 2

Deviation	Sizes of allowable deviations in mm
Deviations from the design dimensions: of blocks for regular laying of blocks for filling	10* 50
Deviations in disposition of recesses and wedges	10*
Greatest hole depth	10
Overall allowable cavity area in % of face area	2
Splits in one side: for structures from right-angle block laying in length in width	500 50
Corner splits (measured along the edges) for structures of linear type berthing type	100 150
Deviation of edges from linearity	10
Deviation in distances between the clamping device instrument axes (shafts, grooves) in blocks for rectilinear laying in blocks for filling	15 20

Table 2 (continued)

Deviation	Sizes of allowable deviations in mm
Deviations in transverse dimensions for clamping devices	10
Note: The size of the allowable deviations marked by an asterisk (*) are increased to 15 mm for a block weighing more than 50 tons.	

9.12. Operations to place blocks in accordance with diagrams must designate the block installation method (by position or by sections), the time periods of placement for each heading of blocks along the sections of the structure, the method and weighting down terms following completion of the placement, or to the extent of its erection, the requirements for maintaining the structure with weighting down or without weighting down, waiting requirements for damping of the sediment, etc, the necessity to erect an experimental section of wall (in weak foundation soils, and bed thicknesses of ≥ 3 m).

Note: The necessity of and times for curing the structure under load are to be defined in the design.

9.13. Prior to the start of proper laying of the blocks on the bed, a marking out of the facing (main) line of the first course from the seaward side must be conducted.

In order to place the first course of blocks for individual supports or heads of coastal fortifications, a marking out of the combat line is to be accomplished along the entire perimeter of the first course.

9.14. The allowable deviations during laying of blocks must not exceed the values indicated in Table 3.

9.15. The first concrete block for the wall is to be placed on the main line at the beginning of the structure or at a wall sediment seam of the wall with special accuracy, and with the mandatory checking of its position by geodesic instruments along all four corners. The first support block or heads of the structure should be placed on a corner, or along the support or head center.

9.16. In the process of placement of the first heading, a systematic check is to be conducted using geodesic instruments to insure observance of the main line of blocks and maintain the proper

upper plane surface of the entire heading; a determination is to be made as well of the actual elevation markings of the blocks' upper surface and a comparison of these data with those of the working drawings.

If there are elevation deviations for certain blocks that exceed established tolerances the appropriate blocks must be raised and alignment of the bed conducted. After this, a repeat placement of the blocks must be accomplished until provision of the correct first heading surface is achieved.

Note 1: In erecting walls that have 2 or more rows of blocks in the lower headings, the external blocks must be placed first.

Note 2: Fill-up of the bed with a solid, fine layer of fine stone is not permitted.

Table 3

Deviation	Sizes of allowable deviations in mm for	
	Straight sectors	Corners and connections
Deviation from the facial line	30	20
Projections or recesses in the masonry relative to the facial plane	30	20
Greatest clearance (seam thickness) between the blocks	30	20
Deviations in the bonding of the seams from the design	150	150
Deviations in the height of individual block headings	40	30

9.17. Stacking of each subsequent heading must be begun only after dampening of the settling of the previous block headings on the front of the stack to a value which is provided for by the design.

Observance of rectilinearity of the facial line with the seaward side must be checked by geodesic instruments according to underwater markers.

The marks of the upper plane of each block heading must be tested by leveling in the process of stacking.

9.18. The allowable deviations in the block laying from the design after loading must not exceed the values cited in Table 4.

Table 4

Structure and construction type	Width of clearances between blocks in mm		Allowable deviations of individual blocks from the heading plane in mm	
	mean	maximum	upper	bottom
Walls of enclosing structures for 3-4 block headings	40	100	100	70
The same for 5-6 block headings	40	120	120	80
Embankment walls for 3-4 block headings	40	70	70	50
The same for 5-6 block headings	40	100	100	70
Individual supports, head sectors of structures, special sectors of walls (attachment corners	30	50	50	50
Note 1: Maximum deviations in the width of clearances are allowed of no more than for 10% of the total number of seams. Note 2: With settling of the layed object above the design and in the presence of deviations which exceed tolerances further operations must be accomplished only with the agreement of the design organization.				

9.19. Settling of a loaded block structure must be tested by geodesic instruments. The testing times must be established by the plan relative to the soil conditions.

9.20. The loading must be recorded by the following documents:

- a) a schematic plan of the structure with indication of the type of loading of each sector, the date of installation and the removal of the loading blocks and the achieved ground stresses;
- b) a profile of the structure with annotation of the loading blocks;
- c) a log-book and a drawing of all the alignments made during the loading of the laid structure;
- d) statements of all the special technical conditions encountered during loading of the laid structure (relaying of blocks, disruption of the layed structure, etc).

9.21. Upon completion of the loading of each sector an underwater diver inspection must be conducted of the condition of the blocks and the laid object; during the inspection special attention must be given to the completeness of the blocks and the absence of violations of the laying. The inspection results must be recorded in a statement.

9.22. Special sectors of the block structure the end and the angle connections with existing structures, the points of change in the longitudinal profile, the soil conditions and the like must be accomplished especially carefully.

9.23. Stacking of protective blocks on the berm and the slopes of the bed must be conducted after installation of the first block heading of the wall in each sector. The condition of the berm and the slopes of the bed which are subject to covering by the protective blocks must be checked first.

9.24. Stacking of the blocks on the berms of the bed must be conducted beginning from a row which is directly adjacent to a wall, where the berm blocks must be stacked directly against the blocks of the first heading.

Stacking of the blocks on the slope of the bed must be conducted beginning from a row which is stacked down slope.

9.25. During stacking of the blocks on the berms and the slopes of the bed abutment must be provided of the edges of the upper blocks situated on the slope to the edges of the blocks on the berm.

9.26. A log-book of operations with the blocks must be kept for the reliable rating of operations to stack the blocks, besides the technical documents cited in the previous paragraphs, for the course of the entire period of operations with the blocks. The number assigned to the block according to the production yard and annotated on the block remains unknown in all the technical documents.

9.27. The acceptance of the block laid construction must be conducted on the basis of the results of inspection of the laid construction in natural conditions, examination of the certificates of intermediate acceptances and examination of operations which precede the installation of the blocks. In this the following must be tested:

- a) the condition of the bed and the previous headings of the laid construction according to data from the divers inspection and the certificate of tentative acceptance;
- b) the quality of the concrete of the blocks laid in the work;
- c) the dimensions of the masonry (total and by headings) and its arrangement (plan and elevation);

- d) the number of laid blocks along each heading and their arrangement in plan and elevation;
- e) the position of settling seams, the number of bindings of the seams between the blocks, the dimensions of the seams and the amount of settling of the laid construction;
- f) the block operations log-book;
- g) geotechnical data on the structure;
- h) data from the test of the condition of the bed before beginning operations for the installation of the blocks;
- i) certificates for spacing operation;
- j) working and assembly drawings of the masonry of each heading;
- k) the log-book construction;
- l) the list of allowed deviations from the design;
- m) data on the loading of the masonry (the loading lay out, the weight of the loading blocks, the curing times of the masonry construction under load and the like) if loading is provided for by the design;
- n) data from observations of the settlings and the deformations of the laid construction in its erection period and;
- o) certificates about special technical circumstances which occurred in the period of operational production.

Filling of the Blocks

9.28. Wooden patterns positioned above the surface of the water must be used for conformance to the design axis and profile of filling, besides the markers.

9.29. Operations to fill the blocks should be performed in compliance with the following requirements:

- a) lateral blocks must be installed before starting the filling of the blocks;
- b) deviations of the lateral blocks from the design stacking line must not exceed 250 mm;
- c) filling of the block must be conducted initially in the external (seaward) part of the structure profile and;
- d) deviation in the actual area of the cross-section and of the filling from the design area must not exceed 5% in compliance with the design elevation of the top of the fill.

Blocks placed in the upper part and on the slopes of the structure must be stacked, but not dropped.

Note: During operations the crane must be installed on the inner side of the structure so that work is performed with its finished parts protected.

9.30. Adherence to the design profiles must be tested by measurements which must be conducted every 5 meters along the axis of the structure and every 3 meters along the transverse profile. Drawings of the filling profiles must be compiled as the basis of the measurements.

9.31. During the entire operational production until acceptance of the objects into exploitation systematic observations must be conducted of the condition of the filling and when settlements are discovered, replenishment of the profiles by blocks must be conducted, about which a certificate is written with the appropriate annotation in the project log-book.

9.32. Operations to fill the blocks must be fulfilled with adherence to the following requirements:

- a) the slings, tools and fixtures for filling the concrete blocks must be checked daily before beginning operations;
- b) the cranes used to fill the concrete blocks must be set up with consideration of protecting them from damage due to possible rolling of the concrete blocks;
- c) the concrete block to be jettisoned must be freed from the slings and dropped into the lowest position allowable without disturbing the structure of the concrete block filling and
- d) divers are not permitted to work near the crane during jettisoning of the concrete blocks.

9.33. During the acceptance of fillings from concrete blocks the following must be checked:

- a) the quality of the concrete blocks in the filling;
- b) the dimensions and the disposition in the plane of the sector of the filling being delivered;
- c) the number of the concrete blocks in the sections;
- d) the hollowness of the filling;
- e) the location of the lateral and berm concrete blocks installed on the slope of the bed;
- f) the settling of the filling; as well as the following production forms and records:
 - a) the profiles of the filling actually accomplished, indicating the percentage of cavities;
 - b) the log-book for observations of the settling of the filling and
 - c) data on additionally dumped concrete blocks.

Based on the enumerated documents, the quality and volume of complete operations must be recorded and the actual volumes must be compared with the volumes provided for by the design.

Reinforced Concrete Monolith Construction

9.34. During the construction of reinforced concrete monoliths, deviations in the dimensions of the welded grids and frames as well as deviations from the design distances between the rods and the welded elements should be allowed in accordance with the requirements of the chapter of the SNiP III-B.1-62, "Concrete and Reinforced Concrete Monolith Construction. General Rules for the Production and Acceptance of Projects".

9.35. Impact effects on the steel of the inserts with a temperature below -25°C are prohibited.

9.36. Reinforcement projections designed for connection of the elements to each other must be straight. Deviations in the lengths of the reinforcement projections from those assigned by the design must not exceed $+30\text{ mm}$ and -10 mm , while the distance between them - no more than 0.5 times the diameter of the reinforcement rod.

