U.S. Department
of Transportation
**Federal Aviation
Administration**

Advisory Circular

Subject: Seaplane Bases

Date: 8/31/2018
Initiated by: AAS-100

AC No.: 150/5395-1B
Change:

1 **Purpose.**

This advisory circular (AC) provides guidance to assist operators in planning, designing, and constructing seaplane bases and associated facilities.

2 **Cancellation.**

This AC cancels AC 150/5395-1A, *Seaplane Bases*, dated August 6, 2013.

3 **Application.**

The FAA recommends the standards and recommendations in this AC for use in the design of civil seaplane bases. In general, use of this AC is not mandatory. Use of this AC is mandatory for all projects funded with federal grant monies through the Airport Improvement Program (AIP) and/or with revenue from the Passenger Facility Charges (PFC) Program. See Grant Assurance No. 34, *Policies, Standards, and Specifications*, and PFC Assurance No. 9, *Standards and Specifications*.

4 **Principal Changes.**

This revision includes the following changes:

1. Updated definitions and guidance for filing notices to the FAA in Chapter 1.
2. Restructured Chapter 2 for clarity.
3. Clarified the basic components of a public-use seaplane base as suitable water operating area, which in turn, consists of approach/departure paths and designated sea lane(s). Components may include taxi channel(s), an anchorage area, and a shoreline ramp or pier (Chapter 1). Depending on user needs, shoreline or on-shore facilities may become basic components (Chapter 4 and Chapter 5).
4. Simplified the discussion on piers, fixed dock, and floating docks into a comprehensive section discussing docks (paragraph 4.4).

5. Deleted Table 2-1, Recommended Sea Lane Dimensions, Water Depths, Approach Slopes in Feet (Meters), and incorporated design information into Chapter 3 for seaplanes currently operating in the system.
6. Updated the format of the document, and made minor editorial changes throughout.

Hyperlinks (allowing the reader to access documents located on the internet and to maneuver within this document) are provided throughout this document and are identified with underlined text. When navigating within this document, return to the previously viewed page by pressing the “ALT” and “ ←” keys simultaneously.

Drawings in this document are representations and are not to scale.

5 **Feedback on this AC.**

If you have suggestions for improving this AC, you may use the Advisory Circular Feedback form at the end of this AC.

John R. Dermody
Director of Airport Safety and Standards

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CHAPTER 1. THE SEAPLANE BASE

1.1 Introduction.

The seaplane is in the unique position of being able to provide air service which is practically impossible with any other kind of craft. It offers the public the speed of the airplane with the utility of the boat, allowing pilots to access areas where a conventional landing area is either unavailable or cannot feasibly be built. It has provided a variety of services which has established it as a valuable means of air transportation. Seaplane landing sites, referred to as a seaplane base, will not supplant the need for land airports to serve scheduled air carrier operations and other flying activities.

Note: Photographs are included only for context and illustration, and do not necessarily represent approved design standards or operating conditions.

1.1.1 Benefits.

Aviation, as a whole, plays a significant role in the nation’s economy and in its transportation network. Seaplane bases serve the flying community like a marina serves boating enthusiasts. A seaplane base provides the aviation, business, and tourism community an operational base and supports the community with economic, employment, and recreational opportunities. In other cases, nonscheduled or scheduled intrastate seaplane passenger-service routes have proven desirable where surface transportation by land or water vessel may not exist or is tedious and time consuming.

Figure 1-1 and Figure 1-2 illustrate examples of seaplane bases for a public recreational area and a city’s waterfront.

1.1.2 Planning and Design Questions.

In the continued expansion in the field of aviation, consideration should be given to the utilization of the suitable shorelines, lakes, rivers, and harbors which offer natural landing sites for seaplane operations. The design problem concerning seaplane bases poses such questions as:

- When a community determines the need for a seaplane base, where should it be located?
- Given that the site has a suitable water operating area, what types of shoreline and off-shore facilities are available?
- If a community improves its seaplane base with on-shore facilities, what design items are important?
- What FAA federal forms must a proponent for a new seaplane base fill out?

This AC answers questions such as these and to assist local communities or persons interested in solving aviation and marine problems regarding seaplane bases.

Figure 1-1. Example of Seaplane Usage at a Public Recreational Area

Figure 1-2. Example of a Seaplane Base Along Seattle's Lake Union Waterfront

1.1.3 Community Outreach.

Community outreach is critical for identifying and addressing stakeholder concerns. The extent of community outreach will vary depending on the seaplane base project and the community. See AC 150/5050-4, *Citizen Participation in Airport Planning*, for additional guidance.

1.1.4 Components of a Public-Use Seaplane Base.

The basic public-use seaplane base will include:

- A suitable water operating area, including identified approach and departure paths,
- A designated sea lane (alternately referred to as a water lane), and
- Shore/land access.

Additional facilities may also include:

- Designated taxi channels
- An anchorage area
- Shoreline ramp, or piers
- A floating repair hangar
- Docks, slips, and berths, either public use or leased
- On shore aprons, service hangers
- Passenger or cargo terminals, management or administration buildings
- Water rescue boat

For federally-funded projects, the facility must include the supporting planning and forecasting. Sponsors should coordinate with the Airports District Office regarding eligibility questions.

1.2 Explanation of Terms.

The following definitions are relevant to this AC. U.S. Codes of Federal regulations (CFR), ACs, and other publications are available on www.faa.gov.

1. **Anchorage Area.** An area designed specifically for the parking of seaplanes. (Reference: AC 150/5300-18, *General Guidance and Specifications for Submission of Aeronautical Surveys to NGS: Field Data Collection and Geographic Information System (GIS) Standards*.)
2. **Aircraft Landing and Takeoff Area.** Any area of land, water, or structure used or intended to be used for the landing and takeoff of aircraft.
3. **Airport.** An area of land or water that is used or intended to be used for the landing and takeoff of aircraft and includes its buildings and facilities if any (Reference: Title 14 CFR Part 1, *Definitions and Abbreviations*). For this purpose, the term "airport" includes airport, heliport, helistop, vertiport, gliderport, seaplane base,

ultra-light flightpark, manned balloon launching facility, or other aircraft landing or takeoff areas.

4. **Airport Reference Point (ARP).** The approximate geometric center of all usable runways at the airport.
5. **Conventional Aircraft.** As used in this AC, an aircraft, fixed wing or rotor craft, that is not equipped to operate on a liquid water surface during normal operations.
6. **Critical Aircraft.** The aircraft that is the most demanding which is currently or is forecast to use the seaplane base regularly, excluding touch-and-goes. Federally-obligated airports, or those planning to seek Airport Improvement Program grant-in-aid funding for seaplane base development, should refer to AC 150/5000-17, *Critical Aircraft and Regular Use Determination*.
7. **Docking Area.** A defined area on a seaplane base either fixed or floating, intending to accommodate seaplanes for the purposes of loading or unloading passengers or cargo, or refueling, parking, or maintenance. (Reference: AC 150/5300-18.)
8. **Gangway.** A movable walkway where people board and disembark decks, piers, and barges.
9. **Hazard to Air Navigation**. Any obstruction to air navigation having a substantial adverse effect upon the safe and efficient use of the navigable airspace by aircraft or upon the operation of an air navigation facility. An obstruction to air navigation is presumed to be hazard to air navigation until an FAA study determines otherwise. Note: 14 CFR, Part 77, Safe, Efficient Use, and Preservation of the Navigable Airspace, Subpart C, Section 77.17 Obstruction Standards, establishes the standards for determining obstructions to air navigation.
10. **Mooring.** A fixed permanent installation on the water surface used to secure seaplanes. The seaplane may be moored to a floating buoy, a pier, dock, etc.
11. **Mooring Buoy.** A buoy connected by chain or cable to a permanent unmovable anchor sunk deeply into the bottom of a body of water.
12. **Notice of Landing Area Proposal (**FAA Form 7480-1**).** 14 CFR Part 157, *Notice of Construction, Alteration, Activation, and Deactivation of Airports*, requires all person to notify the FAA at least 90 days before and construction, alteration, activation, deactivation, or change to the status or use of a civil or joint-use (civil/military) airport.
13. **Obstruction.** Any object, including a parked aircraft, which may hinder aircraft operations or which may have an adverse effect upon the operation of an air navigation facility.
14. **Obstruction to Air Navigation.** An object of greater height than any of the heights or surfaces presented in subpart C of Title 14 CFR Part 77, *Standards for Determining Obstructions to Air Navigation or Navigational Aids or Facilities*. This includes any object for example a parked aircraft located in navigable airspace.

15. **PATON (Private Aids to Navigation).** Any marine aid to navigation installed and maintained by anyone other than the U.S. Coast Guard. (i.e., Federal, State, county, city, town government agency, private individual, or company).

16. **Public-use Airport.** Any airport that is available for use by the general public without a requirement for prior approval of the owner or operator. (Reference: FAA Order 5010.4, *Airport Data and Information Management*, and AC 150/5200-35, *Submitting the Airport Master Record in Order to Activate a New Airport*.)

17. **Private-use Airport.** Any airport available for use by the owner only or by the owner and other persons authorized by the owner. (Reference: latest edition AC 150/5200-35.)

18. **Seaplane.** An airplane on floats (amphibious or non-amphibious) or a flying boat (water-only or amphibious) (Reference: AC 91-69, *Seaplane Safety for 14 CFR Part 91 Operators*, Definitions). While operating on the water, the seaplane is considered a vessel and must abide by all U.S. Coast Guard rules and regulations.

Note: Status of Seaplanes as Vessels determined by U.S. Coast Guard Regulation, Navigation Rules: International – Inland, quotes the following definition: "The word "vessel" includes every description of water craft, including non-displacement craft and seaplanes, used and or capable of being used as a means of transportation on water." Hence, a seaplane is classified as a vessel once it lands on the water and, as such, is required to comply with the U.S. Coast Guard navigations rules applicable to vessels. Adherence to section 14 CFR Part 91.115 should ensure compliance with the U.S. Coast Guard rules.

19. **Seaplane Base.** A designated area of water used or intended to be used for the landing and takeoff of seaplanes and shore side access. It also may include water taxi channels, anchoring locations, ramp service, and possibly on-shore facilities for pilots, passengers and aircraft needs.

20. **Sea Lane.** A defined path within a water operating area dedicated for the landing and takeoff of seaplanes along its length. A marked sea lane is defined as a sea lane that has its four corners identified by visual markers such as buoys. Sea Lane may also be referred to as Water Lane.

21. **Turning Basin.** A water area used for the water taxi maneuvering of seaplanes along shoreline facilities and at the ends of a narrow sea lane.

22. **Taxi channel.** A water channel used for the movement of seaplanes between shoreline facilities and the sea lane.

23. **Water Operating Area.** A designated area on a body of water deemed suitable to facilitate seaplane operations for landing, takeoffs, and water taxiing. At a minimum, the water operating area should consist of a sea lane, a taxi channel, a turning basin (where the width of the sea lane in restricted), an anchorage area or a shoreline ramp or pier.

1.3 Filing Notice of Seaplane Base Landing Area Proposal.

For the purposes of Federal filing requirement, seaplane bases are considered to be airports. In order to establish or modify a seaplane base, notification to FAA by the proponent is required under 14 CFR Part 157, *Notice of Construction, Alteration, Activation, and Deactivation of Airports*, when no Federal financial assistance has been requested (Federal agreement). This filing requirement applies both to public-use and private-use seaplane bases. When Federal financial assistance is anticipated, the proponent instead must obtain an FAA-approved Seaplane Base Layout Plan by working closely with their FAA ADO or Airports Regional Office. Please see paragraph 1.6 for details. Filed Notice is submitted on FAA Form 7480-1, *Notice for Construction, Alteration and Deactivation of Airports*, available at http://www.faa.gov/forms/, copies of which may be obtained from the FAA Airport District Office (ADO) or the Airports Regional Office that serves your geographic area.

1.3.1 14 CFR Part 157.

Title 14 CFR Part157 requires any person (without a Federal agreement) who intends to do any of the following to notify the FAA of their intent:

1. Construct or otherwise establish a new airport or activate an airport.
2. Construct, realign, alter, or activate any runway, sea lane, or other aircraft landing or takeoff area.
3. Deactivate, discontinue using, or abandon an airport or any landing or takeoff area of an airport for a period of one year or more.
4. Construct, realign, alter, activate, deactivate, abandon, or discontinue using a taxiway or taxi channel associated with a landing or takeoff area on a public use airport.
5. Change the status of an airport from private use to public use or from public use to private use.
6. Change any traffic pattern or traffic pattern altitude or direction.
7. Change anticipated aeronautical operations, e.g., from VFR to IFR.

1.3.2 Filing a Notice of Intent.

When a notice of intent is filed to establish a seaplane base on a body of water, the resulting FAA determination is for seaplanes landing on and taking off from that body of water. In the case of publicly-owned bodies of water, the FAA will issue determinations to subsequent proponents for seaplane bases proposing to utilize the same body of water. In these cases, the subsequent FAA determinations may contain limitations that apply collectively to all previous FAA seaplane base determinations. Subsequent determinations, however, do not normally affect a prior proponent's mooring areas.

1.3.2.1 It is not uncommon for a point to be reached where seaplane operations to or from different landing and takeoff areas in close proximity to each other must be coordinated to ensure safe and efficient use of the airspace. The

FAA will identify the coordination procedures that must be implemented to prevent traffic pattern overlap of adjacent aircraft landing and takeoff areas and their respective approach and departure paths.

1.3.2.2 The FAA airspace determination is independent of permission granted by local authorities to use the water area. The proponent may seek and obtain permission to use the water prior to or subsequent to an airspace determination. However, local authorities may require an FAA airspace determination as a prerequisite for granting permission to use the water area.

1.3.3 Filing Process - Activation of a New Public-Use Seaplane Base.

The proponents of all proposed, new public-use seaplane bases should contact the nearest FAA Airports Regional Office or Airports District Office (ADO) and prepare an FAA Form 7480-1. Proponents should submit the completed form back to the FAA Airports Regional Office or ADO. This action may be the first information available to the FAA about the proposed, new public-use seaplane base.

1.3.3.1 **Calculating the Airport Reference Point (ARP) on FAA Form 7480-1.**

If waterlane thresholds are marked, or planned to be marked, the ARP is the geometric center of all useable water runways at the seaplane base. See AC 150/5300-13, *Airport Design*, for information on how to calculate the ARP. If the waterlanes are not marked, the ARP is located at the center of the seaplane float(s), dock(s), or ramp(s).

1.3.3.2 **Results of Aeronautical Study.**

When the FAA receives the completed FAA Form 7480-1, it will initiate an aeronautical study. Once it completes the aeronautical study, the FAA issues an airspace determination letter to the proponent specifying the results of the aeronautical study. There are three airspace determinations: (1) no objection, (2) no objection with conditions, and (3) objectionable. The letter will include a blank FAA Form 5010-3, *Airport Master Record (Newly Established Public Use Airports)*, and advises the proponent to fill out the form and submit it to the FAA after the seaplane base becomes operational).

1.3.3.3 **On-site Inspection.**

When the FAA receives the FAA Form 5010-3 from the proponent, the FAA Airports Regional Office or ADO will assemble and provide to FAA Airport Engineering Division (AAS-100) an electronic “5010 package” containing, at a minimum, a copy of the airspace determination letter, a copy of FAA Form 7480-1, and the original FAA Form 5010-3. In turn, the FAA Airport Engineering Division will ask the FAA or State airport inspector to conduct and provide inspection results to AAS-100 using the filled-out FAA Form 5010-3 by the proponent. If the FAA or State inspector is unable to physically inspect a newly established public-use seaplane base, then AAS-100 will obtain complete airport data from the airport manager or proponent.

1.3.3.4 **Seaplane Base Location Identifier.**

The FAA or State airport inspector after inspecting the seaplane base will submit a revised FAA Form 5010-3 to AAS-100. AAS-100 will review the inspection data for accuracy, assign the seaplane base a site number, and forward the FAA Form 5010-3 to the Air Traffic Organization. Air Traffic will enter the seaplane base into the FAA's National Airspace System and assign it the permanent location identifier. Lastly, the proponent will receive a letter with their Location ID.

1.3.3.5 **State Aviation Agency Requirements.**

When establishing a new public-use landing area, it is advised that the proponent also contact the State Aviation Agency for additional guidance on State aviation requirements.

1.3.4 Filing Process - Activation of New Private-Use Seaplane Bases.

The airport proponent of all proposed, new private-use seaplane bases should contact the FAA Airports Regional Office or ADO and prepare a FAA Form 7480-1. Proponents should submit the completed form to the FAA Airports Regional Office or ADO. This action is usually the first information available to the FAA about proposed, new private-use airports.

1.3.4.1 **Airport Reference Point (ARP) on FAA Form 7480-1.**

If waterlane thresholds are marked, or planned to be marked, the ARP is the geometric center of all useable water runways at the seaplane base. See AC 150/5300-13, *Airport Design*, for information on how to calculate the ARP. If the waterlanes are not marked, the ARP is located at the center of the seaplane float(s), dock(s), or ramp(s).

1.3.4.2 **Aeronautical Study.**

When the FAA receives the FAA Form 7480-1, it will initiate an aeronautical study. Once it completes the aeronautical study, the FAA issues an airspace determination letter to the proponent. There are three airspace determinations: (1) no objection, (2) no objection with conditions, and (3) objectionable. In addition to notifying the airport proponent of the results of the FAA aeronautical study, it also includes a blank FAA Form 5010-5, *Airport Master Record (Newly Established Private Use Airports)*. The letter advises the proponent to fill out the form and submit it to the FAA when the seaplane base becomes operational.

1.3.4.3 **On-site Inspection.**

When the FAA Form 5010-5 is received from the proponent, the FAA Regional Airports Office or ADO will assemble and provide to the FAA Airport Engineering Division (AAS-100) an electronic "5010 package" containing, at a minimum, a copy of the airspace determination letter, a copy of FAA Form 7480-1, and the original FAA Form 5010-5. No on-site inspection will be conducted.

1.3.4.4 **Seaplane Base Location Identifier.**

AAS-100 will review the completed FAA Form 5010-5 for reasonableness and accuracy. When necessary, AAS-100 may seek clarification from the proponent or the appropriate FAA Airports Regional Office or ADO. Upon completion, AAS-100 will assign a site number to the landing area and transmits the original FAA Form 5010-5 to Air Traffic. Air Traffic will enter the seaplane base into the FAA's National Airspace System and assign it the permanent location identifier. Lastly, the proponent will receive a letter with their Location ID.

1.3.4.5 **State Aviation Agency Requirements.**

When establishing a new private-use landing area, it is advised that the proponent also contact the State Aviation Agency for additional guidance on State aviation requirements.

1.4 Notice of Construction or Alteration.

Title 14 CFR Part 77, *Objects Affecting Navigable Airspace*, Subpart C, Obstruction Standards, requires any person who intends to construct or alter any building or structure on, or in the vicinity, of an existing or proposed airport (including a seaplane base) available for public use to notify the FAA of their intent. This action allows the FAA to evaluate the potential impact of such action on air navigation at the seaplane base and other nearby airports. This protection of the seaplane base applies only if their sea lane(s) is outlined by visual markers. This visual identification offers a greater level of safety. FAA Form 7460-1, *Notice of Proposed Construction or Alteration*, is used to submit the required notice and is available at http://www.faa.gov/forms/.

1.5 FAA Aeronautical Study of Existing Objects/Structures.

The FAA conducts aeronautical studies of existing structures whenever there is a need to determine their physical or electromagnetic effect on the use of the navigable airspace and navigation facilities. Situations that normally result in an aeronautical study of existing structures include but are not limited to:

1. A determination as to whether an obstruction to air navigation has a substantial adverse effect upon the safe and efficient use of navigable airspace;
2. A change in an aeronautical procedure at a seaplane base with a marked water operating area;
3. A request for technical assistance in the design and development of a seaplane base with a marked water operating area;
4. A determination as to whether an object should be altered, removed, marked, or lighted;

5. A determination as to whether marking and lighting can be reduced or removed without adversely affecting aviation safety, or whether marking and lighting should be added, intensified, or expanded to make pilots better aware of an object's presence;
6. A determination of an existing activity's electromagnetic effects upon a navigational aid or communications facility; or
7. A recommendation to the Federal Communications Commission concerning the erection or dismantling of an antenna.

1.6 Airport Layout Plan (ALP) for Seaplane Bases.

All federally obligated airports, including seaplane bases, must maintain a current ALP drawing set. Any proposed development must be shown on the FAA Approved ALP in order to receive federal funding. An ALP is not required for airports or seaplane bases that are not federally obligated. The ALP is a valuable tool the seaplane base operator and users can use to describe existing conditions, and plan for any anticipated development.

1.6.1 Development, Submittal, and Approval of an ALP for a Seaplane Base.

Chapter 10 of AC 150/5070-6, *Airport Master Plan*, Airport Master Plan discusses the process for developing and submitting an ALP to the FAA for approval. The process is identical for both land based airports and seaplane bases, despite the differences in use.

An ALP for a seaplane base may not have all the elements discussed in Chapter 10 of the Airport Master Plan AC, for example, some of the required drawings for a land based airport are not applicable when the water lane thresholds are not marked. (See paragraph 3.2.5.) Specifically, the Airport Airspace Drawing and the Inner Portion of the Approach Surface Drawings cannot be completed without a defined threshold because the relevant surfaces shown in those drawings are calculated from the threshold coordinates.

A water lane presents a special situation when trying to depict on an Airport Layout Plan. When marked, the water lane should be shown on the plan with the dimensions, and threshold coordinates. When not marked, the general water operating area should be shown. Refer to Figure 3-3 for one possible way to depict an unmarked water lane. Docks, ramps, anchorages, and any on-shore facilities should be depicted as if the base were a conventional land-based airport. If there are any aircraft operational or movement restrictions due to water conditions, or proximity to on shore facilities, note them on the ALP. Seaplane bases collocated with conventional airports should be shown on the ALP for that airport and not on a separate layout plan.

Local or State government may have land use or zoning regulations that set landside development standards. These regulations could apply to structures, pavement, or utilities on or off the sea plane base land. Identification of nearby land use restrictions, and discussion of those restrictions in the Airport Master Plan, or ALP Narrative is recommended. Identification of any required setbacks for utilities, wastewater, etc., on the ALP will facilitate proper planning of future development. Additionally, if the sea plane base is located in proximity to a land based airport, and there is a direct connection between them (taxiway or access road) show that connection on the ALP

The ALP for a seaplane base is to be submitted to the FAA for review and approval as described in the Airport Master Plan AC. The FAA will review the ALP for accuracy, completeness, and safe and efficient use of the airspace. The FAA will also review proposed development expected to receive federal funds to ensure they meet the policy directives and aviation priorities of the FAA.

Upon satisfactory review, the FAA will issue an approval letter indicating their approval, and any conditions on that approval.

1.6.2 ALP for Seaplane Bases Approval.

FAA Approval of a ALP represents a statement concerning the safe and efficient use of airspace, and does not represent a commitment to provide federal financial assistance to implement any development shown on the plan. Unless specifically indicated otherwise, all proposed development on the ALP will require environmental clearance from the FAA prior to start of construction, regardless of funding source.

1.7 U.S. Army Corps of Engineers Regulatory Program.

The U.S. Army Corps of Engineers is charged with maintaining and regulating the use of navigable waterways. The U.S. Army Corps' regulatory program concerns the integrity of navigation channels and the quality of the waters of the United States, including the territorial seas. Activities and fixed facilities requiring U.S. Army Corps permits include but are not limited to dredging, filling, breakwaters, boat ramps, piers, bulkheads, and riprap.

Note: Appendix A contains the application forms and other information required to apply for a Department of the Army permit.

1.8 U.S. Coast Guard Approval.

The U.S. Coast Guard is charged with marking navigable waterways. Markers of the type used to identify sea lanes are classified as private aids to navigation (PATON) and require U.S. Coast Guard approval.

Note: Appendix B contains the application form and instructions for completing the application form as well as addresses of U.S. Coast Guard District Commanders.

1.9 State and Local Requirements.

1.9.1 State Approval.

Many state aviation agencies or similar local authorities require notice or application for the establishment of seaplane water operating areas, to allow issuance of a state approval, permit, or license. Requirements vary and may depend on factors such as: ownership, public or private use, commercial activities, type and number of based seaplanes, and type and number of seaplane operations. Coordination with the state's department of transportation or aviation agency is recommended. It is recommended to always check with Federal or local officials in advance of operating on unfamiliar bodies of water. In addition to the agencies listed in Table 1-1, the nearest Flight Standard District Office can usually offer some practical suggestions as well as regulatory information (see FAA publication Aeronautical Information Manual (AIM)).

Table 1-1. Examples of Jurisdictions Controlling Navigable Bodies of Water/Authority to Consult for Use of a Body of Water

Location	Authority	Contact
Wilderness Area	U.S. Department of Agriculture, Forest Service	Local forest ranger
National Forest	U.S. Department of Agriculture, Forest Service	Local forest ranger
National Park	U.S. Department of the Interior, National Park Service	Park Superintendent
Tribal Resources	U.S. Department of the Interior, Bureau of Indian Affairs	Local Bureau office
State Park	State government or state forestry or park service	Local state aviation office for further information

Source: Aeronautical Information Manual

1.9.2 Local Approval.

Most communities have zoning laws, building codes, fire regulations, and environmental, noise, or similar ordinances. A review should be made to determine whether local laws, rules, and regulations affect the establishment and operation of a seaplane base.

Note: U.S. Army Corps of Engineers permits are still required in addition to any state or local permits.

CHAPTER 2. SITE SELECTION

2.1 Introduction.

This AC provides site selection criteria based on the physical characteristics of seaplanes, their unique operating characteristics, and the interplay of wind and water current and water depth. Designers will observe because of these differences this AC recommends larger dimensional clearances and separations for seaplane base and their facilities as compared to land airports.

2.2 Seaplane Characteristics.

There are two main types of seaplanes: flying boats (often called hull seaplanes) and floatplanes (conventional airplanes with floats or pontoons added) as shown in Figure 2-1. Reference to amphibious aircraft can be either type of seaplane that has a retractable wheel gear to allow operation on land or ingress and egress from the water via a ramp. The characteristics described below from FAA-H-8083-23, *Seaplane, Skiplane, and Float/Ski Equipment Helicopter Operations Handbook*, are the more pertinent characteristics used in this AC.

Figure 2-1. Flying Boats, a Floatplane, and an Amphibian

2.2.1 Floatplanes.

Floatplanes typically are conventional land airplanes that have been fitted with separate floats (sometimes called pontoons) in place of their wheels. The fuselage of a floatplane is supported well above the water's surface. In this AC, the term "seaplane" will be used in place of the term "floatplane."

2.2.2 Flying Boats.

The bottom of a flying boat's fuselage is its main landing gear. This is usually supplemented with smaller floats near the wingtips, called wing or tip floats. Some flying boats have sponsons, which are short, wing like projections from the sides of the hull near the waterline. Their purpose is to stabilize the hull from rolling motion when the flying boat is on the water, and they may also provide some aerodynamic lift in flight. Tip floats are sometimes known as sponsons. The hull of a flying boat holds the crew, passengers, and cargo; it has many features in common with the hull of a ship or boat.

2.2.3 Amphibians.

Some flying boats and floatplanes are equipped with retractable wheels for landing on dry land. These aircraft are called amphibians. On amphibious flying boats, the main wheels generally retract into the sides of the hull above the waterline. The main wheels for amphibious floats retract upward into the floats themselves, just behind the step.

2.3 Seaplane Operating Characteristics.

The following discussions highlight several operational difficulties that seaplane pilots face as compared to pilots operating land aircraft. As a result, this AC addresses such difficulties by offering larger sea lanes than paved runways and greater water operating areas to maneuver seaplanes near objects (reference: FAA-H-8083-23).

2.3.1 No Brakes.

Many of the operational differences between land airplanes and seaplanes relate to the fact that seaplanes have no brakes. From the time a seaplane casts off or is untied, the seaplane floats freely along the water surface. That is, it is virtually always in motion due to the wind and current effects, propeller thrust, and inertia. This drifting causes seaplane pilots to take deliberate actions to control such movement. Hence, to help pilots maintain safer water operations, this AC recommends extra dimensional space design criteria for taxi channels, turning basins, and for maneuvering seaplanes towards and within seaplane bases located in the water operating area and the shoreline.

2.3.2 Weathervaning.

Another major operational difference is the effect of the wind to cause an airplane to weathervane while on the water, i.e., yaw the nose into the wind. This tendency, which is less pronounced on land airplanes but very evident in seaplanes, can possibly impact the pilot's ability to maneuver seaplanes. Hence, this AC addresses this condition by providing design criteria with extra dimensional space for anchoring and mooring seaplanes in the anchorage area (anchors and mooring buoys), tie downs at piers/docks, and for water taxiing along shoreline facilities.

2.3.3 Landing.

When a landplane makes an approach at a towered airport, the pilot can expect that the runway surface will be flat and free of obstructions. Wind information and landing direction are provided by the tower. In contrast for water operations, the pilot must make a number of judgments about the safety and suitability of the water landing area, evaluate the characteristics of the water surface, determine wind direction and speed, and choose a landing direction. Additionally, it is quite rare for active land airport runways to be used by other vehicles, but it is common for seaplane pilots to share their landing areas with boats, ships, swimmers, jet-skis, wind-surfers, or barges, as well as other seaplanes. Once landed, water taxiing is more complicated given that seaplanes are in constant motion without the benefits of braking actions.

2.3.4 Takeoff.

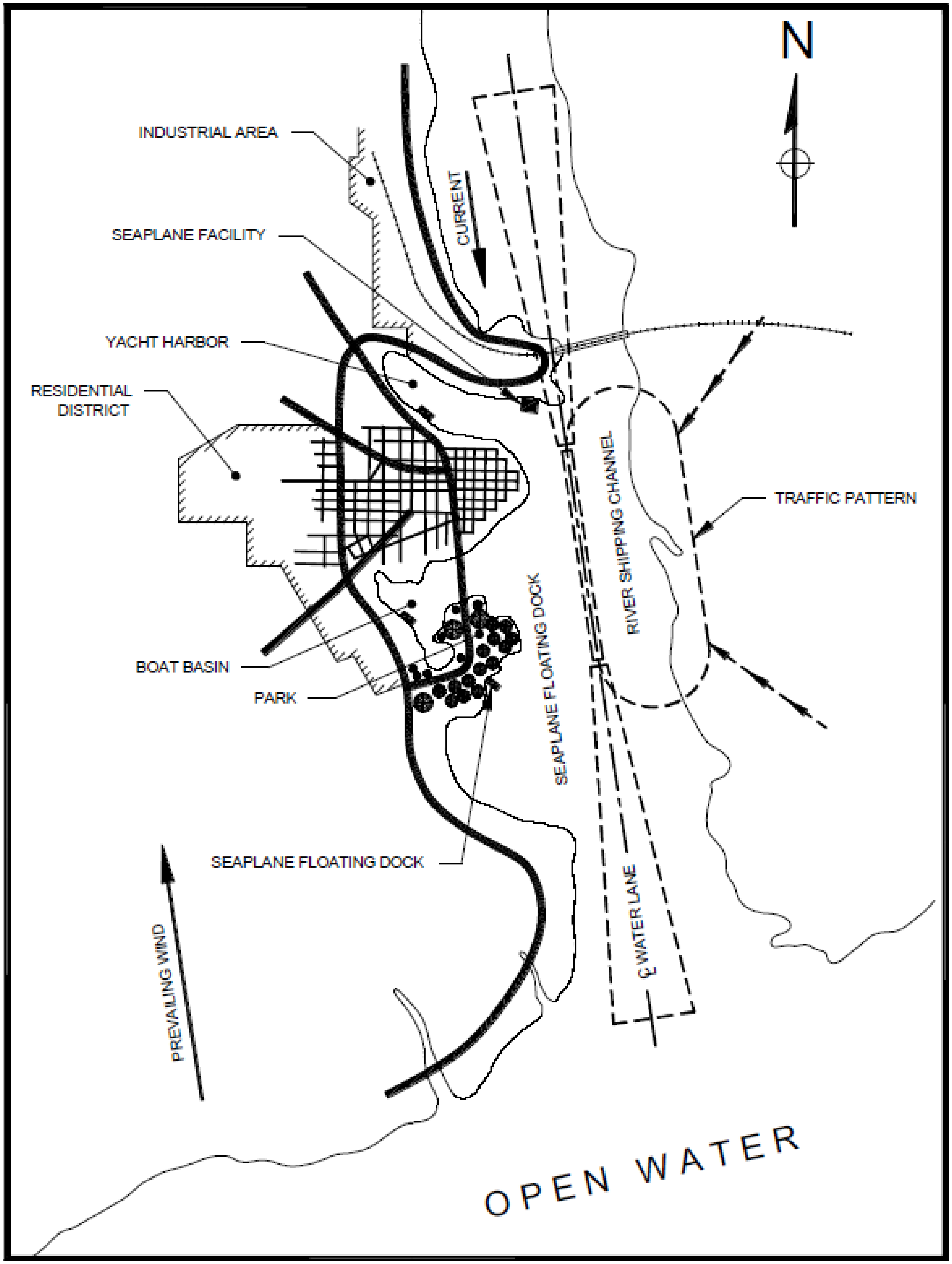
For most seaplanes, the water takeoff distance is usually much longer than the distance required for taking off from land. This is due to drag of the water on the floats or hull. As seaplane weight increases, the floats or hull will sink deeper into the water, creating more drag during initial acceleration and significantly increasing the required takeoff distance.

2.4 Site Selection Criteria.

This section provides proponents site selection criteria for determining a safer and more efficient seaplane base. Figure 2-2 shows one potentially safe, efficient, and compatible siting of a seaplane base to a typical community in general terms and more particularly to the other waterfront activities. Two seaplane base locations are illustrated in this “close” relationship with town businesses, the industrial waterfront area, and the convenience of access routes to the residential areas. In addition, the approach/departure paths and the traffic pattern do not pass over the existing community. Recreational boating can operate along the west shoreline safely and without interference or disturbance from seaplane operations. If the community can attract itinerant aviation it would be possible to provide additional shoreline facilities, such as a floating dock with tiedowns, for enplaning and deplaning passengers. Seaplane servicing is provided at the main north hangar facility. In general, river shipping is along the east shoreline with ample seaplane turning and docking area north of the railroad and bridge. This site location further offers protection to both seaplane base sites from down-river currents and prevailing north winds. All takeoff climbs and approaches are over water, thereby providing a higher degree of safety as compared to over land paths.

Note: For federally-funded seaplane bases, the sponsor, the federal government, or a public agency are required to hold good title to the areas of the airport used or intended to be used for landing, takeoff, and surface maneuvering of the aircraft, or assures that good title will be acquired (see Title 49 United States Code § 47106(b)(1)).

Figure 2-2. Seaplane Water Landing Area in Relation to a Waterfront Community



2.4.1 Water Operating Area and Shore Facilities.

The necessary size and location of the water operating area and shore facilities will depend upon at a minimum the following factors:

1. the performance characteristics and number of seaplanes expected to use the water operating area,
2. presence or absence in the surrounding area of existing or potential obstructions,
3. presence in the surrounding area of wildlife attractants such as bird sanctuaries or areas that attract flocks of birds due to terrain, vegetation, presence of food sources (landfills, seafood processing facilities, fish hatcheries, etc.). A local university cooperative extension may be able to assist in identifying these areas.
4. strength of water currents, water depth, wave action,
5. shoreline, river, or channel geography,
6. local regulations,
7. noise considerations,
8. prevailing wind direction,
9. presence of other seaplane bases and airports in the general area,
10. public accessibility,
11. character of development within the surrounding area, and
12. commercial ship operating routes, pleasure boating activities, and common recreational boating paths of travel.

2.4.2 Approach and Departure Paths.

The recommended location for seaplane approach/departure paths is over water, preferably not occupied by large vessels, wherever possible. This site selection criterion permits reasonably safer landings during the approach and during the initial takeoff climb in the event of power failure. This selection criteria further helps to avoid flying over populated areas, beaches, and similar shore development. Where a suitable sea lane (within the water operating area) exists but the shore and surrounding development prohibits straight-in approach and departure paths, an over-water climbing turn or let-down procedure may be possible. To avoid operational limitations, the approach/departure paths should be clear of obstructions to air navigation (see paragraph 1.4). For example, approach/departure paths should be clear of established shipping or boating lanes. If an obstruction to air navigation is determined to be a hazard to air navigation and cannot be altered or removed, the FAA will impose seaplane operational limitations, e.g., limit the type of seaplane operations as a means to mitigate the hazard determination. Another mitigating alternative is the practice of lighting or/and marking of evaluated obstructions to air navigation which in turn may preclude such an object as being a determined as a hazard. Thus, this practice may alone avoid the need for operational limitations. The latest edition of AC 70/7460-1, *Obstruction Marking and Lighting*, prescribes standards for marking and lighting of obstructions. Coordination with local governments responsible for zoning restrictions may also provide enhancements to approach and departure paths.