9.37. Acceptance of the elements of the reinforced concrete monoliths must be conducted by batches when the concrete reaches 100% of the design strength.

Note. A batch is considered any number of elements of a single standard, sequentially constructed by one technology from materials of a single type and sort in 10 days, but no more than 100 units with a volume of a single element of up to 1 m^3 or more than 50 units with a volume of a single element of up to 5 m^3 .

Reinforced Concrete Monolith Assembly from Precast Elements

9.38. The assembly of reinforced concrete monoliths must be conducted on building berths.

The operational surface of the bed must be rigidly adjusted, avoiding sagging of the beams during their loading. Deviation from the marks at the top of the beams must not exceed $\pm 5\text{ mm}$.

The beams must be marked off by lines and they must be used as standards for laying the bottom plate of the reinforced concrete monolith. Deviations of no more than $\pm 5\text{ mm}$ are allowed in the marked off dimensions.

9.39. The allowable deviations from the design position of the assembled elements of the reinforced concrete monolith must not exceed:

a) $\pm 10\text{ mm}$ in the clearances between the plates of the bottom, the front, the middle and the rear walls.

- b) 5 mm of noncoincidence in the external and internal surfaces of the adjacent bottom plates and the front, middle and rear walls;
- c) 5 mm of shift of the axis of the vertical elements in the lower cross section relative to the peg axis in the bottom plates and
- d) the greatest deviation of the planes of the vertical elements from perpendicular in the upper cross section is 5 mm.

9.40. Assembly of the vertical elements must be conducted upon completion of the monolithization of the clearances between the bottom plates and acquisition by the monolithizing solution of 25-30% of its design strength.

Monolithization of Butt Joints

9.41. All the edges of the elements which must be adjoined with the monolithizing concrete must be first treated through their cleaning, blow-off and wash-off.

Monolithization of the butt joints between the bottom plates must be conducted through pumping of the solution by a mechanical method into the enclosed seam.

Monolithization of the vertical butt joints between the wall plates must be conducted through guniting.

The butt joints in the bottom plates monolithized by the cement solution must be covered and maintained in a moist condition until the acquisition of a strength which is no less than 70% of the design strength.

9.42. The guniting must be conducted at a temperature of the air and the surface of the elements to be sprayed of no less than +5°C. At an air temperature below +5°C the guniting must be conducted in construction enclosures. Freshly layed gunite must be shielded from the suns rays, the wind and the rain. Glazing of the gunite must be conducted 1 hour after its application and be repeated every 3 hours until the acquisition by the gunite of the design strength.

9.43. During the assembly and monolithization of reinforced concrete elements of reinforced concrete monoliths, the installation and welding of the reinforcement projections must be accomplished according to the specifications of the chapter of the SNiP III-V.3-62, "Concrete and Reinforced Concrete Assembly Constructions. The Rules for the Production and Acceptance of Assembly Projects".

Testing of Reinforced Concrete Monoliths for Water Penetrability

9.44. Testing of reinforced concrete monoliths for water penetrability must be conducted upon completion of all assembly and butt joint finishing operations. Tests are conducted on the bed by pouring a layer of water into all the compartments with a height no less than the settling of the reinforced concrete monolith during its towing. While the tests are being conducted the bed must be reinforced in accordance with the design instructions.

9.45. Filling of the compartments with water must be conducted from both ends of the monolith towards its center by gradual, staggered pouring at an external air temperature above 0°C.

The duration of the compartment testing by pouring must be determined as the time required for examination of the surfaces being tested, but no less than 1 hour.

9.46. The monolith being tested is considered impenetrable when no flows in the form of streams which drip or leak appear on the surfaces being observed.

When water leaking points are discovered, they must be cleared (cut out) and sealed off with concrete of the very same composition as the concrete of the element.

9.47. The constructed reinforced concrete monoliths must be examined and accepted by the commission at the assembly points.

The accepting commission must present the following technical documents:

- a) working drawings of the reinforced concrete monoliths with indication of deviation from the design dimensions during their construction;
- b) a report on testing of concrete samples;
- c) the production operations log-book;
- d) statements of intermediate acceptances and inspections of projects which preceded the concreting (reinforcement, preparation of concrete forms, etc) and
- e) laboratory data on tests of the concrete components: cement, the fillers, additives and water.

During acceptance the following must be accomplished:

- a) testing of the compliance of the finished construction to the working drawings through external inspection of the concrete surfaces and measurement of the elements of the reinforced concrete monolith and
- b) examination of the statements for all the concealed works, the data from laboratory tests of the concrete components, the reinforcements and the test samples of the concrete.

The external examination and measurements of the reinforced concrete monolith must be governed by the allowable deviations, cited in Table 5.

Table 5

Name	Measurement unit	Allowable deviation
Deviation in dimensions of the reinforced concrete monolith in length, width and height	%	0.5
Deviation in dimension of cells (in the plane)	mm	40
Deviation in the planes and the lengths of their intersection from the perpendicular:		
for 1 linear meter	mm	5
for total height:		
a) with concreting in panel forms	mm	15
b) with concreting in a movable form	mm	40
Note. The thickness of the protective layer of the walls and the bottom is not allowed to be less than 30 mm.		

9.48. Discovered defects, whose dimensions exceed the allowable, must be eliminated. After elimination of the defects, the reinforced concrete monolith must be examined by the commission again before lowering into the water.

Lowering of the Reinforced Concrete Monolith into the Water

9.49. The movement of the reinforced concrete monoliths and their positioning must be conducted with the use of measures to prevent damage to them and the appearance of cracks in the bottom and the walls.

Note. It is not permitted to lower reinforced concrete monoliths into the water before their concrete reaches the design strength.

9.50. The lowering of reinforced concrete monoliths made on floating or dry docks or on active ship building or ship repair slips must be governed by the rules for exploitation of these facilities.

Installation of Reinforced Concrete Monoliths into a Structure

9.51. Stopping (temporary standing) of reinforced concrete monoliths should be allowed only in water bodies protected from the effects of wind, with temporary flooding to a depth which allows the pumping out of the water from the flooded reinforced concrete monolith when there are no projections of rocks, boulders or other objects on the bottom which may damage the bottom of the reinforced concrete monolith, or in a floating condition with bracing to a depth which guarantees buoyancy of the reinforced concrete monolith during the stop.

9.52. The withdrawal of the reinforced concrete monolith shell from the protected water area to the point of installation and the installation should be conducted only after receiving a forecast for the next two days for waves of a sea state of no more than two.

The reinforced concrete monolith must not be outlet until the loading of all the materials and equipment onto the barge, which are required for its unloading.

9.53. Before outlet to the point of installation, all the required equipment (winches, cables, range poles, bits, etc) must be installed on the reinforced concrete monolith in accordance with the work accomplishment design.

9.54. Towing of the reinforced concrete monolith must be accomplished:

- a) by a tugboat near the side at a transport distance of up to 2 km or in close quarters or
- b) by a tugboat on a towing cable at a transport distance of greater than 2 km in non-congested conditions.

9.55. The installation of the reinforced concrete monolith into the profile of the structure must be conducted through flooding.

9.56. Tightening of the reinforced concrete monolith to the point of installation in the profile of the structure must be conducted with the help of winches, installed on the monolith.

9.57. Submersion of the reinforced concrete monolith for installation on the bed must begin only after adjustment of the position of the reinforced concrete monolith by the range lines. Submersion must be conducted evenly. The evenness of settling should be regulated and checked against the graduation marks applied to the corners.

9.58. After installation of the reinforced concrete monolith on the bed, its position must be checked from the range lines along with the abutment of the bottom of the reinforced concrete monolith to the bed along the perimeter.

Deviation from the range lines must exceed 6 cm. Deviation in the clearance between the faces of the adjacent reinforced concrete monoliths must not exceed 5 cm of the design size (a total clearance of 10 cm).

Note. If after installation of reinforced concrete monoliths on the bed there is deviation from the range lines more than that allowed, enough water must be pumped out of the compartments so that the reinforced concrete monolith will separate from the bed and it must then be adjusted. When there are gaps between the surface of the bed and the bottom of the reinforced concrete monolith larger than those allowed for the design type of the bed leveling, the reinforced concrete monolith should be lifted, placed to the side and the bed leveled. After this, the second installation of the reinforced concrete monolith is conducted.

9.59. After installation of the reinforced concrete monolith onto the bed, the winch cables remain tightly packed until the monolith is completely filled with water. The winches should be removed after loading the reinforced concrete monolith.

9.60. After installation of the reinforced concrete monolith onto the bed, observation of its settling must be organized. The settling must be checked by periodic leveling according to the marks made on the corners of the reinforced concrete monolith.

Note. The first leveling should be conducted immediately after installation of the reinforced concrete monolith onto the bed and the second, after its loading.

9.61. Loading of the reinforced concrete monolith with the concrete mix must be accomplished in a dry state with preliminary, alternate pumping of the water out of the individual compartments. Filling of the concrete under water by the "rising solution" method may be authorized only in the presence of special justification.

Filling of the compartments by loose materials (stone, sand or gravel) should be conducted in the water.

9.62. Loading of the compartments should be conducted evenly, beginning from the center. The compartments subjected to the greatest wave impact must be filled first.

Note. Loading of stones into the compartments should be conducted with adherence to the required safety measures against damage to the concrete of the protective layer of the bottom and the walls of the compartments.

9.63. In the acceptance of a reinforced concrete monolith installed on a bed, compliance with the design must be checked for:

- a) positioning of the reinforced concrete monolith being inspected in the plane and according to height;
- b) settling of the reinforced concrete monolith after its installation (from the results of diver inspection) and
- c) the quality of the materials used for filling the compartments and the covering plates or blocks.

Acceptance should be conducted based on an external inspection and a diver's inspection and data from the following documents:

- a) the settling graph of the installed reinforced concrete monolith;
- b) reports of intermediate acceptances and inspections of the construction of the reinforced concrete monolith, of the installation of the bed, its leveling, etc, and
- c) reports of the diver inspection of the reinforced concrete monolith after its installation.

Assembly of Reinforced Concrete Corner Quays

9.64. During the design of a foundation pit for corner type quays, erected "dry", deviations from the design reference marks must not exceed ± 50 mm.

Leveling of the bed must be conducted by sections and partial fillings in the packing (rolling) period. Unrolled partial fillings are prohibited.