2.4.3 Wind Data.

Recorded wind observations taken in the immediate vicinity of the site over an extended period of time are the most desirable. When local observations are not available, data from a nearby locality or airport can be used. Keep in mind that wind data of this source may not be directly applicable to the site considered, as many on-site factors can change wind conditions considerably. Therefore, it is important that the latter type of data be checked by comparing the observed wind conditions at the proposed water operating area with winds being observed at the nearby location. It is recommended that these comparisons should be made under conditions of high and low wind velocity, from all quadrants, on both clear and cloudy days, and at substantially different temperatures. Information concerning the study and use of recorded wind rose data is available in the latest edition of AC 150/5300-13. Lacking data from these sources, it is advisable to consult local sailing and boating interests or residents of the area who may be able to supply general information regarding the winds in the vicinity of the water operating area.

2.5 Water Currents and Water-Level Variations.

2.5.1 Water Currents.

It is recommended that the landing and takeoff areas be located where the currents are less than 3 knots (5 mph). Landing and take-off operations can be conducted in water currents in excess of 6 knots but any taxiing operation between the sea lane (or water operating area) and the shoreline facilities will usually require the assistance of a surface craft. Currents in excess of 3 knots usually cause some difficulty in handling seaplanes, particularly in slow taxiing mode while approaching piers, floating docks, or in beaching operations like ramps. Hence, it is preferable to have the current flow away from the dock or floating docks. In some cases, undesirable currents may be offset to some extent by pilots by advantageous prevailing winds. Locations of the following types should be avoided:

1. Where the currents exceed 6 knots (7.0 mph);
2. Where unusual water turbulence is caused by a sharp bend in a river, the confluence of two currents, or where tide rips are prevalent.

2.5.2 Water Levels.

As a general rule if the change in water levels exceeds 18 inches, it will be necessary to utilize floating structures or moderately inclined beaching accommodations to facilitate handling of seaplanes at the shoreline or water front. Where water-level variations are in excess of 6 feet, special or extended developments to accommodate seaplanes must be made. These developments might require a dredged channel, extended piers or special hoisting equipment depending upon the slope of the shore. It follows that the greater the water variation, the more extensive will be the facility requirements. It is recommended that designers use a listing of tidal ranges that can be expected at various coastal points around the United States to address these factors.

2.6 Water Surface Conditions.

All evaluations of the water surface conditions should include height of wave action and existence of floating debris. Open or unprotected water operating areas may become so rough under certain conditions of winds and currents as to prohibit operations; hence, the varying water conditions at the proposed site must be investigated. The most desirable conditions exist where the surface of the water is moderately disturbed; having ripples or waves approximately 3 to 6 inches in height. The average light seaplane (3,000 pounds or less), equipped with twin floats, can generally be operated safely in seas running to about 15 inches measured from crest to trough, while 18-inch seas will restrict normal safe operations of these seaplanes. Larger float-equipped or hull-type aircraft ranging in weight from 3,000 to 15,000 pounds can generally be operated safely in seas running as high as 2 feet measured from crest to trough. At the other extreme, smooth or dead calm water is undesirable because of the difficulty experienced in lifting the floats or pull off the water during take-off. Lastly, the presence of floating debris must be determined. Areas in which there is an objectionable amount of debris for considerable periods of time should be avoided or debris should be removed.

2.6.1 Sheltered Anchorage Areas.

A sheltered area that is protected from winds and currents is recommended, particularly if overnight or unattended seaplane tie-ups are to be made at locations where sudden and sometimes unexpected storms or squalls develop. To facilitate seaplane base growth, a cove, small bay, or other naturally-occurring or manmade (via breakwaters or docks) protected area with enhanced shorelines is desirable for use since it offers additional seaplane anchorage or mooring area to relieve piers, docks, and onshore apron tiedowns. Other related information concerning anchorage areas are found in paragraph 3.6.

2.6.2 Bottom Conditions.

The type and condition of the bottom at the site of a proposed seaplane base can influence the arrangement of the various components thereof, the means of construction of the fixed structures, and the water operation areas to and from the shoreline. Reservoirs and other artificial bodies of water often are flooded natural land areas and frequently are not grubbed (stumps and logs removed) before flooding. This situation causes anchors and anchor lines to foul and, over a period of time, can create a hazard if these submerged objects rise to the surface and remain partially or totally submerged. Obstructions which project from the bottom and constitute a hazard should be removed or, if this is impractical, must be suitably and conspicuously marked to indicate their presence to those utilizing the water operating area. A hard bottom composed of shale or solid rock formations will make the construction of fixed off-shore structures difficult and costly. Anchors also tend to drag over this type of bottom. This leads to the use of mooring anchorage which is a permanently fixed installation. Unless specially designed mooring anchors are used, precautions should be taken by selecting a more suitable anchorage area. Where boulders are found on the bottom, some construction difficulties may be encountered and anchor lines may tend to foul. Mud bottoms ordinarily present little or no difficulty.

2.6.3 Environmental Factors.

In seeking approval for establishment of a seaplane base, the permitting authority may require an environmental analysis. This evaluation should include an analysis of the proposals impact on water quality, wildlife, existing and proposed land use, noise, and historical/archeological factors. The design of fueling facilities and storage areas should comply with local regulations and accepted measures for pollution prevention. Federal actions (including but not limited to approval of Airport Layout Plans and/or Seaplane Layout Plans), requests for federal funds, development of flight procedures, installation of navigational aids, etc., are subject to review under the National Environmental Policy Act (NEPA), as set forth in FAA Order 5050.4, *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions*, and FAA Order 1050.1, *Environmental Impacts: Policies and Procedures.* In addition to NEPA and the associated Council on Environmental Quality (CEQ) regulations, there are several other special-purpose environmental laws that may apply as well. In addition, most states have their own environmental laws or regulations as well, all of which need to be considered and followed prior to establishing a seaplane base.

CHAPTER 3. OFF-SHORE FACILITIES

3.1 Introduction.

Most large bodies of water can provide a suitable water operating area with adequate depth, length, and width for seaplane operations. The basic off-shore facilities include a sea lane, taxi channel, and an anchorage area. The anchorage area is a site where pilots can use single line anchors to secure their seaplanes to the bottom or mooring buoy anchoring sites that use permanent anchored mooring buoys. Beyond the basic offshore facilities, shoreline facilities may be added according to need. See Chapter 4.

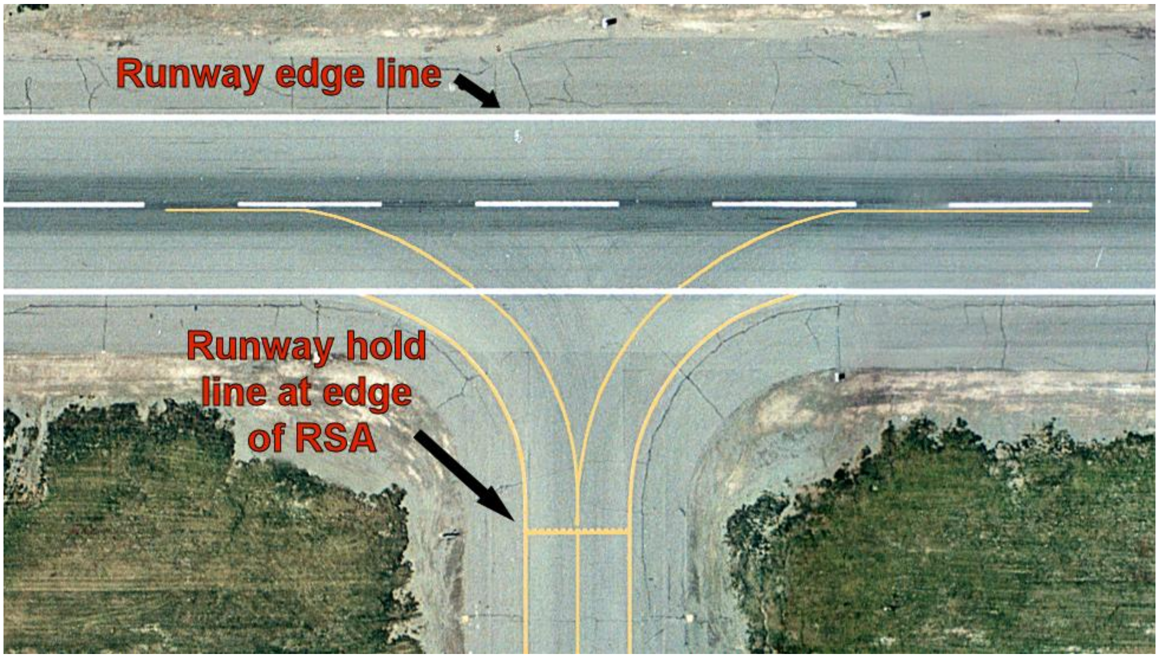
In unconstrained open water, it may be tempting to establish facilities that are much larger than needed. Reasons to do so may include; accounting for varying winds/water conditions, uncertainty on aircraft types and performance, or accommodating potential future demand. It is important to right size the off-shore facilities, taking into account aviation needs, and the needs of other users. Even in unconstrained water bodies, there may be regularly used shipping channels, or recreational uses that would have the potential to overlap the water landing area and taxi channels if they are oversized.

3.2 Waterlane – Dimensions, Depth, and Design Surfaces.

AC 150/5300-13, *Airport Design*, Chapter 3, provides standards for design of land-based runways. Many of the runway design standards are applicable to a water-based runway in concept, but because aircraft are operating on a water surface, distinguishing between the operational surfaces and the safety/clearance areas can be problematic.

A land-based airport clearly delineates the runway from the surrounding runway safety area (RSA), object free area (OFA), and obstacle free zone (OFZ). For example, a runway may be a paved surface with painted edge lines, and the RSA is often delineated with hold marking and signage, all of which are easily identifiable. This differs from a water runway, especially one that is not marked. Because of this, it is recommended that the seaplane operating area dimensions incorporate the safety and object free areas in the overall runway/taxiway dimensions.

Figure 3-1. Land-based Runway with Surrounding Runway Safety Area (RSA)



3.2.1 Determining Length.

The aircraft using the seaplane base are the driving factor in identifying take-off and landing length requirements. To determine the waterlane length, identify the most demanding aircraft and size the waterlane to accommodate their requirements plus a safety buffer.

Identify the most demanding aircraft, or family of aircraft that will make regular use of the seaplane base. Federally obligated airports, or those planning to seek federal funds for airport development must use AC 150/5000-17, *Critical Aircraft and Regular Use Determination*, in their critical aircraft determination process.

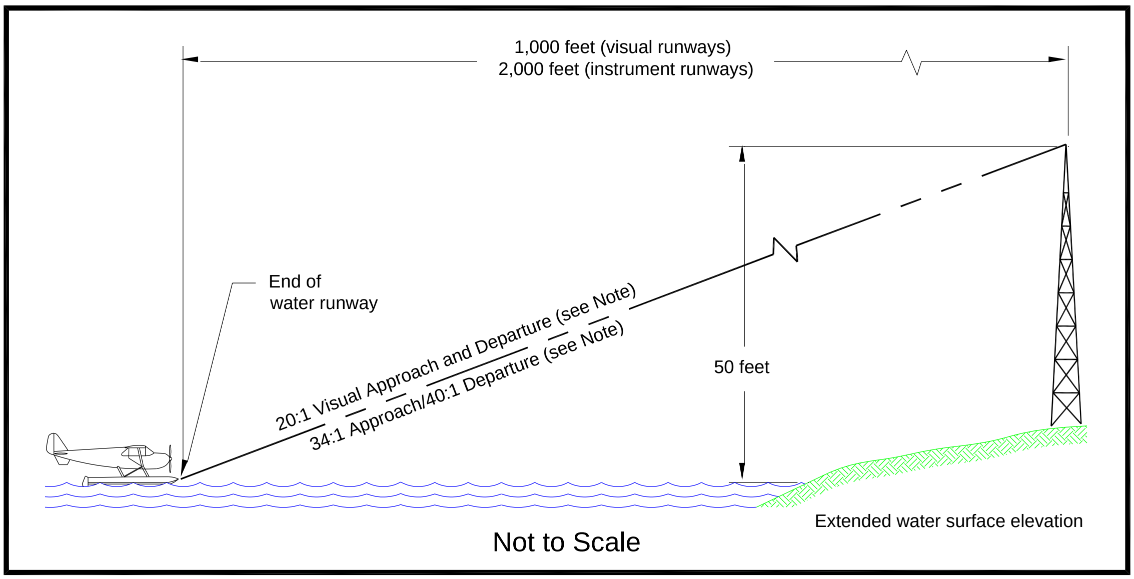
Note: Determination of the critical design aircraft may be difficult when establishing a new sea plane base. If no aviation forecast, or other planning data is available, it is recommended that the most demanding aircraft likely to use the new sea plane base within a reasonable flying radius be used as the design aircraft.

AC 150/5325-4, *Runway Length Requirement for Airport Design*, provides the process for the runway length determination. Given the variances between the operational characteristics of floatplanes versus wheeled aircraft, the Runway Length AC should not be your only source for determining runway length. In addition to the Runway Length AC, use the Airplane Flight Manuals or *Airplane Manufacturer's Information/Pilot Operations Handbook* to determine the greater of take-off or landing distance requirements for the aircraft to clear a 50-feet above water elevation obstacle at Maximum Take-Off Weight (MTOW) for the critical design aircraft. The distance from the water lane to the 50-foot obstacle will vary based on approach type, either visual or instrument. (refer to AC 150/5300-13 for more information)

- If the seaplane base only serves visual approaches, the distance to the 50 feet obstacle will be 1,000 feet, based on a 20:1 visual approach and departure slope.
- If the sea plane base supports instrument approach procedures, the obstacle is assumed at 2,000 feet from departure threshold based on a 40:1 instrument departure surface.
- Objects that are shorter and closer may penetrate the 20:1 or 40:1 surfaces and need to be taken into account if present.

Typically, the take-off distance requirement is greater than landing distance for seaplanes. Adjust length for mean high monthly temperature and airport elevation. Refer to the Runway Length Requirement in AC 150/5300-13 for how to account for temperature and elevation.

Figure 3-2. Water-based Runway Obstacle Clearance



Note: The approach and departure surfaces are not individually shown to reduce clutter on graphic. Refer to AC 150/5300-13 to select and site the proper approach and departure surfaces.

3.2.2 Determining the Width.

When there are no constraints on the width of the waterlane, 200 feet wide is considered a reasonable minimum width for most seaplane bases. This width accommodates the water runway and runway safety area (RSA) for the majority of seaplanes; accommodates variation in water and wind conditions to minimize effects on aircraft; and provides a safety buffer.

However, the 200-foot width does not include the runway Object Free Area (OFA) (AC 150/5300-13). The OFA is an area surrounding the runway safety area that is clear of above-grade objects, but does not have to be suitable for supporting aircraft operations.

A seaplane base may have an OFA that extends over underwater rocks, vegetation, or dry land.

Refer to AC 150/5300-13 for recommended OFA dimensions. In situations where full OFA dimensions cannot be accommodated, a minimum width equal to half the design aircraft wingspan should be provided.

The recommended 200-foot width may not accommodate all aircraft or operational conditions.

- A wider waterlane is necessary in areas where the prevailing wind or water currents vary, and 95% wind coverage cannot be achieved across a 200-foot waterlane width. When necessary, increase the waterlane width in a method similar to that for a land based runway.
    - AC 150/5300-13 recommends increasing runway width to the next larger aircraft design group to accommodate excessive crosswinds. Those increases are:
        - DG-I to II: 25%
        - DG-II to III: 33%
    - The above increases result in waterlanes of 250 feet and 330 feet, respectively.
- Incremental increases if necessary due to wind conditions or aircraft usage, are recommended to avoid establishing too wide of a waterlane, and unnecessarily restricting the water surface for other uses.
- Wider waterlanes can be established where there is need and available water area, either due to wind/water conditions, or operational use.

A waterlane that is constrained by terrain, or located in a width limited water area such as a lake, channel, or specially-created floatpond, should have a designated width that maximizes use of the water for take-off and landings without restricting the ability of taxiing aircraft to maneuver to/from the waterlane.

- It may not be possible to provide 200 feet of waterlane width in a constrained situation. Narrower waterlanes are acceptable, as long as the aircraft can operate safely under prevailing wind conditions.
- Where necessary, and if operational needs and safe conditions allow, back taxiing can be accommodated on the waterlane. There is an operational and capacity impact from doing so, as the taxiing aircraft is occupying the landing area for an extended period of time, preventing use by other aircraft.
- Similar to land based runways where wind coverage cannot be achieved, the pilot will have to make the determination to operate during less than ideal conditions based on their aircraft performance and piloting skills.

3.2.3 Determining Depth.

The water operating areas should provide a minimum of four feet of depth; six feet is recommended.

In open water, the operating areas should be clear of underwater obstructions that are less than four feet below the low tide line. If not possible to avoid or remove the obstruction, it should be identified with a marker, or buoy.

3.2.4 Marked Waterlanes.

If the waterlane is marked with buoys or other methods, the following surfaces apply:

- Visual Approach Surface: 20:1 (reference AC 150/5300-13)
- Instrument Approach Surface: 34:1 (or 50:1 depending on approach)
- Instrument Departure Surface: 40:1 (if waterlane supports an instrument approach procedure, not applicable otherwise)
- Runway Protection Zone (RPZ) (reference AC 150/5300-13)
- Runway Visibility Zone (RVZ) (reference AC 150/5300-13) (only applicable if there are intersecting waterways)

Because of the inherent safety benefit of identifying the above surfaces and the identification of the water runway for other potential users of the water surface, the FAA recommends marking the boundaries of the water runway in accordance with paragraph 3.2.5.