On the packed bed, deviations in the actual reference marks of its surface from the design must not exceed:

- a) ± 10 mm under the forward part and the central assembly foundation plates and
- b) ± 20 mm in the remaining part of the bed and with installation of monolithic foundation plates.

9.65. Before beginning operations, the inventory of all the elements to be mounted should be positioned in the operational zone of the crane.

With operation of a floating crane, the inventory of the elements must be built up on barges or on the shore strip near the loading berth. The assembly elements must be arranged in units in a strict

technological sequence which provides for the comprehensive conduct of operations.

9.66. The elements to be assembled, delivered to the construction area, must be equipped with an established sample certificate and be marked by indelible paint on the upper end of the element in the plane of the lift hooks.

9.67. The lifting, transport and the accumulation of the assembly elements must be conducted with adherence to the following conditions:

- a) lifting of the elements is conducted exclusively by the lift hooks and preferably with the use of a traverse rod and
- b) during transport and accumulation, the assembly elements are disposed with their ribs up and special attention is paid to prevention of the bending of the projecting inserts designed for attachment of the tie rod. Because of this, stacking in several layers is not permitted.

9.68. In the concreting seams between the sections, the toothings must be lined up and the interblock reinforcement must be installed in accordance with the plan.

Note. Concreting of the foundation plate must be conducted directly to the complete height (including the height of the forward projection) without installation of the horizontal concreting seams.

9.69. The allowable deviation in the plane of the support of the forward projection from the design position (in a direction perpendicular to the cordons) must not exceed ± 10 mm. Here, the angle between the plane of the support for the forward projection and the upper plane of the foundation plate must be in the range of $90-92^\circ$.

9.70. The plane of the foundation plate where the vertical element rests must be established horizontally, varying by the laying of the cement solution with a composition of 1:2 with finishing according to established standards. The allowable difference in the reference marks of the support plane in this must not exceed 10 mm.

9.71. During concreting of the foundation plate, the allowable deviations from the design dimensions must not exceed:

- a) in the size of the protective layer, ± 10 mm;
- b) in the thickness of the plate 0, $+20$ mm;
- c) in the width of the plate, ± 50 mm;
- d) for inserts of the tie rod in the plane, ± 10 mm;
- e) for inserts in height 0 minus 10 mm (a deviation with a plus is considered upwards along the perpendicular) and
- f) in the slant of the inserts towards the horizon, $\pm 1^\circ$.

9.72. During laying of the foundation plates the following may be allowed:

- a) a shift of the plates along the cordon and the clearance between them up to 20 mm;
- b) a difference of the reference marks in the ends of the plate along its axis (along the length of the plate) of ± 20 mm and
- c) a difference in the reference marks along the width of the plate of ± 10 mm.

9.73. The assembly of the vertical elements should be conducted only after instrument testing of the reference marks and the position in the plane of the foundation plates and the inserts for them.

This testing must be made official by a report with the enclosure of the following documents:

- a) certificates for the assembly foundation plates (the brands of concrete of the monolithic plate according to data from tests of standard samples with reports on installation of the reinforcement) and
- b) the plan of the foundation plates with the annotation of the axes, with indication of the reference marks at the points of installation of the vertical elements and the existing deviations from the design.

9.74. During final installation of the vertical element onto the plate, close abutment of the adjoining surfaces must be guaranteed.

9.75. Allowable deviations in the assembly of vertical elements must not exceed:

- a) in the clearance in the quadrants, ± 15 mm;
- b) in deviation from the plane of the cordon, $+20$ mm along the length of the section and ± 10 mm from the adjacent elements;
- c) in the clearance between the facial plane of the vertical elements and the plane of the support projection of the foundation plate, $+10$ mm and
- d) in the slant of the facial plane, 0.002.

9.76. Assembly of the vertical elements onto the monolithic foundation plates is not permitted until the concrete in the foundation plate reaches 70% of the design strength.

Organization of the Above-Water Construction of Structures

9.77. The lay-out of above-water construction must be accomplished according to executive working drawings, which take into consideration the actual position of the underwater part.

Operations for the erection of the above-water part should not begin until the stabilization of the underwater part of the structure, which is determined on the basis of materials from the observation of its sinking.

Note. Corrections are introduced into the working drawings with the agreement of the design organization.

9.78. The allowable deviation from the design dimensions of the shell plates must not exceed the values cited in Table 6.

Table 6

Deviation or defect name	Allowable deviation
Departure from the design dimensions of the plates: in the plane in thickness	± 10 mm -5 & +10 mm
Convexity or concavity of the center of the plate	10 mm
Skewing of the corners of the plate	No more than 0.005 times the length of the least of the two sides which form the angle
Deviations in the thickness of the protective layer of concrete	5 mm
Flaws in the facial surface and cracks visible to the naked eye	Not permitted
Hairline cracks on the side of the plate: facial rear	Up to 200 mm long Any length
Peeling of the cement film on the facial side of the plate	Not permitted

Assembly of the shell plates must be accomplished with adherence to the following requirements:

- a) recesses between the shell plates on the facial surface must not exceed 5 mm and
- b) deviations from the design clearances (of the seams) between the shell plates must not exceed 10 mm.

9.79. Before concreting the block, the established shell plates must be accepted according to the report.

9.80. During loading of the blocks with concrete, the shell plates must be protected from impact loading.

9.81. The working seams of the block concreting must not coincide with the horizontal seams of the shell plates.

9.82. The seams between the shell plates must be filled with a solution and rubbed down with dry cement. In strength, water resistance and frost resistance, the solution for filling the seams must be of the same quality as the concrete used for making the shell plates.

9.83. The adjacency of the shells to the filling concrete must be checked by knocking before seam finishing. The detected cavities are filled with a pressurized cement solution.

9.84. Before the start of concreting, each section of the above-water structure must be checked for compliance to the working drawings of the inserts which provide for linkage of the above water structure with the underwater part of the structure. The position and attachment of the inserts of the mooring devices and the recoil devices must also be checked. The form and the surface of the base of the section must be cleaned of dirt, slime, overgrowths, garbage, etc and the reinforcement and other metallic inserts from rust.

9.85. The cordon rocks must be installed with adjustment of their position in the plane and in height by geodesic instruments. Allowable departures from the design position must be no more than 10 mm. The difference in the position of the facial planes of the adjacent rocks along the vertical and horizontal must not exceed 5 mm. The seams between the stones must be filled with a solution, where the vertical seams must not be thicker than 5 mm and from the face, the seams must be expanded with the cement solution.

9.86. During acceptance of an above-water structure, the masonry work and the installation must be examined in natural conditions and the compliance of the dimensions of the elements of the above water structure must be tested against the working drawings.

The actual dimensions of the above-water structure must have no deviations from the design dimensions of the profile by more than 30 mm.

Moreover, the following documentation must be checked:

a) the working drawings of the above-water structure with the annotation on them of corrected marks and dimensions from the results of testing of the markers and dimensions of the underlying part of the structure, as well as the working drawings of the protective and mooring devices.

b) documents on the quality of the materials (the cement, sand, stone, etc);

c) data from laboratory tests of concrete samples;

d) certificates on special technical circumstances during the conduct of operations;

- e) the project production log-book;
- f) the instrument testing log-book or information on tests of the dimensions and correctness of the lines of the above-water structure;
- g) a report on the works conducted;
- h) a list of deviations from the design;
- i) data from observations of the condition of the structures and
- j) a reference point catalog and a log-book of their leveling.

Note 1. Along with the documents listed in paragraph 9.86, the commission must be presented with technical documents on the applied marks or control points, made by a notch or another means on the parapet of the above-water structure or on the cordon itself and which serve for observation of the settling and other deformations of the structure in the exploitation process.

Note 2. The points or marks must be positioned at a distance of 10 m from each other along a straight line or along a line, which corresponds to the planned configuration of the structure.

10. Wood Construction

10.1. Construction of wooden maritime engineering facilities is to be accomplished in accordance with the requirements of SNiP Chapter III-V.7-62, "Wood Construction. Regulations for Construction and Acceptance of Assembly Projects" and the requirements of this chapter.

10.2. Portions of wooden maritime engineering facilities that are located within a variable water level zone, and surface structures that are in contact with soil, masonry and other materials will be constructed using treated lumber in accordance with the specifications of SNiP Chapter III-V. 8-62, "Protection of Structures from Rotting and Fire. Regulations on Construction and Acceptance of Projects," and Chapter I-V.28-62 "Materials for Protection of Wood Structures from Decay, Shipworms and Fire."

10.3. Accomplishment of projects that envisage corrosion protection of metal parts and tie-connector clamps for wooden components of maritime engineering facilities will be in accordance with the requirements of SNiP Chapter III-V.6-62, "Protection of Structures from Corrosion. Regulations for Construction and Acceptance of Projects," and SNiP Chapter L-V.27-62, "Protection of Structures from Corrosion. Materials and Products Effective Against Corrosion."

10.4. When joining composite elements of supports, beams and capsills, no more than 25% of all the joints should be in any one section.

Construction of Piles, Sheet Piles and Fenders

10.5. Piles are to be constructed in accordance with the requirements of SNiP Chapter I-B.13-62, "Wood Materials, Products and Construction from Wood," and the requirements of this chapter.

10.6. Grooves and tongues made of wood are to have a smooth surface. Wooden sheet piles are to be joined to each other and appropriately placed prior to immersion.

10.7. Deviations from design values in the dimensions of sheet piles made of wood are not to exceed the limits specified in Table VII.

Table VII

Type of Deviation	Acceptable Deviation (mm)
sheet pile thickness	-0+10
size of groove and tongue	± 2
distortion of surface and pile or sheet-pile edges per 1 m. of length	± 3

10.8. Gunned wooden piles and sheet pile will be made from coniferous boards treated with phenol-formaldehyde adhesives. Thickness of the boards is not to exceed 50 mm (46 mm after planing), the width--220 mm.

10.9. Quality of the adhesives used is to be checked by gluing standard samples and testing them against chipping. Shearing strength of the adhesive seam will be no less than 60 kg/cm².

10.10. Board joints in adhesive piles will be made flush end-to-end, or with miters, whose length will be no less than 10 times the thickness of the boards being joined.

The distance between joints of adjoining planks in the pile will be no less than 20 times the thickness of the planks for flush joints, and no less than 10 times the thickness for mitered joints, counting the space between ends of the miters.

The quantity of joints in one pile section or pile sheet is not to exceed 25% of the total number of planks in the pile; there will be no more than one joint in the zone having the greatest material stress.