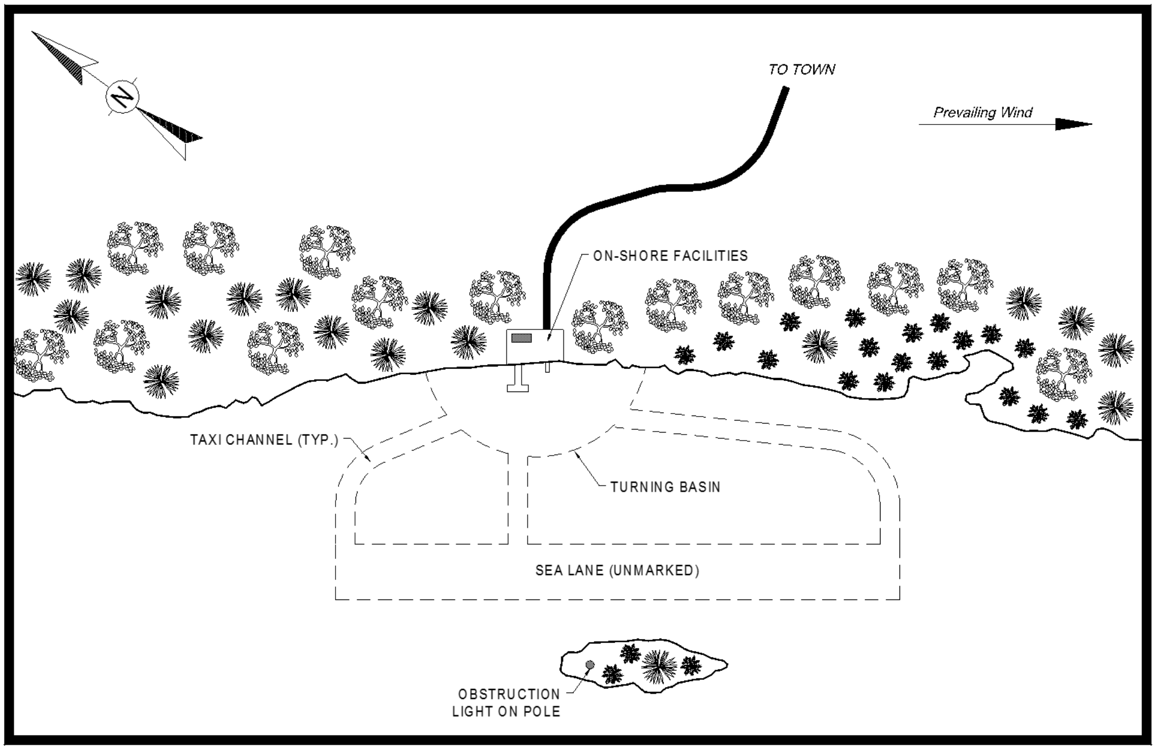
3.2.5 Marking Water Lanes.

Unlike a land-based airport, with an established, well defined runway, the water lane is defined on a liquid surface. This has benefits and drawbacks that need to be considered, especially when it comes to defining, and marking the water lane.

3.2.5.1 **Unmarked Water Lanes - Operational Flexibility.**

An unmarked water lane within a water operating area is the choice of many seaplane pilots. This practice allows the pilot to take advantage of the entire water operating area in order to adjust landing and takeoff operations for the existing water currents, wind direction, and the height of wave action. FAA-H-8083-23 provides seaplane pilots in-depth discussions on how to pilot the various landing and takeoff operating conditions encountered by seaplane pilots. Figure 3-3 shows an example of an unmarked water lane.

Figure 3-3. Example of an Unmarked Water Lane and Taxi Channel



The disadvantage of unmarked water lanes is that aeronautical use surfaces, such as the approach and departure surfaces defined in AC 150/5300-13 and FAA Order 8260.3, *United States Standard for Terminal Instrument Procedures (TERPS)*, as well as the 14 CFR Part 77 obstacle identification surfaces cannot be defined. This is because the surfaces are defined in relation to a marked runway threshold. An unmarked water lane does not have a defined threshold.

Because these surfaces cannot be defined for unmarked water lanes, it is recommended that the sea plane base owner protect their facility through the application of building restrictions within airport property and work with state and local governments to implement zoning restrictions outside of the property boundary.

3.2.6 Marked Water Lanes - Prevailing Winds.

Because of the inherent safety benefit of identifying the clearance surfaces mentioned in paragraph 3.2.4, as well as the identification of the water runway for other potential users of the water surface, the FAA recommends marking the boundaries of the water runway in accordance with paragraph 3.2.5. 14 CFR Part 77.3 states that, for the purpose of notifying the FAA of proposed construction, and determining the aeronautical effect of the proposal, a "seaplane base is considered to be an airport only if its sea lanes are outlined by visual markers." Effectively, this means that the regulatory protections offered by Part 77 are only applicable if the sea lanes are marked. Without clear marking identifying the water lane, it is not possible to calculate and draw the approach, departure, and Part 77 surfaces. This adds difficulty in protecting the area around the seaplane base from encroachment of buildings or structures that represent a hazard to operations.

The water lane should be designated with, at a minimum, two buoys at each end of the water lane, designating the threshold and width of the water lane. The water lane should be aligned to take advantage of maximum wind coverage and to avoid obstructions in the approach and departure paths.

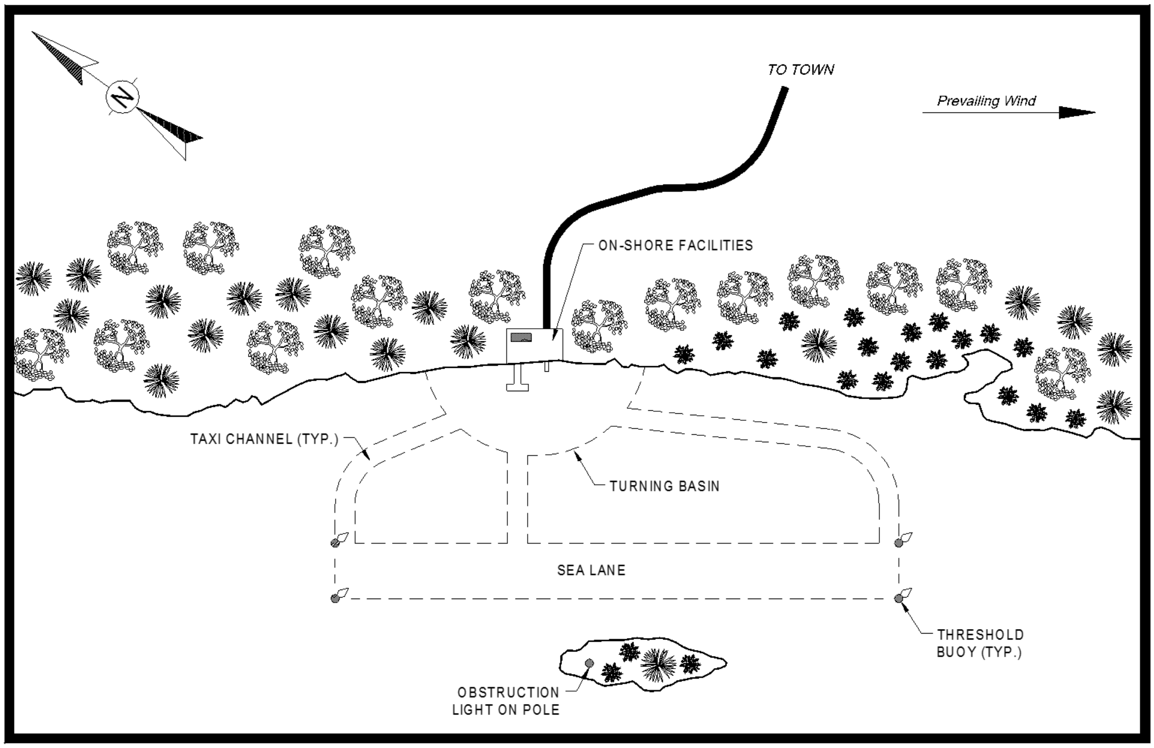
As with land based runways, the direction and velocity of prevailing winds over the surface of the water will be the controlling factor in determining the directional bearing of the water lane. Winds of three miles an hour or less are generally not problematic, and can be ignored when making this determination. Influences of the approach/departure paths, shoreline, and water current need to be considered in aligning a water lane. Peculiarities of surface currents and wind over water, the channelizing effect caused by shoreline terrain/banks, and effects of thermal air currents will produce wind conditions that may vary significantly from those observed by land based instruments as close as a quarter mile away. Wind observations can be limited only to daylight hours unless the seaplane base is going to support night operations.

Having the water lane ends marked (or planned to be marked), with identified geographic coordinates (LAT/LONG) and elevations allows the seaplane base to take advantage of the safety and notification benefits of 14 CFR Part 77, as well as approach and departure surfaces per AC 150/5300-13 and FAA Order 8260.3.

3.3 Buoys.

The installation of buoys may require coordination with multiple resource and government agencies (e.g., U.S. Coast Guard, U.S. Army Corps of Engineers, etc.) and tribal groups. It is the responsibility of the seaplane base owner/operator to identify and coordinate with all applicable authorities, Federal, State, or Local. A partial list of agencies with jurisdiction is provided in Appendix C.

Figure 3-4. Example of a Marked Water Lane and Taxi Channel



3.4 Taxi Channels.

A taxi channel is a basic, minimum facility of a seaplane base that allows adequate separation for water taxing as shown in Figure 3-3. The taxi channel provides direct access from the sea lane to the anchorage area and onshore facilities. The taxi channel should be oriented so that the approach to shoreline and onshore facilities, such as the anchorage area and ramp, pier, will be into the prevailing wind or current. Dimensions are as follows:

- Minimum Width: 125 feet (recommend 150 feet)
- Minimum Depth: 4 feet
- Wingtip to Wingtip Clearance for passing seaplanes (dual directional taxi channels): 50 feet

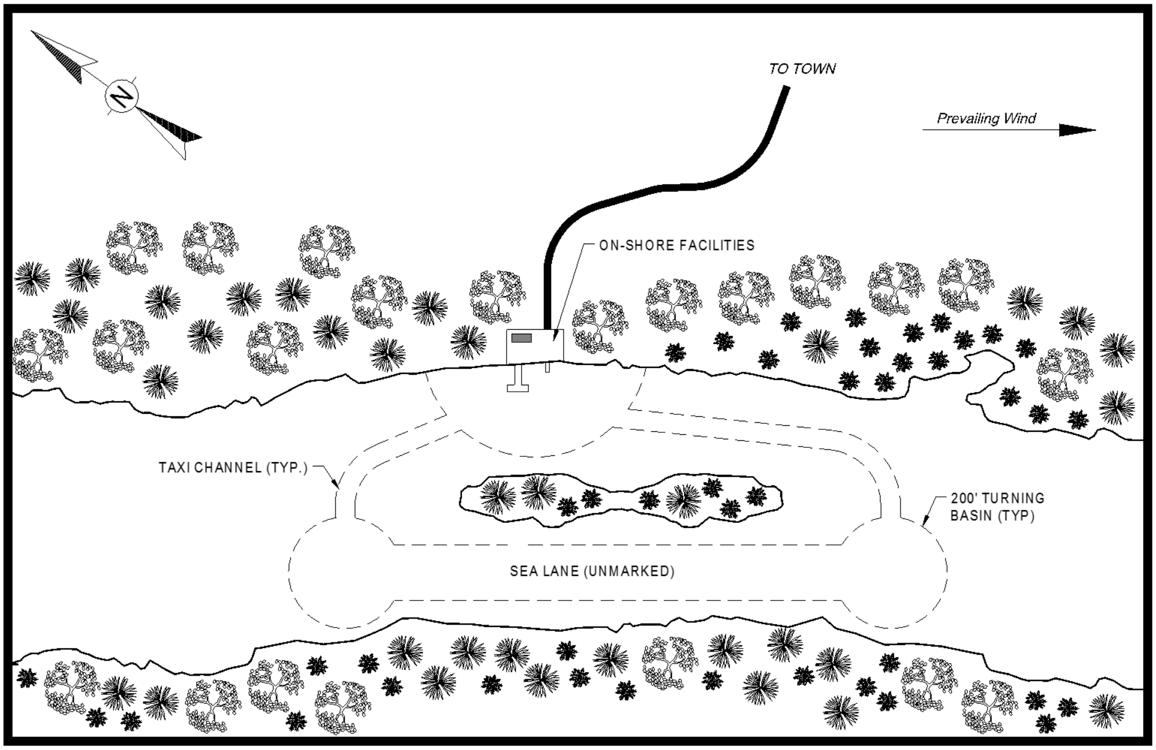
3.5 Turning Basins.

Turning basins as shown in Figure 3-5 are extra wide water maneuvering areas to facilitate water taxiing, turn maneuvers, and to accommodate periods of changing wind and current conditions.

3.5.1 Location.

A turning basin should be provided to offer seaplane pilots an extra wide water taxi maneuvering area to enter/exit an anchorage area and facilities located on the shoreline, for example, ramps, piers, hoisting equipment. For narrower, restricted sea lanes under 200 feet (60 m) in width, both ends of such restricted sea lanes should have turning basins of a minimum diameter of 200 feet (60 m).

Figure 3-5. Example of a Constricted Sea Lane and Taxi Channel



3.5.2 Clearance.

The stronger the wind and current, the more room it takes to make a water turn. Hence under these conditions, a minimum clearance of 50 feet (15 m) should be provided between the side of the turning basin and the nearest object.

3.6 Anchorage Areas.

The basic seaplane base has a dedicated anchorage area along the shoreline for securing seaplanes. Anchoring, as shown in Figure 3-6, is an easy, inexpensive way to secure a seaplane near the shoreline. Sea plane base owners should provide information to pilots on type of bottom conditions to be expected for anchoring, if known. Center-to-center spacing of anchors, where small twin-float seaplanes are to be moored, should not be less than twice the length of the longest anchor line plus 125 feet to allow for weathervaning, fuselage and wingspan parameters. For larger types of seaplanes, including flying boats and amphibians this spacing should be increased by an additional 100 feet. In comparison, Figure 3-7 and show Figure 3-8 an anchoring area with permanently anchored mooring buoys. Although a seaplane base may offer tiedown capabilities, increased seasonal demand could necessitate supplemental anchorage areas. In all case, it is recommended that the anchorage area be within sight and calling distance from the shoreline or from floating docks, ramps, etc., if possible.

Figure 3-6. Anchoring (Single Anchor Line)

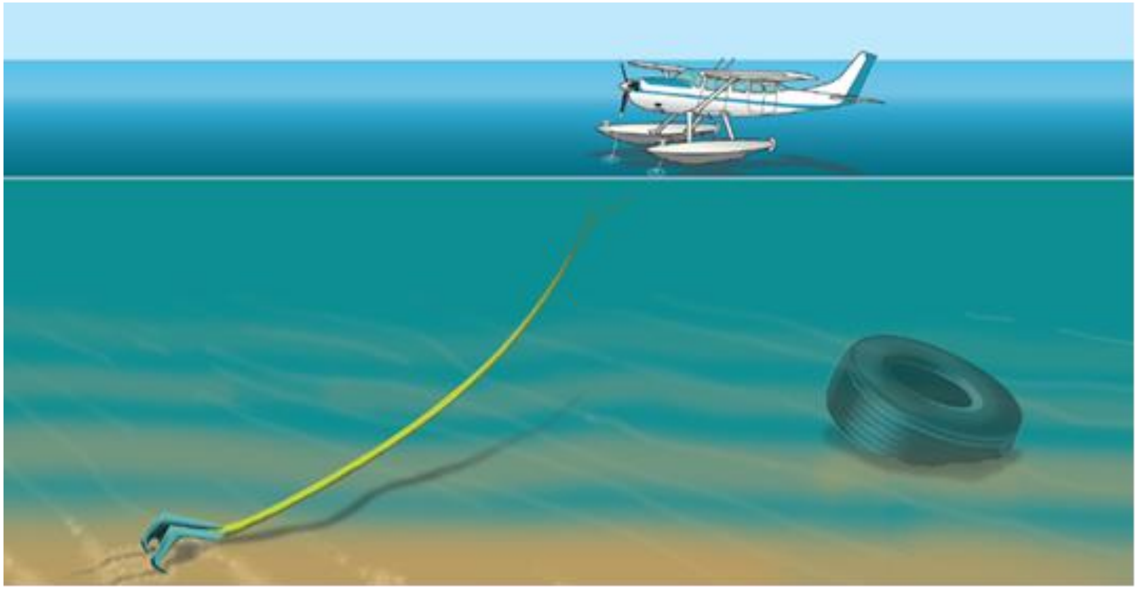
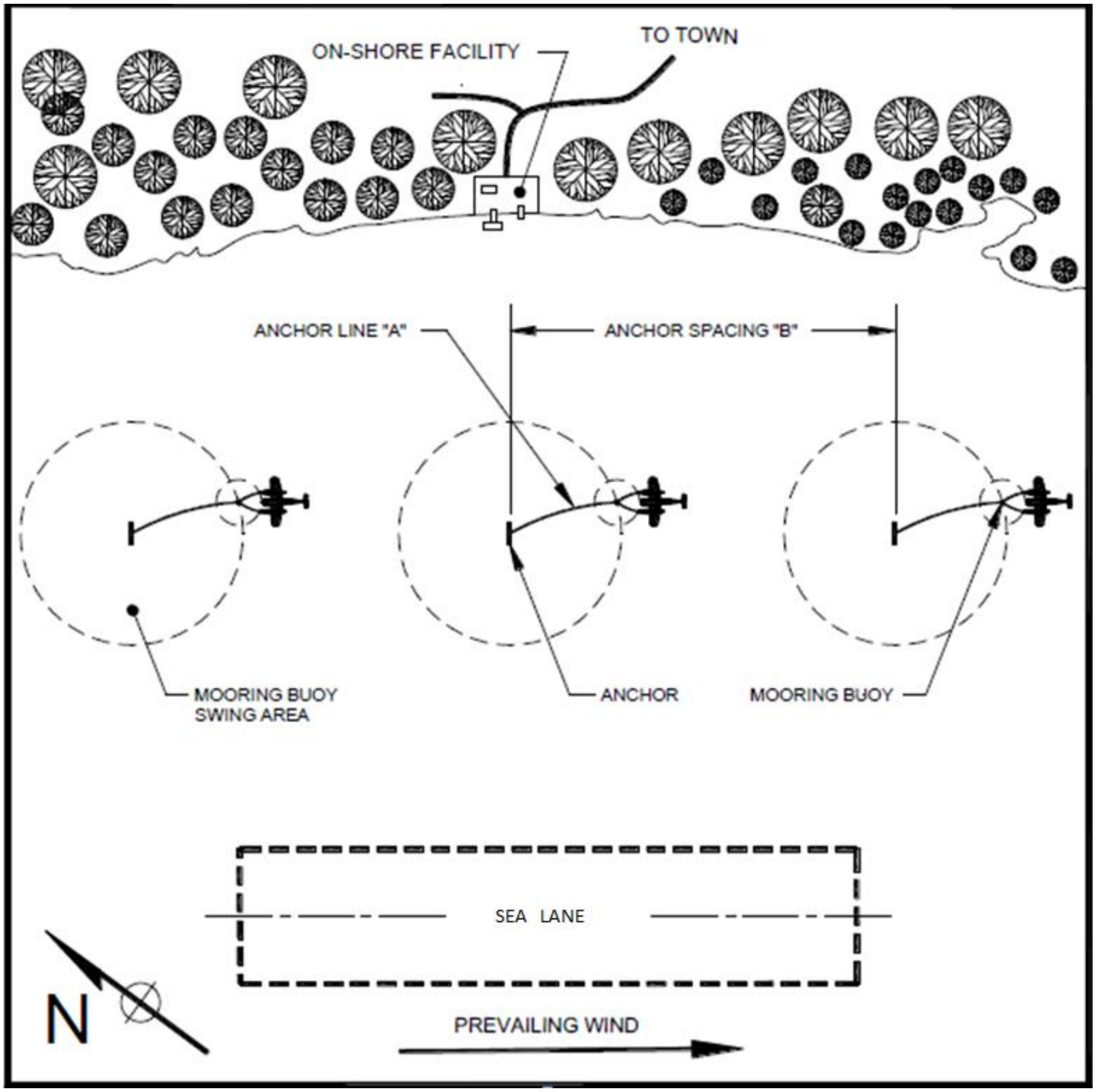


Figure 3-7. Example of a Mooring Buoy Anchorage Area (Dual Anchor Line Plus Bridle)

Figure 3-8. Example of an Anchorage Area With Permanent Mooring Buoys Swing Areas



3.6.1 Site Considerations.

The anchorage area selected should be out of the way of moving vessels and in water deep enough that the seaplane will not be left aground during low tide. With these factors evaluated, the overall size of the anchorage area can then be determined by the number and size of seaplanes and the following conditions. First, the site allows enough room so that the seaplane can swing around the anchor without striking nearby obstacles. Second, it permits unrestricted maneuvering of the seaplanes when approaching the anchorage area. It is desirable that anchorage areas provide maximum protection possible from high winds and rough water. If this is not possible, a shear boom should be considered if seaplanes are to be moored in an area where the current is strong. A shear boom consists of a series of logs tied together at their ends and anchored. Its functions are to create an area of calm water on the downstream side, as well as to deflect debris away from the seaplane floats.