10.11. For baffle mounts, beams of first and second grade conifer will be used.

Note: Beams may be used with a covering of not more than 5 cm from each side (without increasing their cross section).

10.12. Acceptance of adhesive piles and sheet piles is to be accomplished by examining each pile. Of the number of piles accepted through exterior examination, mechanical testing against buckling (until collapse) will be performed on 2%, but not on less than two pieces.

10.13. Adhesive piles and sheet piles will not be accepted under the following conditions:

- a) when there are non-adhesive sections longer than 150 mm. in a seam;
- b) when there is a non-adhesive mitered seam;
- c) when the thickness of a glued seam is more than .5 mm.;
- d) when the joint locations and quality of materials do not meet the requirements of this section;
- e) when the outside planks of the rabbet forming the groove are displaced relative to the center plank, or if the annular rings are buckling on the outside.

Cribbing Construction

10.14. In constructing cribs, logs of second grade conifer (pine, larch) are to be used; other types of conifer may be used for temporary cribwork.

10.15. For crib walls, logs of 20-26 cm. diameter will be used. The front wall will be tightly built of beams trimmed on two edges, with a bed whose thickness is not less than 10-14 cm.

Note: With strongly butted wood, beams trimmed on four edges (with rough edges) having cross sections of 20x20 to 22x22 cm. will be used.

10.16. With crib sizes exceeding the length of the lumber, the crown is joined along the length with several logs.

The lower and upper lengths of the crown are joined with a simple cam. Intermediate parts of the crown are joined using tongue and groove. The ends of joining logs are perforated with bolts.

Log joints are to be located in the center of the span between lateral walls, and spaced not more concentratedly than every two rings in the vertical direction. Joints in the outer casing of the crib are not permitted.

10.17. All crowns of longitudinal and lateral walls are to be connected by bolts driven alternately from either side at a distance of 70 cm. from the axes of the intersecting walls. The bolts are placed through the bank in each row, while into the upper crown and lower third crown not less than two bolts will be driven from the bottom in each bank.

10.18. Besides bolts, two clamps will also be used for height-connection of the crib walls. They will be placed vertically at corners of the thwart timbers or joined to the crib walls with bolts.

For tight joining of clamps to the crowns, the crib walls are cut. Joining by clamps along the length is not permitted. Holes for bolts in the clamps are made in an oval shape, whose length is dependent on the settlement of the crib (up to 2% by height).

10.19. Acceptable deviations in crib specifications will not exceed those shown on Table VIII.

Table VIII

Type of deviation	Acceptable crib deviation
crib length, width, height	100 mm.
warping of the crib by % of crib height, width, length	1
fissures between crowns in front walls and at joints	no more than 10 mm.
deviation in frontal surface	100 mm.
deviation of walls from the vertical, as % of wall height	0.5

10.20. Beams and timbers of through-cut cribs are to have a length not less than that of three adjoining crib sections.

10.21. Crib assembly areas will be in locations protected from moving or drifting ice, and if possible, close to the crib's intended installation site.

10.22. Cribs are built in cut-out portions of stable embankments, either in inactive moorages with subsequent launching into water using cranes, or on ice.

10.23. Construction of an embankment slip for crib launching and all crib-engineering work--especially construction and retraction of retaining devices--will be worked out in the project plan.

Installation of Cribs

10.24. Cribs afloat will be completed while affording protection against waves and currents.

Water depth at the work site will be 0.3 - 0.5 meters greater than the estimated crib draft.

Floats will be placed around the crib perimeter.

10.25. Crib installation at the site is accomplished with the help of winches placed on the crib, and of hawsers and anchors. It is controlled using geodesic instruments with reinforced buoys.

10.26. Deviations in crib position when installed from the planned position will not exceed the limits shown in Table IX.

Table IX

Type of deviation	Acceptable deviation for permanent facilities (in mm.)
displacement of axis	100
warping during crib filling	100

10.27. Cribs completed while afloat must be securely berthed at a moorage or put at anchor.

Cribs will be equipped with rescue gear (lifesavers, belts, etc.), and floats or boats will be kept nearby.

10.28. Filling of cribs in open water will be begun immediately after their installation on site. Duration of installation and filling will not exceed 36 hours.

Fill will be distributed uniformly throughout the entire area. The crib position relative to the final site during filling, up to the moment of final set-down, will be checked periodically.

10.29. Underwater bolt-hole axes will coincide with the axes of the piles; grips and braces will not be outside the center third of these elements.

10.30. The following will be inspected during crib acceptance:

- a) installation area;
- b) rock bed;
- c) elements prepared for crib construction when accomplished afloat or on ice;
- d) cut cribs;
- e) wood preservative treatment for cribs;
- f) filling of cribs.

The following documentation will also be checked:

- a) for axil-filling;
- b) the entire set of working plans and drawings;
- c) work certificates as to geodesic layout of the facility;
- d) data on examination results with respect to foundation soils and geological data in the design plan;

- e) certification for concealed work and certificates of intermediate examination;
- f) register of deviation from plan.

Note: In documentation prepared prior to entry of the crib into the water, the following should be indicated: type of crib, type and quality of wood used, correspondence of crib dimensions with those of the design, quality of joints, type of clamps and their correspondence with the design plan, dates the crib work was started and completed, etc.

11. Pile Construction

11.1 Pile construction will be accomplished in accordance with the requirements of SNiP Chapter III-B.6-62, "Pile and Casing Foundations and Supports. Grooved Barriers. Regulations for Construction and Acceptance," and the requirements of this chapter.

11.2 All piles having unsupported lengths of over 5 meters, that are subject to a wave force greater than 3, will be reinforced after submersion.

11.3 An increase in the pile sway factor due to weight (e.g., installing ready-made reinforced driving caps) is prohibited without safely separating the piles.

11.4 Steel and timber piles that deviate beyond the allowable design levels may be corrected. In such cases, the horizontal stress will not cause permanent deformation of steel piles or the collapse of wooden piles.

11.5 Cutting of piles will be accomplished only after authorization of the acceptance commission, following acceptance of the submerged piles.

Cutting of concrete pile heads will be accomplished several centimeters above the rated level, with the subsequent neat finishing of the cut surface up to the mark.

After cutting and cleaning of the concrete, the remaining part of the pile will be inspected by the acceptance commission, which will give permission for further operations to join piles with the superstructure.

11.6 The amount of soil resistance during vibration extraction will be determined from the following approximate figures for each soil at one square meter of area of lateral face of the element being extracted:

saturated sand	0.1 - 0.2 tons/m. ²
dry sand	0.3 "
sandy loam	0.4 - 0.5 "
loam	0.8 - 1.2 "
clay	1.5 - 3 "

Based on this data, the required strength of the extracting apparatus will be calculated.

11.7. Permissible deviation from the planned submersion depth of grooves will not exceed ± 100 mm.

Should it be impossible to submerge the groove to the intended level, the problem of changing the level will be resolved by the design organization.

11.8. Submersion operations will be terminated for casings when conventional craft are used and the wave factor exceeds 2.

Note: If the submersion operation involves large craft which insure safety and reliable operations, work may proceed if the wave factor exceeds 2.

11.9. When constructing facilities on piles, it is necessary to clear the soil at the driving site and to monitor pile locations for deviation from planned positions.

During complex pile operations (e.g., driving cylindrical piles, installing cells in metallic tongues, etc.), it is necessary to install metal jigs and secure the rig while piles are being driven into their proper positions.

12. REQUIREMENTS FOR HYDRAULIC ENGINEERING WORKS FOR EQUIPMENT ASSEMBLY.

12.1. Erection of hydraulic engineering structures for handling equipment (gantry cranes, transporters, pneumatic and other stationary installations) shall be done only if all concrete and reinforced concrete parts of the structures have reached 70% of calculated strength and monolithic assemblies - 100% of computed strength. The computed strength has to be tested in a laboratory after curing 28 days.

Stone or earth embankment must be sloped according to plan.

12.2. Equipment assembly on the cargo platforms, which have been riprapped with artificial packing (rolling with tracks, pneumatic or electric rammer, vibration, water-saturation with needle filters, etc.) shall be done after obtaining soil density according to plan. Soil density shall be determined by laboratory tests.

12.3. All underground communications have to be laid out before beginning assembly.

13. SHORE PROTECTION.

13.1. When performing shore protection work it is necessary to follow the rules of SNIP III-B.1-62 - "Earth Work. General Rules, Performance and Acceptance of Work," and to follow the supplements of the given chapter.

13.2. It is necessary to do preliminary planning of the underwater parts of reinforced earth slopes and banks to sweep, clean, and, if necessary, to level the underwater part.

Dirt slopes, that have been leveled and found to be in compliance with elevations, dimensions and soil density shall be accepted according to acceptance certificate.

13.3. The support installation shall be completed before beginning the strengthening of dirt slope construction and bank compaction.

BANK REINFORCEMENT WITH REINFORCED CONCRETE SLABS.

13.4. When placing precast slabs in winter, leveled surface of reverse filter shall be cleared of snow and surface ice.

13.5. When slope consolidating with precast reinforced slabs, permissible deviations shall not exceed values shown in Table 10.

TABLE 10

Name	Value
Ledges of separate slabs over the next slabs	10 mm
Deviations in the width of exposed slab joints	15 mm

Note. Slope consolidation shall have an even surface without misalignment of separate slabs.

BANK CONSOLIDATION WITH ROCK FILL

13.6. Rock fill on soil slopes shall be placed according to the reverse filter principle.

The stone size must be determined from the specifications.

13.7. Riprapping shall be even on the earth slope surface, allowing for a settling factor and stone penetration into soil.

Rockfill leveling to the necessary profile shall be done after it settles.

BANK CONSOLIDATION WITH GABIONS

13.8. Stone loading of gabions, box-casing, and revetment shall be as follows:

a) in nonsubmerged places, or in places where the water depth does not exceed the heights of the frame and box-casing revetment shall be installed empty, then filled with stone.

b) if the installed location of box-casing and revetment is submerged, gabions shall be filled with stone close to the place of installation, and later on they must be transported with the aid of lifting devices or poles. The poles shall be stable and easily removed afterwards.

It is not permitted to throw box-casing and revetments into the water.

13.9. Revetments shall be placed on slopes with their long side in the direction of the pitch of the slope, and lower revetments, which cover the base, shall be placed along the base.

The lower row of gabions shall be placed with its short side toward the water and the remaining gabions shall be placed with joints bonded, and bonds shall bend less than $1/3$ of the length of the lower revetment or box.