3.6.2 Individual Anchoring – Requirements.

The space required for each seaplane is determined by seaplane's length, wing span, the length of the anchor line of a mooring bridle if used, type of lake or sea bed and water depth considering the lowest water level condition experienced in the anchorage area. The length of the anchor line "A" as shown in Figure 3-8 should be five to seven times the maximum depth at mean high water depending upon the type of anchor and rode used. Extra consideration should be given where seaplanes may weathervane and the swing is limited. Shortening the length of anchor line may be dangerous. In some cases, it may be shortened to not less than three times the water depth where light winds and calm conditions prevail and it may be necessary to increase the normal anchor weight or holding capacity to avoid dragging the anchor. Caution should be given to short anchor lines since anchor holding power is more a factor of scope (length to depth ratio) than to the weight of the anchor.

3.6.3 Multiple Mooring - Space Requirements.

Referring to Figure 3-8, center-to-center anchor spacing, "B", should not be less than twice the length of the longest anchor line plus 125 feet (38 m). For larger seaplanes, such as multiengine flying boats, an additional 100 feet (30 m) should be added to this spacing.

3.6.4 Anchor Considerations.

Appropriate anchorage selection (weight and shape) depends on intended use and the holding characteristics of the bottom. The length of the anchor line should be about seven times the depth of the water. See Figure 3-6 for an example.

3.6.4.1 **Bottom Conditions.**

Common bottom conditions such as sand, clay, or similar materials require anchors that will "dig in" to hold moored seaplanes within designated areas. For bottom conditions having deep, soft, mud and silt conditions, pilots have used mushroom-type or large base-area anchors which will not sink excessively into the sediments. In comparison, for shale, smooth rock or other hard bottoms, a much heavier anchor is required because the weight of the anchor is the principal holding factor. Pilots have used 5 to 10 pound (2.5 to 4.5 kg) cast-iron or steel boat anchors under normal conditions for temporary or emergency mooring. These types of anchors have been used to secure temporary night-lighting buoys or floating lighting devices. To evaluate the holding capability after dropping the anchor, first align the seaplane headed into the wind, and then allow the seaplane to drift backward to set the anchor. At that point, watch two fixed points somewhere to the side of the seaplane, one farther away than the other, that are aligned with each other, such as a tree on the shore and a mountain in the distance. If they do not remain aligned, it means that the seaplane is drifting and dragging its anchor along the bottom. If anchoring the seaplane overnight or for longer periods of time, use a heavier anchor and be sure to comply with maritime regulations for showing an anchor light or daytime visual signals when required.

3.6.4.2 **Weight.**

When computing the weight of permanent mooring or lighting-fixture anchors, the reduction in weight due to their submersion must be considered. The apparent weight reduction is equal to the weight of the water displaced by the anchor. Permanent markers or light-buoy anchors, other than typical boat anchors, should not weigh less than 250 pounds (100 kg) when submerged. Small aircraft mooring buoy anchors should not weigh less than 600 pounds (275 kg) when submerged and should not roll on the bottom. An excellent mooring anchor for seaplanes of gross weights up to 15,000 pounds (6 800 kg) can be made from two large steel drums or wooden barrels filled with concrete and connected with heavy 2 to 3-inch (5 to 7.5 cm) diameter iron pipe. This anchor has a gross weight of approximately 2,200 pounds (1 000 kg) and a submerged weight of about 1,320 pounds (600 kg). A single-barrel anchor constructed as above will be satisfactory for anchoring small seaplanes. Three drums may be needed for larger, heavier aircraft. Filled concrete blocks tied together with reinforcing rods will also make a satisfactory anchor.

3.6.5 Anchor Lines.

In addition to anchor lines being of required length, as previously mentioned, they must have certain other characteristics if they are to prove satisfactory.

3.6.5.1 **Strength.**

The strength of an anchor line is based on the safe working load being equal to or greater than the gross weight of the anchor. Under most wind and water conditions, a 0.25-inch (6.5 mm) wire rope or chain will be strong enough for mooring aircraft up to 3,000 pounds (1 360 kg) gross weight, and a 0.50-inch (12.5 mm) anchor chain or wire rope will be satisfactory for mooring aircraft up to 15,000 pounds (6 800 kg) gross weight.

3.6.5.2 **Effects of Water.**

Mooring lines of the size indicated will remain serviceable for several years in fresh water. In salt or brackish waters, due to the rapid deterioration of metals, the minimum size should be increased by 1/8-inch (3 mm) unless stainless steel rope is used. A practical application is to attach the anchor line to the end of a heavy chain. This arrangement reduces the strain and shock on the aircraft when riding in rough water or heavy swells. Refer to engineering handbooks for weight and strength characteristics of wire rope and chain for determining anchor line sizes.

3.6.5.3 **Metal Fittings.**

Copper or bronze fittings should not be used in direct contact with steel fittings or lines unless they are insulated. Without such proper insulation, electrolysis takes place leading to metal corrosion. Galvanized screw or pin shackles are recommended at the buoy, thus allowing the buoy to rotate on the anchor line. All hardware should be hot-dipped galvanized. When wire rope is used, the ends should be doubled back over a thimble and made fast with rope clips or clamps. It is customary to use three clamps per connection.

3.6.6 Mooring Buoys.

Mooring a seaplane to a buoy eliminates the problem of the anchor dragging. Mooring buoys are floating markers held in place with cables or chains to the bottom. Mooring buoys must be chosen that will not damage floats or hulls if they are inadvertently struck during water operations. The mooring site must accommodate buoy swings and seaplane drifting, swinging on its mooring bridle (line connecting the seaplane to the mooring buoy) in as shown in Figure 3-7. The desirable approach to a mooring location is at a very low speed and straight into the wind. Once the site is determined, the permanent mooring installation will consist of a heavy weight on the bottom connected by a chain or cable to a floating mooring buoy with provisions for securing mooring lines. A mooring buoy must first support the weight of the anchor line or wire rope and secondly, flag standards, fittings, and lighting accessories when such additional equipment is used. See FAA-H-8083-23 for an in-depth discussion of buoys.

CHAPTER 4. SHORELINE FACILITIES

4.1 Introduction.

Shoreline facilities are partly on land and in the water. These installations perform two general functions: (1) enable servicing, loading and unloading, handling and tying-up facilities for seaplanes without removing them from the water, and (2) provide hauling-out facilities for removing seaplanes from the water. Facilities along the shoreline, which vary according to need and topography, range from a simple wood-plank ramps and floating deck to the more elaborate piers, fixed docks, and barges, and possibly marine rail. The types, size, and arrangement of these various facilities will be determined by the water and wind conditions, the topography of the land adjacent to the shoreline, the configuration and conditions of the bottom of the water operating area, and the number and type of seaplanes and amphibian airplanes to be moored, docked, or removed from the water.

4.2 Ramps.

A ramp as shown in Figure 4-1, Figure 4-2, and Figure 4-3 is a sloping platform extending well under the surface of the water that vary widely in size, shape, and construction materials, e.g. from rough logs to heavy-duty wood decks to concrete structures. Use caution on concrete ramps to avoid damage to floats when launching and retrieving floatplanes.

Figure 4-1. Ramp With Submerged Ramp Toe

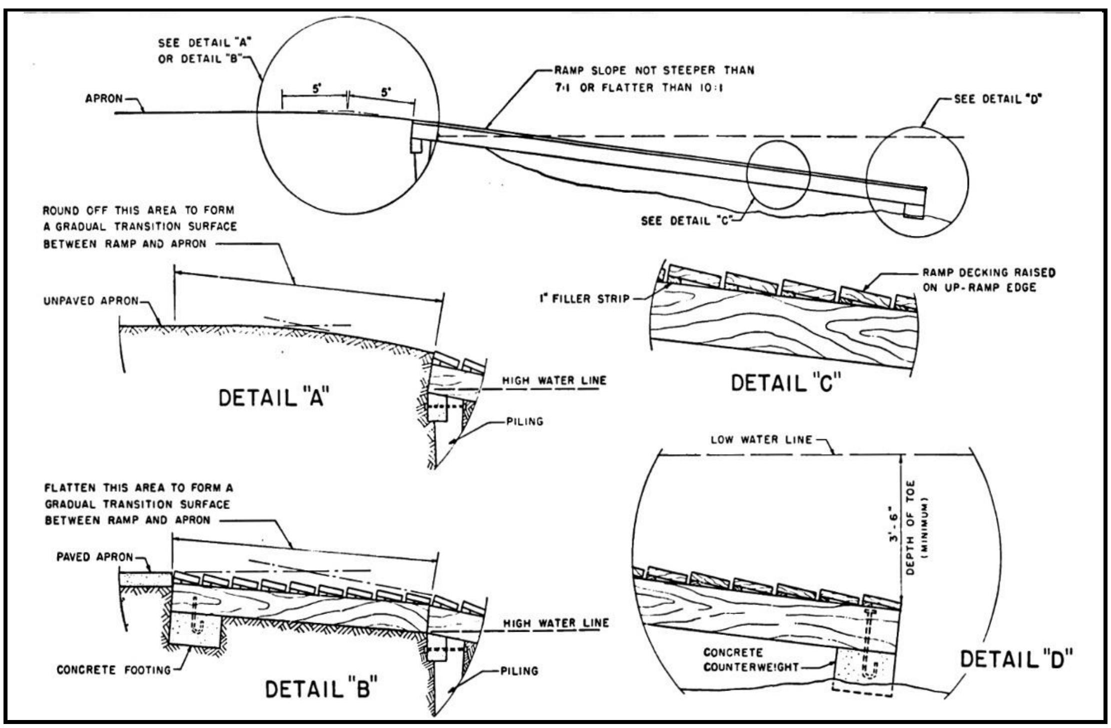


Figure 4-2. Illustration of a Submerged Ramp Toe

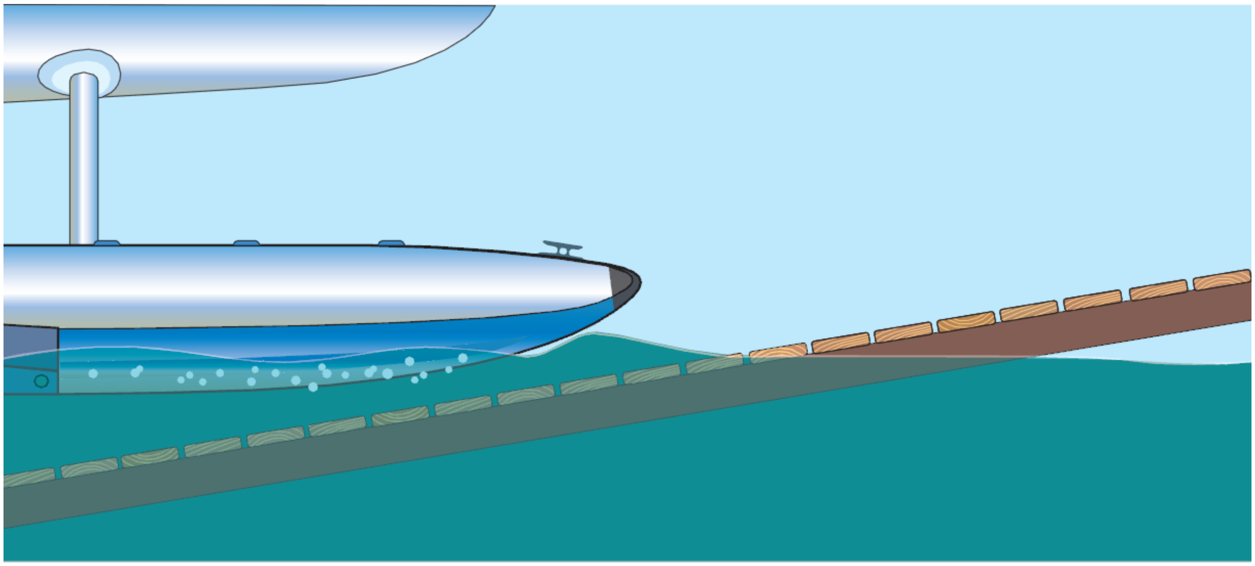


Figure 4-3. Example of a Wood and Concrete Launch Ramp

A typical ramp designed to accommodate seaplane floats is approximately 15 by 20 feet (5 m by 6 m) wide and extends into the water to allow seaplanes to be launched and retrieved easily. The ramp needs to be sized appropriately to accommodate the aircraft that will be using it. When determining the width and depth, take into account any amphibious aircraft that will be using the ramp to transition from water to land. (See paragraph 4.2.3.1.)

The seaplane base should provide clear areas around the ramp to ensure wingtip clearance is provided to avoid damage to aircraft transitioning from water to land. See paragraph 4.2.4.3. Tides, current, and wind conditions may affect amphibious aircraft entering/exiting the water under their own power differently than hoisted/towed seaplanes, necessitating a wider ramp.

Wet ramps are known to be extremely slippery, so good ramp and dock design should minimize the need for pilot and passengers to walk on the ramp. Consider implementing a narrow, high friction walkway down the ramp in a position that will not interfere with floats and will allow a handler, pilot or passengers to approach the plane safely.

4.2.1 Location.

Pick the location of the ramp to consider the direction of the prevailing wind. The preferred direction is in line with prevailing winds. Ramps that do not consider the direction of the prevailing wind create directional control issues for the pilot of a seaplane taxiing on the water towards the ramp, and while launching and departing the ramp. The seaplane will weathervane and will turn nose into the wind and during launch or retrieval damage may occur as the plane turns and strikes nearby structures or the launch vehicle.

Because ramps are the transition point from water to land, the ramp site should offer a minimum 200 feet (60 m) of unobstructed turning diameter directly offshore from the ramp in the direction from which approaches are normally made. Some locations may require an additional ramp where variable wind conditions are a factor.

4.2.2 Design Concept.

Ramps are of fixed or hinged type construction having predetermined lengths with a submerged ramp toe (entrance point for seaplanes.) Fixed ramps as compared to hinged ramps are more common but become relatively more costly in shallow areas or where the water level variation exceeds 8 feet (2.4 m). One factor increasing the cost is the need for longer ramps. Ordinarily, piling or piers are commonly used to support the stringers of fixed ramps.

4.2.2.1 Fixed ramps are secured to a stable on-shore structure in some cases a seawall and usually weighted down or attached to a fixed underwater footing by the ramp toe.

4.2.2.2 Hinged ramps are allowed to rise and fall with the tide by means of a hinge on the shore end, while the ramp toe end is buoyed to a predetermined depth below the mean low water level.

4.2.2.3 Float trucks, forklifts or float trailers (float dollies) are effective and inexpensive methods for launch and retrieval of seaplanes from the ramp. Because the wooden portion of the launch ramp may be slippery, ramp design should consider the use of a concrete surface just above the ordinary high water mark to ensure proper tire traction for the float truck, fork lift or vehicle towing the float trailer (see Figure 4-4).

4.2.2.4 Basic tools to keep the launch ramp clear of flotsam (logs, sticks, weeds, etc.) should be provided at the launch ramp. These basic tools might include a "pike pole" to steer logs away from the ramp, a garden rake and a flat shovel.

Figure 4-4. Example of a Float Truck

4.2.3 Length.

The overall length of the ramp is determined by two principle factors: the ramp slope and depth of the submerged ramp toe.

4.2.3.1 **Slope.**

The slope of a ramp should not be greater than 6:1, with flatter slopes ranging down to 10:1 being more desirable. Slopes flatter than 10:1 are usually too long and costly to construct. Ramps intended to serve tri-gear amphibian airplanes should not be steeper than 8:1 since, with steeper slopes, the hull of some flying boats and the water rudders of amphibious floatplanes may drag on the ramp as the craft enters the water.