13.10. Gabions shall be connected by twists of galvanized wire of a diameter no smaller than the wire that is used for net joining.

The twists shall be attached only to the ribs of the frame, and the distance between them must not exceed 25 cm.

BANK PROTECTION WITH ASPHALT

13.11. The performance of bank protection work with asphalt shall be done according to the requirements of SNIP III.D.5-62. "Highways. Rules of Construction Organization and Performance of Work. Acceptance for service" and according to supplementary requirements of this chapter.

13.12. It is allowed to lay asphalt on dry and unfrozen slopes. Air temperature shall be not lower than 5°C .

13.13. Before asphaltting a slope, a wooden or metal form shall be installed on a slope. It shall be installed within the limits of one section. The form height must be equal to the planned covering thickness. If necessary, the form may be equipped with appliances for tension of reinforced frame, and with pins for installation in the position specified in the plan. The area of one section shall be determined by the asphalt mixer capacity.

When asphalt is placed on the next section, the temperature of the previous section must not be lower than 50°C.

13.14. Monolithic asphalt covering can be done by single-layer or multilayer asphaltting.

If the total thickness does not exceed 10 cm., it may be laid in a single lift. If it is to be a reinforced covering, then the frame is placed on the slope before the asphalt is laid, after which the frame is transferred to the middle of unsolidified layer of asphalt. It is then necessary to compact the asphalt.

If the lift exceeds 10 cm, the asphalt must be laid layer by layer with prior rolling of separate layers, after which the entire cover must be compacted. If, according to the plan, the cover must be reinforced, then the frame is placed on the rolled layer within the cover. The thickness of separate layers is specified in the plan according to the compaction method.

13.15 Asphalt must be compacted by a roller, vibrating roller or weighted platform vibrator. The roller or vibrating roller is moved by a winch fixed near the edge of the slope or mounted on a tractor. The roller is moved up and down on the placed area of asphalt by the winch. Its speed must not exceed 0.7 m/sec.

13.16. The samples of cold asphalt covering must be punched out to check its physical and mechanical properties and the thickness of the covering against the requirements of the plan. Samples shall be taken at the rate of 1 sample per 150 m of the covering. Deviations from the specified asphalt thickness must not exceed 10%.

During bank consolidation, quality control must be performed constantly.

SHORE REINFORCEMENT WITH BRUSHWOOD REVETMENTS

13.17. Submerged slopes and the bottom in the base, which are to be covered with brushwood revetment, must be swept. Underwater obstacles such as stumps and other objects must be removed.

13.18. Woven-fenced guards must be made to keep revetment stone loading on slopes steeper than 1:1.5. For this purpose stakes shall be driven in woven fence ropes. and spaced at 0.3 - 0.35 meters. The length of the stakes must be determined by the thickness of stone loading, to ensure submersion of the revetment.

13.19. On shore stationary building berths must be used when the amount of brushwood work is very large and it is necessary to construct large amounts of massive revetment. On shore berths with rollers must have a slope of 1:7. Small revetments

with an area of up to 200 m^2 can be joined together on the building berth rollers with gradients of 1:3-1:4.

BREAKWATER CONSTRUCTION

13.20. Trenches on unstable plots of bank slope shall be dug in non-adjacent sections according to individual work plans. The trenches of adjacent sections must be made only after completion of jobs and after sufficient amounts of the first wall sections are finished.

13.21. The foundation masonry of breakwater walls whose footing lays below sea level shall be laid in trenches with protection of walling against flooding, and concrete and mortar washout.

Masonry shall be protected against destruction and damage, until it reaches rated strengths.

13.22. The choice of quarry stone masonry surface (without special stone facing) shall be coarse stones without crushed stone.

13.23. It is necessary to provide safe bonding of the facing with the masonry to the body of the wall during performance of the work.

Facing shall be installed dry on the backings, which fix thickness, with careful treatment of stone tailings to give them full stability.

The walls shall be laid after the facing is installed. The masonry of the wall body shall envelope the ends of rod interlocks.

13.24. Small vertical wells shall be left between adjacent stone facing. Joints shall be filled with mortar via these wells.

The joints between stone facings shall be carefully caulked before filling with mortar. After mortar hardens, the inserts and caulking shall be removed.

13.25. The joints between stone facing shall be tightly mortared.

The joint thickness between stone facings shall not exceed 8 mm, and pointing shall be in the form of a concave joint. Joint thickness deviations from theoretical thickness must not exceed 2 mm.

14. INSTALLATION OF CONTRACTION WORKS.

14.1. The following rules apply to the building of contraction work:

- a) the contraction work shall be sequenced in a way that cannot interfere with navigation in adjacent sections of the river.
- b) contraction works on shallow river sections shall be constructed in a sequence that provides for full completion of the structure, its effect on the forming activity of the current according to the project and rules of navigation in the shallows.

c) at the start of initial navigation it is necessary, as a rule, to dredge in autumn or spring, subsequently constructing contraction works.

d) before the finished contraction works are put into service, they shall be inspected, taking time to adjust slope and ridge subsidence, correct washout in the foundation area; build up a head in the event of base washout; adjust the ridge and slope after the first ice flows and spring floods, take measures to build up a ridge to plan levels if the real sag of the structure appears greater than the rated sag; take measures to add more piling if piles have been damaged by floating ice.

14.2. Bottom revetment under the structure shall be placed before starting construction work.

14.3. It is necessary to do post-subsidence repair to level ridge sag and restore ridges to the specified contour after spring ice breakup and flooding.

Note. It is not permitted to build a structure on ice-covered revetments.

15. DRAINAGE AND ENCLOSURES

15.1. It is necessary to follow requirements of chapter III-B.3.-62 "Open drainage and artificial lowering of ground water level. Rules of construction and acceptance."

15.2. The work area shall be closed off according to the plan, assuming that the cofferdam construction has sufficient strength, watertightness, low price, and that local building materials can be used, assuming the possibility of fast and easy cofferdam removal.

Note. If the cofferdams remain during the use of basic constructions (for example, in slips) or if cofferdams are part of permanent structures, there is no need to require easy and fast disassembly of cofferdams.

15.3. The installation of rock-filled cofferdams shall be done from the bank or from floating craft.

In winter the rock fill can be done from the ice.

Permissible deviations in certain cofferdam sizes from design values shall not exceed the following:

a) downward deviation in peak elevation not more than 5 cm.

b) downward deviation in slope steepness up to 10%; no increase in steepness over design values is permitted.

c) deviation in slope of stone prism from rectilinear for local recess or overhang not more than 30 cm.

d) deviation in screen thickness from design value not more than $\pm 10\%$.

15.4. Permissible deviations of crib from design values shall not exceed:

- a) axial shift - 200 mm
- b) skew during crib loading - 150 mm

15.5. In cofferdams, where watertightness is achieved by means of pilings, pilings shall be driven after the cribs are built on the bottom of the river and fully loaded with the exclusion of two external rows of compartments. These compartments shall be loaded before the piling wall is built only up to the beam, and final loading shall be done after the beam is installed and attached to the crowns of the crib of the second compartment row.

15.6. Considering the complexity of disassembling underwater parts of crib cofferdams, the necessary disassembly shall be minimized.

15.7. The necessary condition of using the metal rabbet for the trench guard is the possibility of its extraction for next usage.

15.8. Cylindrical cofferdam with intersections, partitions can allow each cylindrical compartment to be filled with clay independently of the others. The filling of the compartments of segmental cofferdams shall be done step by step with differences in the elevation of two adjacent compartments not in excess of 2.25m.

COFFERDAM USE

15.9. Before pumping out trenches it is necessary to determine if cofferdams will withstand the head. It is necessary to measure the depth in 5-15m zones before the cofferdam to be able to check bottom conditions in this zone.

15.10. It is necessary to inspect every cofferdam during the day or night immediately after it is built.

The following points must be observed:

- a) water discharge at the base from the lower side and in the areas of its contact with bank
- b) good operation of reverse filter
- c) formation of fractures, settling, slope and ridge sag, misalignment shifts and so on.

At the same time it is necessary to run periodic depth checks to determine bottom stability from pressure and back sides of cofferdams.

15.11. For timely repair and restoration of broken cofferdam parts of it is necessary to have enough materials for repair: timber, brushwood, sacks, drainage material and so on. (depending on the cofferdam construction).

16. INSTALLATION OF VISUAL SIGNS OF NAVIGATIONAL GUARD.

16.1. Use of waterways and their sections for transportation is allowed only after the navigational guards are installed, according to navigation safety rules.

16.2. Navigational signs shall be installed according to plan subject to approval of the navigational transport organization.

16.3. Metal structures of navigational signs shall be prepared and erected according to the requirements of SNIP III-B-5.62. "Metal structures. Rules of manufacturing, mounting and commissioning".

16.4. Metal and reinforced concrete structures shall be fabricated in plants and transported in finished form or in separate sections.

16.5. If it is impossible to use permanent navigational signs, temporary signs shall be installed according to a special plan.

The construction and painting of temporary signs shall be the same as that of permanent signs.

16.6. For attachment and commissioning of finished onshore signs and finished floating signs the following shall be checked, in addition to compliance with the plan:

- a) visibility
- b) location of signs and lights
- c) accurate location of channel marks along the entire navigable portion, contrast and clarity against the background

17. RULES OF COMMISSION OF HYDRAULIC ENGINEERING WORKS FOR MARITIME AND INLAND WATER TRANSPORTATION.

17.1. The commissioning of hydraulic engineering work for maritime and inland water transportation shall be according to SNIP III-A.10.-62. "Commissioning finished enterprises, buildings and structures. Basic positions," SNIP III-G.10-62 "Technological equipment. General Rules of Production and Work Commission," and supplements.

17.2. It is permitted to accept separate port sections and navigable channels, separate constructions - mooring embankments, locks, slips, piers, and overloading equipment, necessary communications accesses, warehouse spaces, etc., which provide safe use of the construction.

The sequence for commissioning separate segments of ports, navigable canals, and separate structures shall be established by the plan in accordance with the provisions of the national economic plan.

17.3. For commissioning hydraulic engineering works for maritime and inland water transportation, the following rules shall apply:

- a) overloading and mechanical equipment, seals and other devices and apparatus shall be adjusted and tested before use under working conditions.
- b) to determine readiness and guarantee safe utilization, building constructions shall be tested if necessary. The list and sequence of testing are established by the acceptance commission.
- c) Inspection shall be performed by divers to determine the quality and compliance with the plan.
- d) water accesses to the constructions shall be constructed according to the plan and shall be equipped with navigational devices.
- e) in necessary cases the commission shall determine the necessity, sequence, and duration of instrument monitoring to check performance of the construction after commission.

17.4. The use of finished and commissioned complexes of sea and river transport structures, separate port sections and navigable channels, shall be the responsibility of the administrations of the newly-constructed or reconstructed port, navigable canal and other hydraulic engineering works.

CONTENTS

12. REQUIREMENTS FOR HYDRAULIC ENGINEERING WORKS FOR EQUIPMENT ASSEMBLY.
13. SHORE PROTECTION.
14. INSTALLATION OF CONTRACTION WORKS.
15. DRAINAGE AND ENCLOSURES.
16. INSTALLATION OF VISUAL SIGNS OF NAVIGATIONAL GUARD.
17. RULES OF COMMISSION OF HYDRAULIC ENGINEERING WORKS FOR MARITIME AND INLAND WATER TRANSPORTATION.

The following new building norms and rules have been published.

Part 1, Section B. Ch. 3 Foundations and supports of piles and cylindrical shell. Build-up constructions.

Part 1, Section C. Ch. 4 Reinforcement for reinforced concrete constructsures.

Part 1, Section C. Ch. 15. Polymer-based materials and products.

Part 1, Section C Ch. 17. Bituminous and pitch binders.

Part 1, Section C. Ch. 20. Products for aperture filling and lights.

Part 1, Section C. Ch. 25. Roofing water-proofing and steam-proofing materials with organic binders.

Part 1, Section C. Ch. 27. Anticorrosive protection of building constructions. Anti-corrosive materials and products.

Part 1, Section D. Ch. 1. Water supply and sewer systems. Hot water supply. Internal structures. Equipment, reinforcement and materials.

Part 1, Section D. Ch. 8. Gas supply. Inner structures. Materials, equipment, reinforcement and parts.

Part 11, Section A. Ch. 6. Building climatology and geophysics. Design norms.

Part 11, Section A. Ch. 10. Building constructions and foundations. Basic provisions on planning.

Part 11, Section A. Ch. 12. Building in seismic areas. Norms of planning.

Part 11, Section C. Ch. . Guarding constructions. Norms of planning.

Part 11, Section D. Ch. 1. Internal water supply in residential and public buildings. Norms of planning.

Part 11, Section D. Ch. 8. Hot water supply. Norms of planning.

Part 11, Section E. Ch. 2. Marine engineering works. Basic provisions of designing.

Part 11, Section 1. Ch. 3. Construction of land development systems. Planning norms.

Part 111, Section A. Ch. 3. Norms on construction times for enterprises, launching systems, workshops, buildings, and structures.

Part 111, Section A. Ch. 6. Organizational and technical preparation for building.

Part 111, Section A. Ch. 7. The organization of work. Basic provisions.

Part 111, Section A. Ch. 10. Start up enterprises, buildings and constructions. Basic provisions.

Published chapters SNIP and documents on instructions and standards of GOSTROY SSSR can be obtained in book stores. If published standards documents are unavailable in book stores, write to OBLKNICTORG or the Department of Scientific and Technical Literature at SOYUZKNIG.

CONSTRUCTION NORMS AND REGULATIONS

[V. I. Pal'chikov, S. P. Antonov, Editors; Stroitel'nyye normy i pravila; National Publishing House for Literature on Construction, Architecture and Building Materials, Moscow, 1963; Russian]

CHAPTER 2. MARITIME ENGINEERING FACILITIES: BASIC DESIGN PROVISIONS (SNiP 11-1.2-62)

USSR Council of Ministers State Committee for Construction Affairs

SNiP 11-1.2-62 replaces Chapter 11-d.1, SNiP, published in 1954

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General Instructions

These basic provisions are disseminated for the design and planning of maritime engineering facilities undergoing reconstruction or re-design (breakwaters, berthing and coastal fortification facilities) at seaports and ship repair facilities.

In the design and planning of maritime engineering facilities, the requirements of this chapter and SNiP Chapter 11-a.10-62, "Designs and Bases for Construction. Basic Provisions in Planning and Design," will be adhered to.

Design and planning of maritime engineering facilities in seismic areas and areas of permafrost soil must take into account the additional requirements of appropriate chapters of SNiP and other normative documents.

1. Classification of Maritime Engineering Facilities

1.1. Depending on conditions of their utilization, maritime engineering facilities are categorized as permanent or temporary.

The permanent group comprises those facilities which are in constant use.

The temporary group comprises those which are used during construction of a project or during repair of certain facilities.

1.2. Depending on their significance with respect to the construction project, permanent maritime engineering facilities are categorized as primary and secondary.

The primary category includes maritime engineering facilities whose partial destruction would significantly disturb the operation of the entire project complex or a portion of it (breakwaters and coastal fortification facilities where damage would result in suspension of normal operations of other primary facilities; berthing facilities other than those of the service fleet, etc.).

The secondary category includes maritime engineering facilities and their individual elements whose partial destruction would not significantly affect basic functioning of the project as a whole (coastal fortification facilities whose partial destruction would not interfere with the operation of primary facilities; berthing facilities for the service fleet, etc.).

1.3. Depending on their significance, designation and construction features, permanent maritime engineering facilities are divided into four classes of priority (Table I), pursuant to SNiP Chapter II-a.3-62, "Classification of Buildings and Facilities. Basic Design and Planning Provisions."

Table I

Designation of Facility	Permanent Facility Priority Class	
	Primary	Secondary
Breakwaters	II	-
Berthing Facilities	III	IV
Coastal Fortification Facilities	-	IV

Temporary maritime engineering facilities are categorized as Priority Class V.

1.4. Designation to Priority Class I and upgrading of facilities to a priority class one higher than prescribed in Table I is authorized in the event that breakdown of the facility could lead to catastrophic consequences for ships, cargo or equipment; or if these facilities must be erected in extremely adverse, natural (hydrogeological, etc.) conditions.

Designation to Priority Class I and upgrading of facilities contrary to what is prescribed in Table I must be completely justified and approved by the organization assigning the design project.

1.5. Except for Class IV, the priority class for primary facilities is to be lowered one level if, under operational conditions, the facility will be functioning intermittently and thereby allow its repair without causing a suspension in its scheme of operation.

1.6. In accordance with instructions contained in applicable standards documents for designing certain types of facilities, discrete requirements are to be established for each class of facilities with respect to strength and durability, endurance, and the degree of structural hardness against the destructive effects of climatic, geophysical, hydrological and biological factors.

2. Basic Requirements in the Design of Maritime Engineering Facilities

2.1. Selection of type and design of maritime engineering facilities, and their individual components and assemblies and the materials used to erect the facilities must be accomplished on the basis of a technical and economic comparison of the choices, and taking into account the following:

- a) natural conditions of the region, of the construction area, the facility erection site (engineering and geological, hydrological, meteorological, physical, chemical and biological factors of the surrounding environment);
- b) conditions in which work is performed and methods of erecting facilities;
- c) the most complete and expedient utilization of local construction materials;
- d) completion of construction in the shortest possible time, and using the greatest degree of mechanization and industrialization in construction projects;
- e) requirements for consolidating design types for facilities being planned;
- f) use of prefabricated and pre-stressed construction;
- g) satisfying operational demands;
- h) meeting the requirements of standards documents for planning and designing applicable types of facilities.

2.2. Building materials for constructing maritime engineering facilities must satisfy the requirements of applicable chapters of SNiP Part I, national standards, design specifications for stone, concrete, reinforced concrete, wood and metal construction, as well as the planning norms for individual types of maritime engineering facilities.

2.3. In addition to having certain capabilities (durability, strength) and resistance to crack formation, maritime engineering facilities must exhibit a resistance to the destructive physical and mechanical effects of climate and water (including the combined and alternating action of water and frost); to the chemical effects of a

corrosive medium; to harmful biological effects and to the destructive effects of waves, ice and drifts.

2.4. The endurance capability of maritime engineering facilities and their components in an environment of factors mentioned in paragraph 2.3 is to be ensured by the following:

- a) use of materials resistant to frost, chemicals and abrasion, and situating them appropriately in the design so as to allow replacement of one item by another over the utilization period;
- b) application of special insulation, protective coverings and sealing, suitable impregnation and painting of surfaces of construction components and assemblies;
- c) use of various design measures to lessen the effect of the above-mentioned harmful factors on the facility components being protected.

3. Basic Calculation Premises and Loads

A. Basic calculation premises

3.1. Design calculations for maritime engineering facilities and their foundations are to be made according to limiting conditions pursuant to SNiP Chapter II-a.10-62.

3.2. The following limiting conditions are taken into account in design calculations:

first--endurance characteristics (strength, durability);

second--deformation and displacement;

third--crack stability (not allowing formation of cracks, restricting fissure openings).

Pursuant to SNiP Chapter II-b.3-62, the first and second limiting conditions are taken into account for calculations related to foundations.

Design calculations related to the first limiting condition for strength, limitation of excessive deformations and form stability are made according to calculated loads; durability calculations, as a rule, are made according to normative loads.

Design calculations for position stability are made according to calculated loads.

Foundation calculations related to the first limiting condition are made according to calculated loads.

Calculations for structures and foundations related to the second limiting condition are made according to normative loads.

Design calculations related to the third limiting condition are made according to either normative or calculated loads depending on the nature of the cracks' effects on the operational usage of the facility.

3.3. Depending on the berthing designation, rated loads for designing berthing facilities are divided into categories, and are established using the technical planning standards for seaports.

3.4. The following normative loads should be considered in the design of berthing facilities:

- a) operational--due to cargo kept in storage, cargo transfer vehicles and transport equipment--according to the technical planning standards for seaports;
- b) from mooring, loading and docking impact according to the normative document for determining ships' loads on docking facilities;
- c) from ice--according to written documentation on hand;
- d) from waves--according to the normative document for determining wave effects on sea and river facilities and on shores;
- e) from seismic effects--according to SNiP Chapter II-a.12-62.

3.5. Coefficients for cargo transfer, uniformity of materials and conditions of operation are established by the standards documents for design and planning of various types of breakwaters and berthing and coastal fortification facilities.

Note: Calculations with respect to maritime engineering facilities for which design values of coefficients for cargo transfer, uniformity and conditions of operation have not yet been established are authorized to be made prior to such establishment according to allowable stresses or critical loads.