4.2.3.2 **Submerged Ramp Toe.**

All ramps should have their ramp toe below the water level during mean low tide as shown in Figure 4-1. To determine the amount of submergence, it is recommended that the designer (user) determine the maximum draft of the seaplane(s) using this feature. In many cases, a 4-6 foot (1.2 m) submerged depth of ramp toe will provide sufficient clearance for most amphibious seaplanes. Water depth dimension should be established based on the mean low tide datum in that locality.

4.2.4 Width.

In figuring the ramp width, the designer needs to use the outside-to-outside float dimensions of seaplanes. For public seaplane facilities, use the minimum practical width dimension that is based on the largest seaplane or amphibian being accommodated plus additional space on either side of the ramp. This minimum practical width allows for (1) wind/current drifting when pilots approach the ramp toe and (2) a safer working space for personnel handling a craft on the inclined ramp.

4.2.4.1 A ramp width of 30 to 40 feet (9 to 12 m) will accommodate generally all seaplanes and amphibian airplanes in most wind, current, and tidal conditions. The Seaplane Pilots Association Ramp reports that the ramp width determination does not necessitate consideration of the wheel tread of present-day float airplane dollies. Normally, the dolly wheels are spaced to fall between the floats, and in cases where the wheels are outside, nearly all treads are 16 feet or less.

4.2.4.2 Smaller seaplanes under 15,000 pounds (6,820 kg) can use a 15-foot (4.5 m) ramp under calm water and wind conditions, but require a 20-foot (6 m) width for adverse conditions on an unattended ramp approach.

4.2.4.3 **Ramp Clearance Areas.**

Tides, seawalls/piers, and terrain in the immediate vicinity of the ramp should be taken into consideration when determining ramp width. The designer needs to ensure sufficient wingtip clearance is provided at low tide to ensure aircraft will not collide with fixed structures. Height of the wings above water, and the elevation of the fixed structure above the low tide are factors to consider when determining if the structure represents an obstacle to aircraft transitioning between water and land.

The designer can consult Chapter 4 of AC 150/5300-13, *Airport Design*, for information on determining wingtip clearance for taxiing aircraft as a starting point for establishing wingtip clearance requirements. Areas subject to currents or winds should include additional safety factors when establishing ramp width and clearance areas. Because a floatplane is subject to currents and tides, the clearance dimensions must be sufficient to allow the aircraft float to contact the edge of the ramp, without resulting in damage to the aircraft. This may extend the clearance dimensions beyond those described in AC 150/5300-13.

Figure 4-5. Example of a ramp with a nearby fixed pier. The designer needs to take into account aircraft wingtip clearance at low tide in this situation.

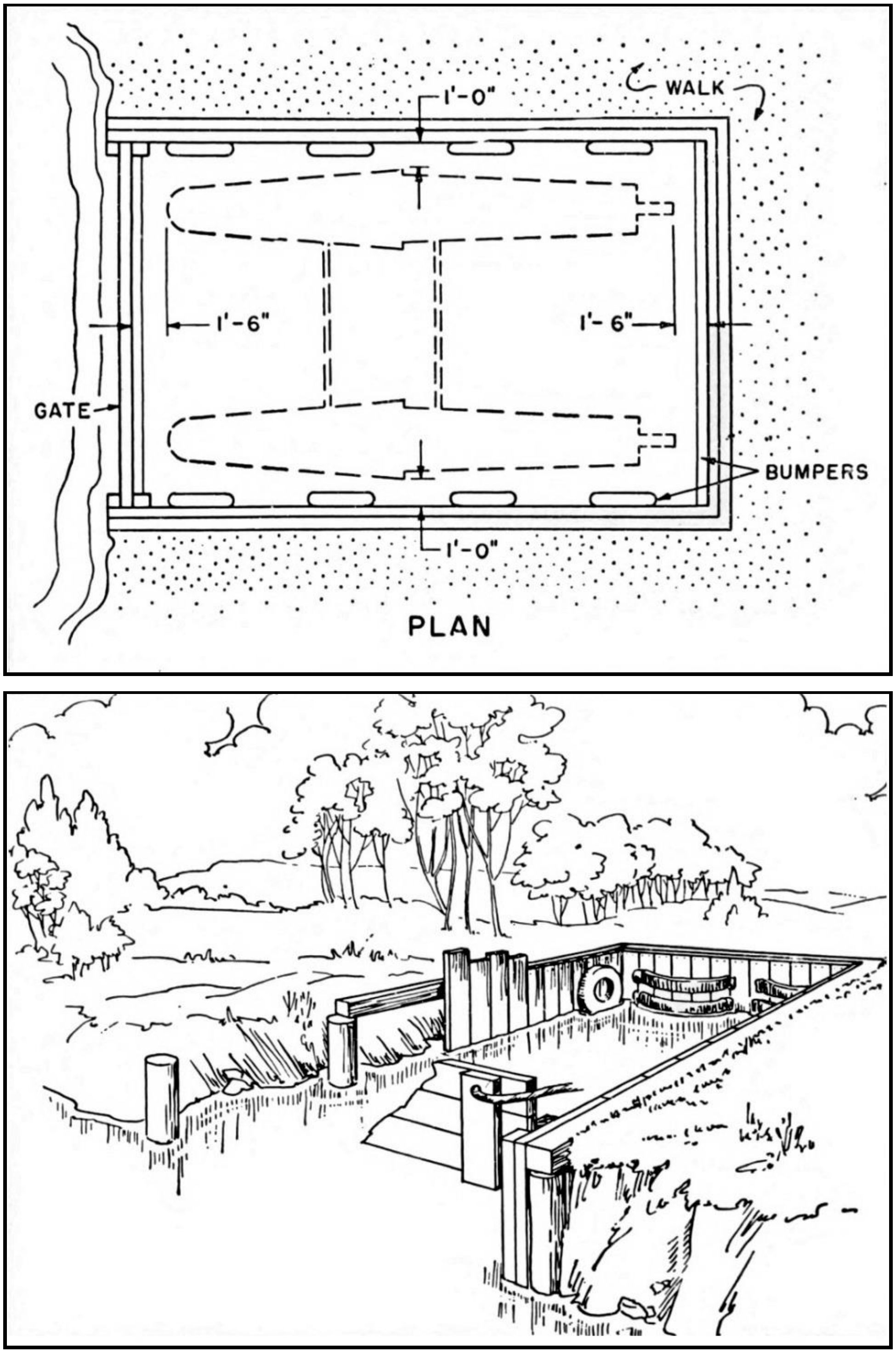
4.2.5 Decking.

Decking planks can be laid diagonally or at right angles to the line of travel. Planks should be placed rough side up with a 0.5-inch (1.3 cm) space between the planks to facilitate drainage and expansion. When laid at right angles to the line of travel, the up-ramp edge of each plank may be raised up to 1 inch (2.5 cm) to permit the hull of the craft to slide easily and still provide good footing for people walking on the ramp. Countersink all bolts, nails, and spikes used to attach the decking planks to the ramp stringers to avoid damage to floats and tires.

4.3 Slipways (Slips).

Seaplane owners may want a private slipway in which to berth their seaplane. Slipways are commonly rectangular in shaped berths form by dredging the shore line. Besides being economical, they often need no specially constructed sides or ends. Figure 4-6 illustrates an example of a slipway.

Figure 4-6. Minimum Recommended Clearances for a Private Slipway



4.3.1 <u>Location.</u>

A slipway should be where the variation in the water level is not greater than 2 feet (0.6 m) while maintaining a minimum water depth between the submerged ground bottom and mean low tide of not less than 2 feet (0.6 m).

4.3.2 Dimensions.

The inside dimensions of the slipway should be 2 to 3 feet (0.6 to 1 m) wider than the seaplane's floats and 3 to 4 feet (1 to 1.2 m) longer than the rudder-down float length.

4.3.3 Features.

Some owners of a slipway install a gate to reduce wave action. Regardless of the degree of wave action, some form of fenders, made of materials such as expanded polystyrene, used steel or Kevlar belted automobile tires, cut strips of tires, etc., should be attached to inside of the front wall, side walls, and, if provided, the gate to prevent damage to the seaplane's floats. Used aircraft tires are not an acceptable fender method as the soft, unreinforced tire sidewalls can result in the bolts pulling through the sidewall of the aircraft tire and loss of the fender from the dock. Additionally, it is advisable that the slipway have some means to secure the seaplane while in the slipway, for example cleats or tie downs.

4.4 Docks.

The term "dock" is often used as a catch-all term for any structure that can be used to secure watercraft (including floatplanes) to a fixed facility, either the shoreline or a structure affixed to the seabed/lakebed. These structures could be a dock, pier, wharf, or float. For purposes of this AC, the below descriptions are used for each of the structures. In the event these definitions conflict with other standards, those standards hold precedent outside of this AC.

4.4.1 Dock.

A dock is a floating surface connected to land by some means, typically a ramp. It rises and falls with the water level. It remains in a relatively fixed position either tied to a shoreline or to the water bed.

4.4.2 Pier.

A pier is fixed to the shore and maintains a constant elevation. Water level rises and falls relative to a pier. A pier does not rise or lower with water level. A pier typically has water access on all sides, although one side or another may be preferred dependent on local conditions. A pier may be low enough for safe seaplane access during portions of the year.

4.4.3 Float.

1. A float is a floating surface not permanently affixed to the land by any means. A seaplane docked at a float requires passengers and goods to be ferried to and from the land by some means. A float may be permanent or used seasonally and affixed to another structure such as a barge, pier or wharf. A float may be called a floating dock.
2. A float is a buoyant material or contrivance used to keep a floating dock or a float (definition a) buoyant remaining above the surface of the water. Examples include: styrofoam blocks, empty barrel, logs, or inflated bladders.

4.4.4 Barge.

A barge is similar to a float however typically larger. A barge is typically used in industrial situations and made of steel. A barge generally rises from the water several feet and precludes normal docking by a seaplane.

4.4.5 Wharf.

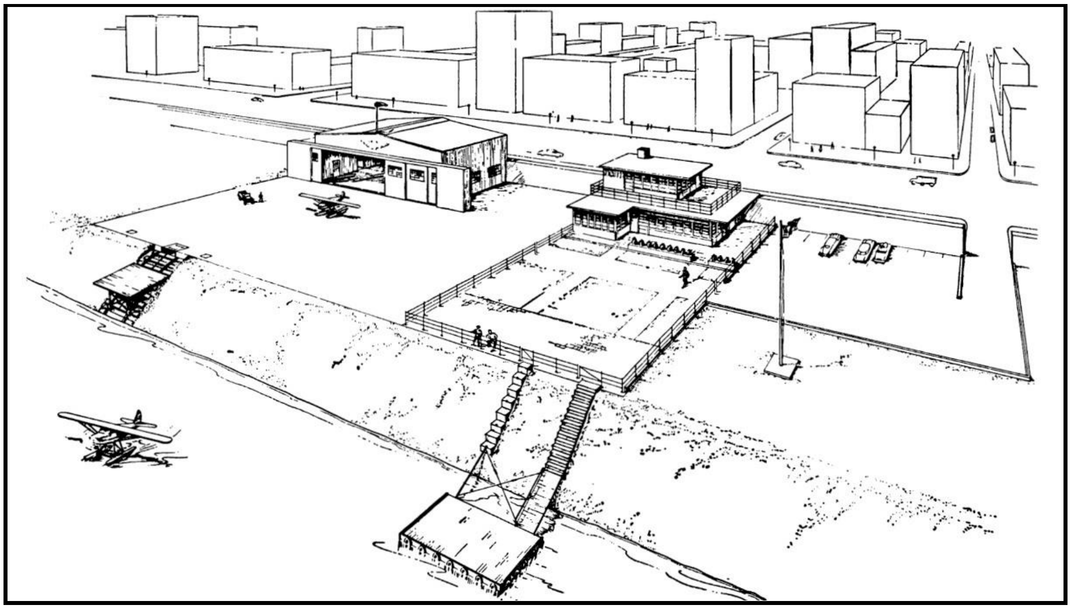
A wharf, like a pier is affixed to the shoreline and does not rise or fall with the water. A wharf is typically used in a harbor or industrial situation for large boats and ships. A seaplane typically cannot dock next to a wharf but may be able to dock straight in or to an attached float.

4.4.6 Docking Systems.

A docking system, whether fixed (Figure 4-7) or floating (Figure 4-8), should be specifically designed to accommodate seaplanes at a seaplane base. Siting considerations should include minimizing potential conflicts between boats and seaplanes as well as specific requirements for seaplanes, as identified in this AC. Thoughtful docking system design should consider wing clearance, wingtip-to-wingtip clearance, and post and cleat spacing to avoid damage to aircraft fuselages and aircraft floats and to facilitate safe and efficient personnel and passenger access.

Figure 4-7. Example of Alaskan Fixed Dock With Parking Ramps

Figure 4-8. Illustration of a Floating Dock and Marine Railway



While some boat docks can be modified to accommodate seaplane access, the better solution is to specifically design a dock to accommodate seaplane access. When the seaplane base owner or sponsor is considering rehabilitation or reconstruction of an existing dock system the guidelines in this AC will prove helpful.

In locations with high tidal flux, fixed over-water structures, such as a pier or wharf, may be used if the variation in water level is 16 inches (45 cm) or less. A pier should extend into the water to a point where the water depth is adequate for the types of seaplanes being used, usually when the depth at mean low water level is at least 4 feet (1 m). See Figure 4-9.

Figure 4-9. Example of a Small Pier with Securing Cleats

If the seaplane facility is required to serve the public, then requirements contained in the Americans with Disabilities Act (ADA) accessibility guidelines may need to be considered. Discussion of ADA requirement is out of the scope of this document.

4.4.7 Gangways.

Floating docks are commonly connected to the shore by a gangway offering flexibility in providing docking facilities shown in Figure 4-10. This type of facility rises and falls with wave actions, tides and seasonal variations in water-level.

Figure 4-10. Example of a Gangway in Alaska

To permit movement, flexible interconnect systems should be used for attaching floats together or for attaching gangways. Typically hinge systems are used. Hinge systems may have removable pins to enable gangways to be disconnected for maintenance or reconfiguration, if needed. In the case of gangways affixed to the shore or to a fixed structure such as a pier or a wharf, the dockward end will often have wheels or skids and a skid-plate facilitating lateral movement as the floating structure rises and falls.

A hinge allows the dock to move laterally with water level changes precluding fixed mooring posts on the dock whereas wheels or skids will require clearance, while maintaining protection of people and objects from the wings and propellers, for the ramp to move laterally along the surface of the dock surface.

Gangway width should take into account intended usage and be wide enough to accommodate anticipated personnel or equipment and goods. Often dock carts or All-Terrain Vehicles (ATVs), and other vehicles in some locations, are used to move cargo from shore to dock and the gangway strength, width and slope must accommodate their safe use.

The length of the access platform is determined by the maximum variation in the water-level. A slope ratio of 2.75:1 is the maximum for safe and easy walking and to prevent the handrails from becoming an obstruction to wings. Common practice is for gangways to be at least 15 feet in length and at least 5 feet in width. Hand rails, preferably on both sides of the gangway, should be provided to assist persons using the gangway. Floats having a gangway that is less than 5 feet (1.5 m) in width should have longitudinally spaced outriggers every 8 to 10 feet (2.5 to 3 m) to prevent excessive rolling of the walking surface.

4.4.8 Interconnected Dock Sections.

Dock sections are often interconnected. It is recommended that hinged systems be used with quick release hinge pins to facilitate reconfiguration, seasonal removal of sections, or removal for maintenance. A metal or rubber tread plate may be laid over the interconnect section to enhance safety when personnel are crossing from section to section.

4.4.9 Location.

For all dock systems, an unobstructed water operating area or a turning basin should be available in the direction from which approaches are normally made to the dock system. The turning basis should be of sufficient size for the seaplanes to be used to make complete 360 degree turns. A minimum of 200 feet (30 m) diameter is recommended.

Dock systems should be located so that access to them by the public will not require the public to cross ramp, or the land-side apron or hangar area. Fixed docks should be located so that seaplanes have access to two sides. Such placement allows seaplanes to be secured on the shore side of the fixed dock during inclement weather, i.e., the fixed dock functions as a breakwater. If the facility is to adequately serve the public, requirements contained in the Americans with Disabilities Act (ADA) accessibility guidelines should be satisfied.

The designer of dock system for seaplanes should consider wave action when selecting a location for the dock. When the seaplane is moored at the dock, ensure that wave action on the aircraft floats is perpendicular to the aircraft floats if possible. Wave action cresting over the aircraft floats can damage floats or result in the aircraft floats filling with water and sinking of the seaplane. A dock section parallel to the shoreline allowing seaplanes sufficient space to dock on the shore side provides an effective barrier to the detrimental action of waves and swells.

4.4.10 Design Concepts.

Dock dimensions are determined by the number of seaplanes simultaneously using or projected to use the dock. In determining the number of berths alongside the dock, use the length of design craft length plus 20 feet (6 m) to offer clearance both fore and aft. A dock should be wide enough to allow seaplanes to dock on opposite sides with at least a 10-foot (3 m) wingtip-to-wingtip clearance.

4.4.11 Obstruction-Free Docks.

Because obstructions on docks such as gangways, handrails, benches, electrical boxes, water faucets, storage lockers and other items mounted on the dock can damage wing and tails on seaplanes, the dock surface should be free of all objects to permit the wings and tails to easily pass over the dock without causing damage to the aircraft.. For example, an unobstructed dock surface of 21 feet (6.5 m) from the pier’s edge will provide the wing clearance for most seaplanes or small amphibian airplanes to come along safely and tie down.

4.4.12 Height of Docks Above the Water, Tie Down Methods and Dock Fender Systems.

4.4.12.1 **Deck Surface Height.**

Often times boat dock designs are used for seaplane docks which result in docks that are too high off the water. The height of the dock above the level of the water should be 12 to 18 inches but can be more if the facility is limited to larger planes. If the seaplane dock’s deck is too high off the water, damage can occur to wings struts, ventral fins, or tail surfaces on seaplanes. It can also make loading the seaplane with passengers and goods difficult. In the case where a surface must be high, such as a pier, wharf, or barge, seaplanes will be required to dock straight in and a robust fender system is recommended if possible.

When calculating the buoyancy of the dock, remember to include the weight of the dock fender system as tires add significant weight to the dock.

4.4.12.2 **Cleats, Bull Rails and Tiedowns.**

Cleats are the recommended tiedown solution for aircraft parked at the dock. Cleats should accommodate a 1” thick tiedown rope and installed 6 feet to 10 feet apart on the dock surface to secure seaplanes. Cleats should be close enough such that a solo pilot exiting a moving plane can catch a nearby cleat in a timely manner and stop forward motion and prevent damage to the plane or another plane in front. Cleats should be through bolted such that they will not pull free. Cleat through bolts should extend beyond just decking planking material into the superstructure to ensure they will not pull free or damage the dock with use.