3.6. Reinforced concrete structures for maritime engineering facilities are to be analyzed for crack stability or cracking in those instances where usage conditions and the interests of insuring the facility's longevity, or consequences of the corrosive environment and climatic conditions, require inhibiting or significantly lessening corrosion in the reinforcement and the concrete, as well as inhibiting filtration through the concrete.

3.7. Design calculations for facilities situated on compressed foundations are to take into account forces that arise as a result of foundation deformation.

3.8. The following factors are to be taken into account in making calculations: the order of priority for construction and loading of the facility; spatial operation of the facility; the support one facility exerts with respect to another; the redistribution of forces caused by plastic deformations.

3.9. Structures for which methods have not yet been developed for determining forces to take into account the properties of plasticity and creep of materials are authorized to be analyzed assuming resiliency in construction operations.

3.10. In foundation soils that contain soluble substances, the leaching of which will lower the strength of the foundation, it is necessary to completely inhibit or lower the leaching of the materials to safe limits for practical use.

B. Loads and effects, and combinations thereof

3.11. Apart from the loads and effects taken into account for ordinary calculations in construction design, the design of maritime engineering facilities should consider the following specific loads and effects:

- a) water pressure, including wave effects and pore pressure;
- b) loads and effects caused by ice;
- c) loads due to ships;
- d) loads from lift mechanisms and cargo transfer machinery, transport and other equipment, as well as loads from cargo in storage;

Note: Special requirements may necessitate taking other loads and effects into consideration (floating body pressure, shock wave, etc.)

3.12. Loads and effects must be considered in the following combinations:

Basic combinations, including loads and effects that regularly act upon a structure, namely:

- a) weight of the structure itself and its permanent equipment;
- b) wave effects;
- c) water pressure;
- d) soil pressure under least favorable water-level conditions;
- e) pore pressure;
- f) loads due to means of transport, cargo transfer machinery and other loads;
- g) ship-related loads--loading and mooring;
- h) loads and effects due to ice;
- i) loads due to wind;
- j) other loads that regularly have an effect;

Special combinations, including loads and effects of the basic combinations plus the following loads and effects:

- k) pore pressure arising as a result of breakdown in the functioning of drainage equipment (this will replace (e) above);
- l) ship impact;
- m) seismic loads;
- n) wave pressure during storms of catastrophic force (this will replace (b) above);
- o) loads due to ice and catastrophic-force effects brought about by ice movement and hummocking;
- p) other catastrophic loads;
- q) effects of temperature and precipitation.

Note: 1. With appropriate economic and technical justification, ice loads and effects may be associated with the special combinations, or not taken into consideration at all.

2. Calculated combinations of loads and effects for maritime engineering facilities must be established in accordance with the practical possibility of their simultaneous action on the facilities.

3. Both static and dynamic (in appropriate cases) loads and effects are to be considered for all combinations.

4. In applicable cases calculations are also to be made for loads and effects that are present during the period of a facility's construction or overhaul, and during the process of testing it. The sequence of taking such loads and effects into account is established by the standards documents for planning and design of the individual types of facilities.

4. Reference Levels and Depths for Ports, Backwater Areas and Approach Channels

4.1. Reference levels for ports, backwater areas and approach channels in both tidal and non-tidal seas are to be designated based on the graph plotted over the course of years of the actual slack water levels for navigation with a 90-98% reliability, based on the intensity of large-vessel turnover.

Note: For tidal seas at ports having a low ship-turnover level, adoption of a reference level of lesser reliability is permitted provided there is adequate justification.

4.2. Reference levels for various sections of entranceway channels are to be designated taking into account the surface gradient of the river.

4.3. Depth of ports and entranceway channels is to be prescribed taking into account the mooring and passage of ships visiting the port over the course of the navigation period.

4.4. The design depth of individual portions of the port's water area (channel, harbor, cove) is to be determined according to the technical planning and design norms for seaports.

4.5. The type of ship and its design load draft are to be defined and specified in the design order, on the basis of technical and economic analysis.

Note: In cases of designing entranceway channels in offshore bar areas and at the mouths of rivers, determination of the load draft must take into account the amount of buoyancy loss during a ship's transfer from the seawater channel (greater density) to the river channel (lesser density).

5. Berthing Facilities

5.1. The number of moorages in the transport area of a port is to be determined based on the calculated cargo turnover for every type of cargo, and on the calculated moorage capacities.

The number of moorages for ship repair works is to be determined based on the ship repair program and ship disposition pattern.

5.2. The depth of moorages for a port and ship repair works should be prescribed depending on the load draft for the rated ships according to technical design norms.

5.3. Length of the moorage that comprises the berthing line is to be established depending on the length of the rated ship and availability of surplus moorage distance between ships (see Table II).

Table II

Overall length of rated ships (m.)	Distance between ships (m.)
Over 200	20
100-200	15
Less than 100	10

Note: 1. Requirements stated in this paragraph do not apply to determination of moorage length for open coastline or island moorages.

2. Data shown in Table II is also to be taken as the distance from ship to berth or coastal fortification situated at right angles (or approximately so) to the moorage where the ship is anchored.

5.4. Elevating a cordon of moorages for ports and ship repair works is to be undertaken depending on operational requirements, according to the technical design norms.

5.5. Types of construction of berthing facilities and basic conditions for their use are as shown in Table III.

Table III

Recommended Types of Construction	Basic Conditions of Use
Piled wharves, pier embankments, piers having separate abutments (columns) with beam-rolled construction	Soils that permit immersion of piles and columns to the required depth; necessity for wave suppression at the moorage
Reinforced concrete retaining walls and metal sheet pilings	Soils that permit sheet-piling immersion to the required depth; no requirement for wave suppression at the moorage
Reinforced concrete, angular-slotted quay walls with barr os	Soils in a foundation that ranges from rocky to average compactness in enclosed water areas; no requirement for wave suppression at the moorage
Quays made of concrete blocks and reinforced-concrete monoliths	Good soils in a foundation that allows loads of 3 kg./cm. ² and greater; no requirement for wave suppression at the moorage; corrosive conditions present
Piers on pylons made of concrete blocks or reinforced-concrete monoliths, having a beam-rolled upper construction	Soils present in the foundation that prohibit immersion of piles and columns; soils present that allow loads of 2.5 kg./cm. ² and greater

Notes: 1. Use of inclined supports (piles, columns) are permitted, but necessity for such use must be justified in the design specifications.

2. For regions rich in rock and timber, where there are no shipworms in the water, use of underwater cribwork and embankments made of timber piles and other wooden construction is permitted. Advisability of their use as opposed to the types shown in Table III must be justified in the design specifications.

3. When design studies conducted with respect to new types of construction show better indications than those recommended, preference should be given to the new construction.

4. Use of walls that have a trapezoidal profile is not recommended.

5. The term "piles" is used to designate supports having a diameter of up to 1 m. "Columns" refers to those of greater diameter.

5.6. For the layout and construction of the mooring structures recommended in paragraph 5.5, the following basic conditions must be met:

a) In onshore constructions and piers of the trestle type on piles and columns, the transfer of thrust to the pilework is not recommended; the acceptability of foundation thrust transfer to pile structures shall be determined by the technical and economic justifications;

b) The use of unstressed piles and columns is permitted when special foundations are provided;

c) The spacings between supports (piles, columns) in longitudinal and transverse rows shall be no less than $5-6d$ or $5-6a$, where d is the diameter of the cylindrical supports and a is the side of the prismatic piles;

d) The supports (piles, columns) shall be rigidly attached to the grating;

e) The depth to which the supports are sunk (piles, columns) in the foundation shall be established according to standards documents for the planning of structures on piles or columns;

f) The joining of piles and columns with the grating is recommended as follows: without caps for grating of collar beam design; with caps for beamless composite grating;

g) It is recommended that skirting beams and ice guards be of prefabricated construction joined monolithically with the grating.

h) The monolithic construction of components of prefabricated steel-reinforced concrete grating shall be accomplished in the assembly holes of the grating and in the joints between prefabricated components;

i) It is recommended to fill the cavities of tubular piles and columns with sandy soil.

Note. If it is required to fill the cavities of tubular piles and columns with concrete, the concrete shall be prepared with non-shrinking and non-expanding cement;

j) The length of the sections of a mooring structure shall be taken into account as a function of temperature effects and joints between sections, but shall not be less than 23m;

k) The sealing of joints between face walls of bulwarks and detached corner walls shall be accomplished in such a way that soil permeation is avoided;

l) Reinforced-concrete face and foundation panels of corner walls shall be constructed with the greatest possible widths and weight permissible on the basis of clearance conditions during hauling and the lifting capacities of the cranes used.

Face panels must be made of pre-stressed concrete;

m) The use of stone unloading platforms behind corner walls and bulwark walls must be specified in the plans;

n) The laying of the walls of embankments of concrete blocks shall be done in horizontal rows of blocks with the greatest possible weight that can be transported and set in place, with joints bonded in the longitudinal direction;

o) It is recommended to construct the submerged part of the wall of embankments of concrete blocks in a prefabricated manner from reinforced type-concrete corner elements of the greatest possible weight joined monolithically with each other and with the pedestal blocks;

p) During the construction of embankments with concrete blocks, large monolithic blocks unitized throughout their width;

q) A horizontal surface is recommended for the rock bed for gravitational walls of vertical cross sections;

r) The placement of supports of ordinary concrete blocks in piers shall be done with joints bonded in both directions.

Note. The use of supports as wooden cribs is permitted in wooded areas not inhabited by carpenter moths.

s) For bridge superstructures between pier supports, it is recommended to use prefabricated pre-stressed concrete components; the maximum length of a bridge support shall be determined on the basis of technical and economic calculations;

t) For the overwater wall of supports of ordinary concrete blocks in piers, it is recommended to build the wall with a monolithic reinforced-concrete construction of low-reinforced concrete;

u) Mooring pedestals on piers of the bridge type shall be built only on supports.

6. GUARD STRUCTURES

6.1. For the planning of guard structures (breakwaters, moles, heels, canals to a port), the layout must be determined on the basis of the need to guarantee:

a) Possibility of safe passage of ships from the open sea to the protected water area and passage to the sea in wind and waves;

b) Undisturbed anchorage of ships on the water area;

c) The possibility of free maneuvering of ships on the water area;

d) The possibility of future development of the port and shipyard.

Note. In the horizontal layout of guard structures, the drift conditions of the harbor area and the effect of the structures to be erected on contiguous segments of the coast must be taken into account.