Flush mount pop-up cleats reduce tripping hazards but should not be used exclusively but may be used in an alternating manner if desired. Pop up cleats do not allow for quick tie-down.

Occasionally bollards or rings will be used as tie-downs. Rings do not afford for quick tie down and bollards can be a tripping hazard or damage airplane surfaces if too tall.

To mitigate tripping and damage hazards associated with cleats or bollards or any protruding structure, consider painting bright yellow or painting a yellow and black safety circle around them.

Bull rails are often seen on docks and implemented as a low-cost alternative to cleats, but they are not the ideal application for seaplanes. Other than low cost, bull rails afford little advantage over cleats and should be avoided if possible. Bull rails are a tripping hazard and do not allow for rapid tie-down when a pilot is exiting a moving plane. Additionally, ropes attached to bull rails are difficult to attach and may slide laterally allowing the plane to move forward or aft into structure or other planes.

4.4.12.3 **Fender Systems.**

A fender system is a key feature of a well-designed dock system. As mentioned previously, aircraft fuselages and aircraft floats are extremely fragile and are often damaged by docks with inadequate fender systems. Fenders should be installed along the sides of the dock structure extending below the edge of the deck on all portions of the dock that are expected to accommodate seaplanes.

The optimum fender system is comprised of used steel or Kevlar belted tires that are of a uniform tire size (Figure 4-11). Fender systems used for commercial and recreational boat docks are not appropriate for seaplane docks as these materials do not allow for the proper "give" necessary for cushioning seaplane hulls and aircraft floats. Allowing for the proper give in a fender system on a seaplane dock is critical when the seaplane pilot is taxing to the dock with too much speed. Unlike boats with thick hulls and reverse gears, seaplanes are fragile and except for aircraft with a reversible propeller, are not as controllable when approaching the dock.

The sides of docks should extend well below the water line to prevent seaplane floats from going underneath them and becoming damaged or stuck. Extending the sides of the dock below the water line also provides a backing to support the fender system. The use of plastic lumber in applications where this material is in consistent contact with the water has shown to be a low maintenance and durable application for the support of the fender system.

Tires should be mounted adjacent to each other along with side of the dock with little or no spacing between the tires so that the tires act as a uniform fender system without gaps. The uniformed sized automobile tires should be lag bolted through the steel or Kevlar belted sidewall of the tire with at least two bolts. Used law enforcement car tires can be a source of uniform tire size because they are typically purchase in bulk orders.

Used aircraft tires are not an acceptable fender method as the soft, unreinforced tire sidewalls can result in the lag bolts pulling through the sidewall of the aircraft tire and loss of the fender from the dock.

Figure 4-11. Seaplane Dock with Fender System

4.4.13 Flotation Materials.

4.4.13.1 **Buoyancy Systems.**

A variety of materials have been used to provide buoyancy for floats, e.g., logs, milled timber, polystyrene billets, fiberglass, and steel drum containers.

When calculating the buoyancy of the dock, remember to include the weight of the dock fender system and any expected transient items such as cargo, personnel, passengers, and affixed structures. Also, account for seasonal variations caused by ice or snow accumulation. In some areas, large sea mammals may become a weight problem. While they should be discouraged from using the dock, the dock also should be sized to handle their weight.

Buoyant floats typically are plastic or metal barrels, styrofoam blocks, logs, or purpose-built bladder systems.

Buoyant styrofoam floats should be encased in wire mesh to disallow mammals such as beavers or muskrats from burrowing and destroying them. Fifty gallon barrels are often used as floats and allow a dock surface to be raised or lowered by adjusting the water level in them.

Buoyant floats will require maintenance and replacement and a dock system should be designed to facilitate their removal and installation.

Polystyrene billets have proven to be satisfactory buoyancy devices for floats. The planks should be evenly distributed, rather than piled at concentrated points, under the superstructure. A barrier of 6 mil (0.15 mm) black polyethylene sheeting should be placed between all treated timber and flotation material contact surfaces. The load supporting characteristics of polystyrene or styrofoam is approximately 50 pounds per cubic foot (800 kilograms per cubic meter) of material. A common billet size is 10 inches by 20 inches (25 by 50 cm) by 9 feet (3 m). Further data on this material may be obtained from the manufacturers. It is recommended that foam planks be enclosed with woven galvanized wire to prevent damage from aquatic animals and sea gulls. Polystyrene deteriorates when exposed to petroleum products, gas spills, etc.

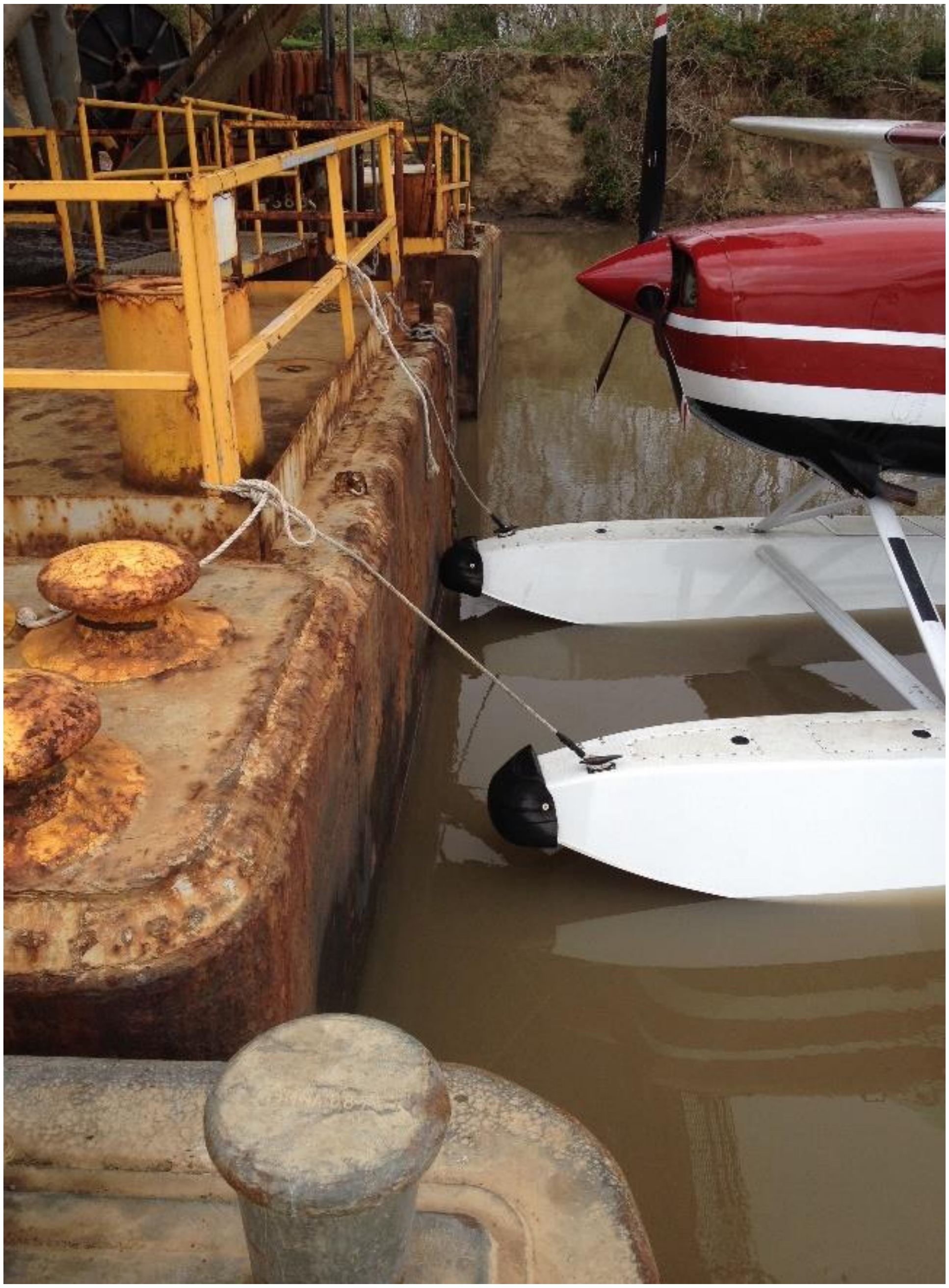
4.4.14 Dock Interconnect Ramps.

Floats connected to a master dock are sometimes equipped with ramps at one or both ends. This type of float is usually constructed at right angles to the master float. A 144 by 40-foot (44 by 12 m) deck, with 10-foot (3 m) wide floats, and 15-foot (4.5 m) ramps on both sides can be used for seaplane storage. Additional docks or floats can be added as needed. Also, a long, narrow float with ramps on both sides is adequate for mooring or tying down light, single-engine floatplanes.

4.5 Floating Barges.

A barge can be used for seaplane docking (Figure 4-12), when a shoreline facility is not practicable or possible. Barges are more typically seen in industrial operations. Less so in commercial transportation or for recreational use. To increase this option’s serviceability, a barge can be fitted with a floating dock for tying seaplanes and/or a ramp. Larger barges occasionally have a working facilities on board and may include seaplane specific services. A barge may be anchored directly to the shore or to a pier that provides booms and a gangway or anchored offshore in a fixed position that provide some means for the public to reach the facility. Typically, a barges sides rise well above the waterline and a seaplane must dock straight in requiring a ladder for access to the working surface.

Figure 4-12. Docking to a Barge, Image courtesy Southern Seaplanes



4.6 Operating Space Between Shoreline Facilities.

The desired clearances between the various docking and pier units, barges, and ramps has a decided influence on their arrangement and location. Each of these units should be so located such that a seaplane may approach and tie up in anyone of the available berths when adjacent units are occupied.

When seaplanes are operated between such units under their own power, the recommended minimum separation between the designated edge of the turning basin and the near faces of adjacent units (fixed docks, piers, floats, ramps, or barges) is 50 feet because a water-borne aircraft can normally be taxied safely past obstructions as close as about one half of its wingspan.

Where seaplanes are moved by hand between adjacent units, the separation between the designated edge of the turning basin and these adjacent units may be less than 50 feet to facilitate the handling process.

CHAPTER 5. ON-SHORE FACILITIES

5.1 Introduction.

Designers of a public-use seaplane base are recommended to conducts the following assessments before considering the installations of on-shore facilities. The addition of shoreline facilities range from simple aprons with tiedowns and public parking to moderate facilities that may include fueling, hangar, service repair shop, and a public building, to a seaplane base with various capital improvements as illustrated in Figure 5-1.

5.1.1 User Needs.

The needs of the seaplane users will determine if and what types of on-shore facilities are necessary at a public seaplane base. Public on-shore facilities commonly range from a service apron with storage/tiedown areas, marine fueling, basic public facilities (rest rooms/chemical toilets, public parking), and possibly a marine store, hangar, building serving the public common area and/or an administrative building.

5.1.2 Shoreline Conditions.

The most desirable locations have a moderately sloping shoreline and a shoreline water depth suitable to permit both water and land operations as close to the shoreline as possible. Sites with excessive fluctuations in water levels are not as desirable since this condition usually requires more expensive shoreline installations or may even prohibit water taxiing operations during low tide. Also, sites with steep shoreline topography may cause a ramp to be unsuitable; thereby it becomes necessary for hoisting equipment or a marine railway to hoists seaplanes from the water onto a land apron.

5.1.3 Landside Conditions.

Any landside assessment should include at least three investigations. First: the availability of utilities such as internet access, video camera (connected to the internet), electricity, water, telephone/cell phone coverage, and sewage. Seaplane bases may not require all utilities. These services should be tailored for individual SPB and are often a function of activity level, costs, and feasibility of these services. In remote rural areas, established water lines and sewerage facilities will likely be out of the question. If such is the case, well water and chemical toilet units are feasible. Check with the state or local sanitary codes when considering the installation of water and sanitary facilities. Second: availability for road access to the nearest community. Third: adequate ground space for the total space requirements of identified installations. No site for an on-shore development should be given serious consideration until utilities are accessed and it is known that adequate ground space exists for all the decided installations. Lastly, for public safety and convenience, certain landside installations – administrative building, public areas, parking, marine store – should be separated from airside facilities – apron, tie-down, hangars, and other incidental activity areas – either by a buffer zone or by fencing.

5.2 **Service Apron, Storage/Tie Down Area.**

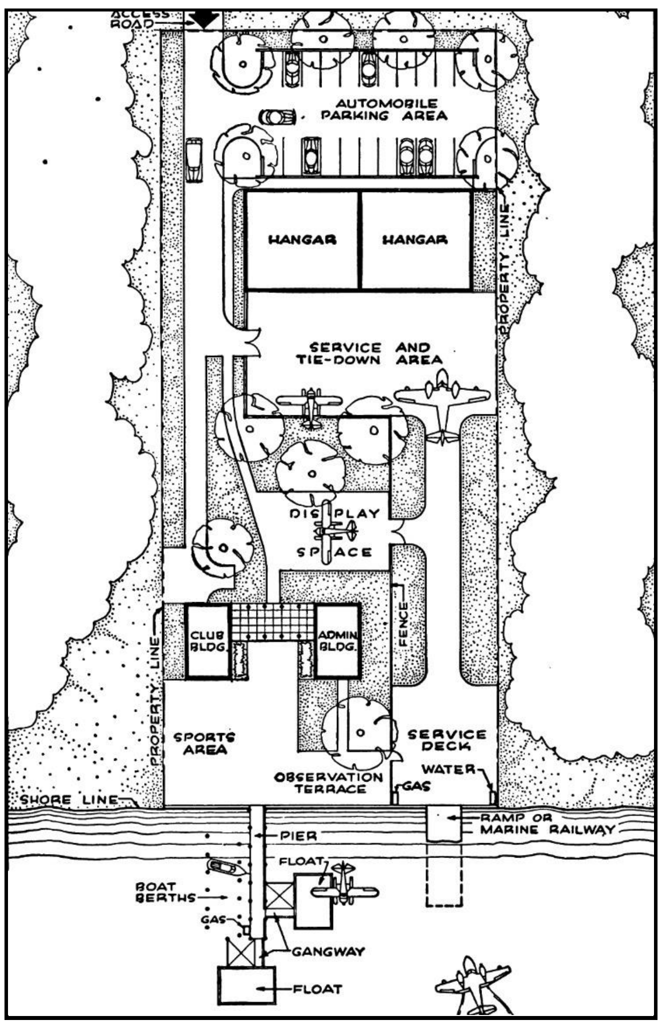
These features will occupy more space than any other on-shore installations.

Transportation of invasive species - With the possibility of seaplanes transporting invasive species between the various water bodies around the nation, consideration should be given to posting reminder signs in the apron or tie down area to remind pilots to check for invasive species that might be attached to their aircraft.

5.2.1 Location.

The desirable location is near ramps or where hoisted seaplanes onto the land have a short, direct route to the service apron and tiedown areas with minimum taxing conflicts with other seaplane movements. For safety and convenience of the public, they should be separated from other incidental activities on the site, either by adequate buffer space, fencing, or both. For example, every effort should be made to locate ramps, floating docks and piers so that access to them by the public will not require crossing the service apron, tie down areas, or hangar area.

Figure 5-1. Illustration of a Seaplane Base with Various Capital Improvements



5.2.2 Size.

The amount of spaced required for a service apron and a tiedown/storage area will depend upon the number and types of aircraft that are to be accommodated. In determining the overall space requirement, it is recommended to also include a conservative estimate for itinerant parking-loading or tiedown positions.

5.3 Hangars.

Many standard types of hangars used for land-based aircraft are adaptable for use by waterborne aircraft.

5.3.1 Location.

Hangars should be located in a functional and orderly manner. That is, determine how seaplanes using ramps or being hoisted onto the land can have a direct route to the hangar without interfering tiedown areas, any common public areas, and eliminate as much as possible taxing conflicts with other seaplane movements. The objective is to avoid relocation of parked seaplanes. Both storage and repair hangars should likewise be located so that delivery of materials and access by service personnel will not conflict with seaplane movements.

5.3.2 Size.

The space required for service hangars will depend upon the number and the type of aircraft that are to be accommodated. Sufficient additional space needs to be provided for taxiing, turning, and temporarily parking of seaplanes.

5.4 Aviation Fuel Service.

Where aviation fuel is provided at a public seaplane base, care must be taken to ensure that the storage and delivery systems are safe and that precautions are taken to minimize the possibility of spills and the resulting adverse environmental effects of a fuel spillage. Tank construction and piping must conform to the U.S. Environmental Protection Agency, state, and local regulations plus applicable fire safety requirements. The capacity of this installation should account for the number of seaplanes (tenant and itinerant users) likely to require fuel and the convenient frequency of resupplying it.

5.4.1 Precautions.

The following precautions should be taken to minimize the entry of water into storage tanks through improperly closed or leaking openings.

5.4.1.1 All tank openings subject to frequent opening and closing should terminate above ground, using recommended pipe extensions or spools.

5.4.1.2 Flush-type tank openings in paved areas should be kept water tight. Inspection and maintenance manholes that are subject to frequent opening should have flanged spool covers.

5.4.2 Dike.

Above ground tanks are recommended to be surrounded by a dike designed to applicable regulations. If none exists, the dike needs to retain the full tank capacity of a single tank, or the capacity of the largest, plus 10 percent of the total capacity of the remaining tanks where more than one tank is installed. The dike should be constructed of impervious non-organic soil with a plastic, liquid tight membrane. A drainage system, provided within the dike, should be designed to remove surface water and to discharge it into a drainage system capable of disposing of the fuel and water mixture in a safe manner. Drains should normally be closed.

5.4.3 Fuel Dispensing System.

A fuel dispensing system usually consists of a pump, motor, strainer, meter, hose reel, hose, nozzle, automatic and manual control switches, and three-point, static discharge, electrical grounding equipment, all located above ground. The grounding and bonding system should provide electrical continuity between all metallic or conductive components; should have both ground and bonding wires, and clamps adequate to facilitate prompt, definite electrical ground connection between hose nozzle/pit/cabinet, and seaplanes being fueled. A pit or cabinet should be permanently, electrically grounded. The hose reel, from an environmental and safety point of view, is an important element of this system. Ideally, an electrically operated rewind wheel should be provided to discourage the practice of "stringing out" the hose along the dock. A 5-gallon (19 l) drip pan located below the rewind reel will collect residual fuel discharge from the nozzle. Federal, state, and local codes provide additional installation requirements. AC 150/5230-4, *Aircraft Fuel Storage, Handling, Training, and Dispensing on Airports,* and applicable National Fire Protection Association (NFPA) standards also provide useful information.