6.2. The width of a port entry shall be determined in compliance with the provisions of paragraph 6.1., but in all cases, it shall not be less than the ship length used in the calculation.

6.3. The layout of guard structures of classes I and II shall be established with allowance made for the contour, the sea bottom relief, and contours of the coastal strip on the basis of laboratory test results from spatial models.

Guard structures shall be laid out without re-entrant angles.

6.4. It is recommended to select the constructions of guard structures according to Table 4.

Table 4

Number	Guard Structure Designs	Foundation: Conditions of Use of Designs
1	Walls of ordinary cement blocks.	Presence of hard, rocky, compact, and medium compact, soft soils in the foundation of the structure, guaranteeing essentially uniform settling; Waves up to 7m
2	Walls constructed as vertical columns of giant, extremely heavy, concrete blocks	Same soil conditions as above with any wave action; presence of cranes of appropriate capacity.
3	Walls of giant concrete blocks	Compact foundation soils or weak soils specially prepared to withstand heavy loads; necessity to accelerate construction times in the sea; waves of any force
4	Paired mutually anchored palisade pile walls with rock fill	Soils withstanding the weight of piles onto the required depths; wave height up to 3.5m; root portions of moles; wooden piles - in wooded areas, carpenter moths must be absent

(cont'd)

Number	Guard Structure Designs	Foundation: Conditions of Use of Designs
5	Sloped structures of stone fills; mounds of reinforced concrete blocks, and other shaped components with stone in the foundation	For various foundations soils, waves of any height; presence of inexpensive stone. Recommended for seismic conditions.

Note. The appropriateness of introducing other types of constructs (for example, cribwork) must be justified in the project by a comparison with one of the more profitable types of constructions recommended for these conditions according to table 4.

6.5. The top of the external berm in structures with a vertical front face in the presence of depths in the access to the structure at which depths waves do not break will preferably be arranged no higher than the elevation mark at which the effect of an interfering standing wave has no effect on the wall.

6.6. The width of the external berm and the top berm of the bed, which extend over the bottom, shall be determined on the basis of the bed's resistance to bulging.

6.7. Protection of the bottom from a structure erected on eroded soils shall be provided if bottom velocities occur which are harmful from the standpoint of soil erosion.

6.8. Protective blocks on the external berm and slope shall be accepted in the event the weight of the stones forming these components of the bed is insufficient to guarantee their being washed out by heavy seas.

6.9. Protective blocks on the top berm shall be provided:

a) If it is necessary to protect the berm from washout by water filtering through in the presence of waves;

b) In the event of immediate wave action in the water area.

6.10. It is recommended to design the above-water wall in segments between joints (keyed expansion joints and expansion joints) as monoliths or prefabricated monoliths.

6.11. The elevation of the top of an above-water wall shall be determined on the basis of the permissibility of permeation of storm waves and wall strength.

6.12. If walls are exposed (completely or partially) to breaking waves, it is recommended to arrange the bed in a ditch.

6.13. The top part of guard structures shall be provided with a thicker cross section with more protection of its foundation than in the remainder of the structure.

6.14. The root portion of a mole (regardless of the type of construction) shall be protected from foundation washout in the case of eroding soils.

6.15. The joint between large concrete blocks in the walls of guard structures shall be secured by the construction of a monolithic or prefabricated monolithic submerged wall, and also:

a) When blocks are laid with vertical columns - construction of grooves and peaks at vertical boundaries; concrete filling of wells in blocks;

b) When concrete blocks are laid in horizontal courses - pointing of joints; for additional bonding, it is permissible to provide grooves and peaks at the horizontal boundaries of blocks.

6.16. When designing guard structures of giant concrete blocks, it is recommended to follow these instructions:

a) Use thin-walled reinforced-concrete monoliths with combined filling and thick-wall monoliths filled with loose material (sand, stone, gravel, etc.);

b) The external and end compartments of thin-walled reinforced-concrete monoliths shall have a width of no less than 1m; the external compartments shall be filled with concrete, and the remaining compartments shall be filled with sand or gravel in the case of combined fills;

c) In the combined filling system, all walls shall be brought to the top of the reinforced-concrete monoliths and frame at the top with cornice beams, and the compartments not filled with concrete shall be covered with a panel no less than 60cm thick after they are filled with sand or gravel;

d) Above-water constructions shall be sunk into the reinforced-concrete monolith compartments to a depth of no less than 30cm and shall be tightly bonded with the cornice beams;

e) The length of reinforced-concrete monoliths shall be established as a function of the engineering and geological conditions of the foundation and the condition under which reinforced-concrete monoliths are lowered into the water;

f) The butt joints between reinforced-concrete monoliths shall be designed in such a way that they are assured of independent settling, and the transverse motion of water and the suction through the soiled bed under the reinforced-concrete monoliths are reduced. It is recommended to choose a butt joint construction in the form of a wide ridge extending into a groove in the adjacent section.

6.17. It is permitted to construct guard piling structures with stone fills from two rows of pilings anchored together and firmly joined to each other, with an over-water concrete wall having an inclined edge on the ice-floe side.

Note. The use of a metal sheet piling must be justified in the plan.

6.18. A reverse filter of fine quarry gravel no less than 1m thick shall be constructed under the stone fill in guard structures consisting of interlocked rows of piles.

6.19. The weight of the concrete blocks used as rumble fill for guard structures shall be determined by a calculation in accordance with the standardization documents for determining wave action on maritime and river structures and shores.

6.20. The ratio of the dimensions (length, width and height) of the concrete blocks used as rumble mounds shall be in the vicinity of 1.5:1:1.

6.21. Moles and breakwaters of cement block rumble on weak soil shall be erected on special beds.

6.22. The support for slopes on both sides of rumble mounds shall be made of concrete edging blocks laid in the body of the rumble or protected with large concrete blocks on the berms of the bed.

6.23. The contour of guard structures of sloping shapes (consisting of rumble mounds, rectangular concrete and hewn blocks) shall be chosen on the basis of laboratory tests.

Note. It is permissible to determine the contour basis of analogs in cases where the structure is under conditions similar to those of the analog.

7. SHORE REINFORCEMENT

7.1. It is recommended to select types and constructions of shore reinforcements according to table 5.

Table 5

Number	Reinforcement Designs	Conditions of Design Application
1	Paving slopes	Shore sections well protected from sea actions; reinforcement of stable slopes situated higher than the working level on the water
2	Stone rumble on slopes, unsorted stone	Reinforcement of above-water and submerged slopes covered from sea action of portions outside the port; waves up to 1.5m high

(cont'd)

Table 5

Number	Reinforcement Designs	Conditions of Design Application
3	Protective coverings of rumble on slopes with large stone or blocks	Same, waves higher than 1.5m
4	Monolithic or prefabricated concrete and reinforced-concrete slabs	Same
5	Rectilinear and curvilinear concrete walls on soil foundation	In the case of solid soils and water depths in front of the wall greater than 1.5m, with wave heights no more than 1.5m
6	Same, on steel-reinforced concrete bases; bulwarks	Same

7.2. Linings and stone rumble mounds on slopes and bottom shall be constructed on a preparation of quarry fines, gravel or crushed stone.

Note. In the absence of carpenter moths, it is permitted to dump stone layers over submerged slopes on brushwood revetments and pavements, excluding portions of the water area in which ships may anchor.

7.3. A horizontal area situated behind the top edge of a sloping pavement and longitudinal breakwater wall where there is a possibility of splashing and other eroding action shall be fortified along the widths subject to this action but no less than 1.5m.

7.4. The foundations of sloping pavements and longitudinal breakwater walls shall be secured against washout.

7.5. The arrangement of the footing of longitudinal breakwater walls at the water level or higher is permitted provided it is ensured that the bottom will not washout in front of the wall.

Note. If there is a possibility of bottom washout in front of the wall, the wall foundation shall be laid lower than the boundary of possible washout.

7.6. In the event soil with poor drainage is dumped behind walls, a drain prism shall be constructed directly beside the wall.

7.7. Special drains shall be constructed in the event a wall is built on water-impermeable soils or soils with poor percolation.

7.8. When calculating the elevation of protected-wall tops, allowance must be made for protection of the shore from the direct action of waves with a calculated safety factor.

8. GENERAL DESIGN REQUIREMENT FOR MARINE ENGINEERING

8.1. The planning of structures of the anchoring-bulwark type shall provide for ensuring the following basic requirements:

a) Connecting (distributing) beams shall be constructed at the face wall of palisade components, solid reinforced-concrete pilings, metal pilings, and other components requiring load distributions;

b) The construction of welded stays, their connecting joints to the wall and anchoring shall meet the requirements and recommendations of standard documents for the planning of basic types of mooring structures.

8.2. Dirt shall be dumped behind a wall of steel-reinforced concrete bulwark and discontinuous corner walls with an angle of internal friction of no less than 30° .

8.3. The terms of the submerged portion of gravitational walls of mooring and guard structures shall extend above the working (construction) level of the water no less than (in meters):

a) 0.3 for mooring structures

b) 0.6 for guard structures

Note. The degree of wood rotting shall be determined by surface data of wooden structures in the construction area.

8.4. For guard and mooring structures of the gravitational type, a bed shall be laid with dumped stone. A reverse filter of crushed stone, gravel or quarry fines shall be laid on soft foundation soil in a thickness of no less than:

a) 0.5m for guard structures

b) 0.3m for mooring structures

Note. 1. On the rock foundation it is permitted to use a leveling layer of concrete in bags no less than 0.25m instead of a rock bed.

2. On an appropriate foundation, it shall be permitted to build cribs directly on the natural foundation.

3. For discontinuous corner walls on shore, it is permitted to prepare a gravel bed provided protective measures are taken against bed washout on the basis of calculated technical and economic justifications.

8.5. The bed width of gravitational structures shall be determined by calculations: if the bed is situated in an excavation, its bottom width must be greater than the width of the structure foundation and no less than twice the thickness of the bed.

8.6. The thickness of a bed of loose rock on a foundation for gravitational structures with non-rocky soils shall be determined by calculation and shall be no less than:

- a) 2m for guard structures, including the reverse filler;
- b) 1m for mooring structures, including the reverse filler.

Note. For mooring structures of an angular type, the minimum bed thickness shall be 0.75m.

8.7. The thickness of a leveling layer of loose stone for gravitational mooring and guard structures on a rocky bed shall be no less than 0.5m.

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