5.5 Hoisting Equipment.

Types of hoisting equipment and their use vary with the operating needs of the individual site. They are frequently needed where a public use seaplane base is developed along a high seawall, bulkhead, or steep shoreline. Private-use hoisting equipment are in use as shown in Figure 5-2.

Figure 5-2. Example of a Private Hoisting Platform

5.5.1 General Types.

Many types of cranes or derricks can be constructed from suitable local materials, or prefabricated steel units can be obtained from manufacturers. Heavy duty hoisting devices are usually powered by gasoline or electric motors; however, a geared hand winch is adequate to lift most light weight seaplanes. Other types of hoisting equipment used at such facilities include a jib crane, pillar crane, or guyed derrick.

5.5.2 Lift Capacity.

Hoisting equipment should be capable of lifting a gross load of three times the maximum weight of the seaplanes to be handled. Cable and band type slings will be necessary to lift seaplanes that are not equipped with hoisting eyes. Detailed information on the capacity, design, and installation of hoisting equipment may be obtained from manufacturers and engineering reference manuals.

5.6 Marine Railways.

Where the shore is steep, an adaptable and desirable method to remove seaplanes from the water is a marine railway as illustrated by Figure 4-8. The railway consists of a pair of light weight rails placed on a suitable structure that slopes into the water having a flanged-wheel platform that rides the rails. A suitable power unit must be provided to raise the platform from the water to the land. The platform will return by gravity if the rails slope is 8:1 or steeper. When the incline is less than 8:1, a reversible power winch rigged with an endless cable will return the platform to the water level. Emphasis is placed to use corrosive resistant materials as possible. Because marine railways are the transition point from water to land, the site should offer a minimum width of 100 feet (30 m) of unobstructed water operating area (a turning basin) directly offshore from the rail platform in the direction from which approaches are normally made.

5.6.1 Marine Rail Supports and Foundation.

The most economical type of support for the rails consists of a continuous line of timber stringers directly parallel and under the rails which in turn are supported by transverse ties. In terms of a foundation, pile bents are used for water areas and at points on the shore where the soil will not support other types of foundations. If the soil at the shore end (rail head) of the marine rail is stable and subject to erosion, then either concrete piers or wooden sleepers may be used and at considerably less cost than pile bents.

5.6.2 Platform and Depth of Toe.

In all cases where a marine railway is used, the platform needs to extend far enough below the water to permit seaplanes to water taxi onto the platform with ease. The depth for the toe of the platform should be the same as that used for ramps usually some 4 feet. In all cases, depth dimension should be established at the low mean water level datum established for the locality. Iron or steel is usually used in fabricating the platform to provide sufficient weight to submerge the platform and keep the platform wheels from jumping the rails. The platform should be decked in the same manner used for ramps. A turntable installed on the platform is one convenient method of turning seaplanes to the desired direction of travel. A platform 20 feet (6 m) wide, 20 to 30 feet (6 to 9 m) long, and inclined at a slope of 8:1 will accommodate most seaplanes.

5.6.3 Catwalk.

For greater ease of operation, a catwalk can be placed adjacent to the side of the travelling platform or between the rails. Such an arrangement allows the public using this installation to reach the platform regardless of its location along the incline.

5.7 Administration Building and Common Public Use Area.

5.7.1 Multi-use Concept.

At small, simply seaplane bases, a hangar can be used for both seaplane services and for an office. At larger seaplane bases a separate administration building may be required to provide adequate space for the manager’s office, passenger and pilot’s lounge, display space, restaurant, snack bar, and observation deck. It is desirable to employ an uncomplicated, functional design that can adequately respond to the administrative needs of the facility.

5.7.2 Location.

The location should be in a prominent position on the site, readily accessible to seaplane arrivals as well as to customers and visitors from arriving from the surrounding community. Visibility of the water area from the administration building is another desirable feature. This condition is especially true when visibility of the water operating area from the administration building may be required for the control of seaplanes at locations where traffic in and out requires two-way radio communications.

5.7.3 Outdoor Space.

It is desirable to reserve an outdoor space immediately adjacent to the administration building for public use and for recreational type purposes. This outdoor space may consist of a small lawn or paved terrace, preferably overlooking the shoreline and suitable for informal gatherings, outdoor picking tables. Any common public use area should be physically separated from the aeronautical activity area and/or areas used for fueling or storage of flammable materials.

5.8 Parking Areas.

Functionally, the parking area should be located for safe, convenient access to the various onshore and shoreline facilities. Hence, a parking area for cars, including handicapped spaces, and other transports must be made. One rule of thumb is to allow one car space for each based seaplane, one car space for each employee, plus a ratio of visitors' cars commensurate with the judgment of local interest in the use of this public facility. Refer to the local building code to determine the area required for each car. The type of parking space lay-out will depend upon the space requirement and shape of the area available for the installation. It is highly recommended that any parking area not be located so that pedestrians must cross a public road to reach the facility proper. This creates an unnecessary hazard, particularly to unescorted children who might dash across the public highway. It is desirable that pedestrians not be required to walk a distance greater than 200 feet from the parking area or service road to reach facility buildings or the shoreline. All walks should be laid out for direct access to and from the facilities to be reached.

5.9 Road Access.

Vehicular circulation must be provided for the public, service personnel, deliveries of gasoline, oil, fuel, and for refuse removal. These routes will influence walks and the interior road access. It is desirable that the interior road access to the seaplane base (administration building and public areas) be by an all-weather road. It is recommended that the seaplane base layout plan reflect the access road connection to a main highway or street.

5.9.1 Roadway Planning.

The access or entrance road should have adequate width, serve the anticipated traffic, and permit safe and easy circulation throughout the landside of the facility.

5.9.2 Service Roadways.

A public highway should never be part of the interior road system of a seaplane base. Vehicular through vehicles, deliveries of gasoline, oil, fuel, and refuse removal, a limited-use access service roadway is needed. These limited use access roadways should be marked and controlled by devices such as removable posts or chains located at the entrance to the areas of aeronautical activity. Also, they serve to permit authorized access and provide circulation routes for emergencies.

CHAPTER 6. SEAPLANE BASE IDENTIFICATION

6.1 Seaplane Base Identification.

Seaplane base identification and lighting for the water operating area and shoreline should be provided for night operations.

6.2 Lighting Within the Water Operating Area.

A simple and inexpensive lightning method for a sea lane, taxi channel, etc., is to install a sequence of portable, battery-operated lights on top of buoys or other appropriate floatation devices. FAA-H-8083-23 informs seaplane pilots that a night water landing should generally be considered only in an emergency. They can be extremely dangerous due to the difficulty of seeing objects in the water, judging surface conditions, and avoiding large waves or swell. See AC 91-69 for preflight briefings, passenger floating devices, and other Federal requirements.

6.3 Rotating Beacon.

It is recommended that the familiar rotating beacon for land airports be used to identify the seaplane landing area during periods of reduced visibility. The emitted light is alternate white and yellow for water landing areas. A double white flash alternating with yellow identifies a military seaplane base. In water areas with congested water traffic, a radio activated strobe beacon may be used to alert mariners and other pilots that a seaplane will be arriving or departing within a short time. See AC 150/5345-12, *Specification for Airport and Heliport Beacons,* for seaplane base beacon requirements.

6.4 Wind Cones.

As previously described and per FAA-H-8083-23, knowledge of the existing wind conditions for the water operating area is important to seaplane pilots. Hence, it is recommended that seaplane bases have a wind cone along or on the shore. See latest edition of AC 150/5345-27, *Specification for Wind Cone Assemblies*, for seaplane base wind cone requirements.

6.5 Shoreline Floodlights.

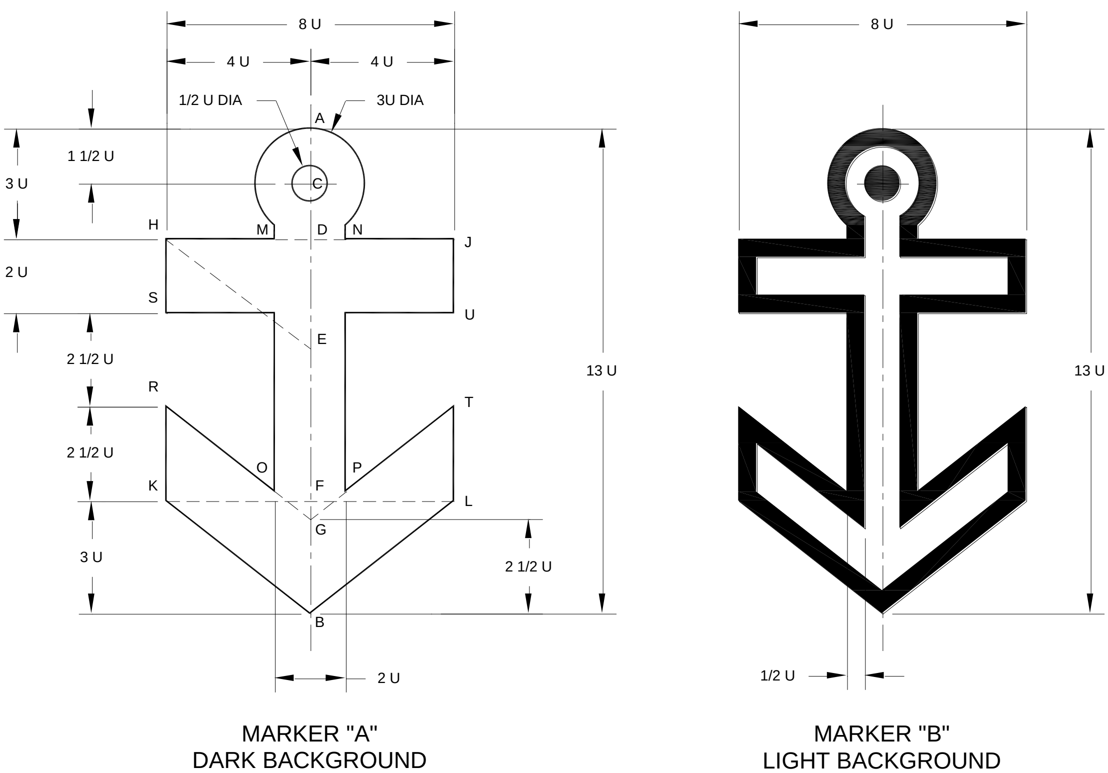
Floodlights or spotlights may be installed on the shore to illuminate aprons, floats, ramps, and piers or other installations deemed necessary. Care must be taken in locating and aiming floodlights to preclude affecting the vision of pilot’s landing, taking off, water taxiing, or creating distracting reflections.

6.6 **Seaplane Base Marking.**

6.6.1 Standard Air Marker.

The anchor symbol as shown in Figure 6-1, similar to the designator found on aeronautical charts, is the standard air marker used to designate a seaplane base. Alternatively, numerals and/or other symbols may be used for such identification. The symbol is often painted on roofs or other flat surfaces that are easily visible from the air. Markings should be uncomplicated and easily maintained.

Figure 6-1. Seaplane Base Air Marker Proportions



Note: Outside dimensions of markers are identical. Black border of marker "B" is 0.5 unit wide. One unit is 1/13 of the overall length.

6.6.2 Color Requirements.

The seaplane base marker shown in Figure 6-1 is Aviation Yellow, No. 13538, and the border, when used to increase conspicuity by providing contrast with the background, e.g., a light-colored concrete surface, is Aviation Black, Lusterless, No. 37038, as defined in Federal Color Standard No. 595.

6.6.3 Dimensions.

The recommended minimum overall dimensions for the seaplane base marker are 13 feet (4 m) in length by 8 feet (2.5 m) in width. The width of a black border, if used, is included within the overall recommended dimensions. Table 6-1 provides dimensional examples for proportionally larger markers over 13 feet (4 m) in length.

Table 6-1. Proportioned Seaplane Base Marker (With or Without a Black Border)

Length Feet (meters)	Width Feet (meters)	Scale Multiplier Baselines = 13 feet (4 m) and 8.0 feet (2.5 m)
13.00 (4)	8.0 (2.5)	1.0
16.25 (5)	10.0 (3.0)	1.25
19.50 (6)	12.0 (3.5)	1.50
22.75 (7)	14.0 (4.0)	1.75
26.00 (8)	16.0 (5.0)	2.00
32.50 (10)	20.0 (6.0)	2.50
39.00 (12)	24.0 (7.5)	3.00

6.6.4 Procedure to Sketch a Seaplane Base Marker.

1. Establish center line AB, 13 units long.
2. Establish points C, D, I, N along AB.
3. Erect perpendiculars to AB: DF, DL, IG, IK.
4. Connect points FG and KL.
5. Establish lines NP, NS, BQ, BR.
6. Connect points PQ and RS.
7. Establish points E, M, H, J, 0, T.
8. Connect points HO and JT.
9. Scribe 1.5 unit radius circle about point C.
10. Extend perpendiculars from points E and M to intersect with 1.5 unit circle.
11. Scribe 0.5 unit radius circle about point C.

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CHAPTER 7. CONSTRUCTION CONSIDERATIONS

7.1 Introduction.

Because of the variety of structures that have been used satisfactorily in various regions of the country, this section emphasizes general design considerations instead of specific plans and details. By following these recommendations, structures can be constructed that are tailored to individual need, finances, and local conditions.

7.2 Preservation of Facilities.

7.2.1 Marine Borers.

If marine structures are to give long service, it is imperative that timbers be protected from attacks by various insects, fungi, and marine borers. The termite, which is the most common, inhabits many parts of the United States and Canada. It frequently enters the wood at or near the ground line. Fungi may develop any time there is a proper amount of air, warmth, food, and moisture. The discharge of various waste materials into bodies of water is conducive to the growth of wood-destroying fungi. The prevalence of marine borers is worldwide, and although they are usually found in salt or brackish waters, slight infestation may be found in rivers above the point of brackishness. No corrosive materials or untreated timbers should be used, in salt water.

7.2.2 Preservatives.

Where permitted by Federal, State, local jurisdictions, some of the more generally used preservatives in marina construction are urethane, epoxy, and shellac as acceptable sealers for all creosote treated wood, and should be used to prevent tracking creosote. The most effective type of wood treatment is the pressure process which forces the preservative into the wood. This pressure process may be either the full-cell or empty-cell treatment, which differ in the amount of preservative retained in the wood.

7.2.3 Piling Protection.

In areas where Teredo and pholad attack are expected or known and where Limnoria tripunctata attack is not prevalent, creosote or creosote solution treatment will provide adequate protection. In areas where Teredo and Limnoria tripunctata attack is expected or known and where pholad is not prevalent, either dual treatment or high retention of ACZA or CCA treatment will provide adequate protection. In areas where Limnoria tripunctata and pholad attack is expected or known, dual treatment provides the maximum protection. Proponents are urged to consult with local experts, engineers, the American Wood Preservers Institute, and the National Timber Piling Council, Inc., prior to using any treated lumber or piling on a project.

7.2.4 Hinged Connections.

Special provisions must be made so that attachment booms and gangways can adjust to fluctuations in water level. One method is to install a fixed hinge at the shoreline in combination with another hinge on the float or runners for the gangway to slide on as the water level changes.

Appendix A. ARMY CORPS OF ENGINEERS PROGRAMS

The U.S. Army Corps of Engineers is charged with maintaining navigable waterways. This is accomplished by the U.S. Army Corps' permit program whose purpose is to avoid obstructions in navigable waters. The U.S. Army Corps' regulatory program concerns the integrity of navigation channels and the quality of the waters of the United States, including the territorial seas.

A.1 The proponent of a seaplane base located on navigable water should contact the Office of the District Engineer who has jurisdiction over the area where the seaplane activity will take place or where a structure will be built. This preliminary inquiry will save time in applying for a Department of the Army permit.

A.2 Pamphlet EP 1145-2-1, May 1985, U.S. Army Corps of Engineers, Regulatory Program, Applicant Information, provides basic and general information of a nontechnical nature designed to assist the proponent in applying for a Corps of Engineers' permit. Title 33 CFR parts 320 through 330, cites the U.S. Army Corps' permit program.

A.3 The following link may be used to locate the U.S. Army Corp of Engineer Division and Districts offices for regulatory information:

http://www.usace.army.mil/Missions/CivilWorks/RegulatoryProgramandPermits/RegulatoryContacts.aspx.

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Appendix B. U.S. COAST GUARD PROGRAMS

The U.S. Coast Guard is charged with marking navigable waterways. For the purpose of this AC, "aids to navigation" refers to nautical application rather than to the aeronautical connotation.

B.1 The proponent of a water operating area located on navigable waters should contact the Commander of the U.S. Coast Guard District which has jurisdiction over the area where the water operating area be developed.

B.2 If the proponent decides that markers are required, then these markers are classified as private aids to navigation. The rules, regulations, and procedures that pertain to private aids to navigation are set forth in Title 33 CFR Part 66.

B.3 The U.S. Coast Guard requires that the application show evidence of a permit having been issued by the Corps of Engineers prior to completing CG-2554 (item 6 of the form).

B.4 The following link may be used to locate the U.S. Coast Guard Districts offices: http://www.uscg.mil/top/units/.

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Appendix C. PARTIAL LIST OF AGENCIES WITH JURISDICTION

C.1 This table is taken from the Aeronautical Information Manual. It does not represent a comprehensive list of Federal, State, or Local agencies with jurisdiction over navigable bodies of water.

C.2 The seaplane base owner/operator holds responsibility for identifying all responsible agencies and ensuring proper coordination when establishing, or altering, their seaplane base.

Table C-1. Jurisdictions Controlling Navigable Bodies of Water

Authority to Consult for Use of a Body of Water		
Location	**Authority**	**Contact**
Wilderness Area	U.S. Department of Agriculture, Forest Service	Local forest ranger
National Forest	USDA Forest Service	Local forest ranger
National Park	U.S. Department of the Interior, National Park Service	Local forest ranger
Indian Reservation	USDI, Bureau of Indian Affairs	Local Bureau office
State Park	State government or state forestry or park service	Local state aviation office for further information
Canadian National and Provincial Parks	Supervised and restricted on an individual basis from province to province and by different departments of the Canadian government; consult Canadian Flight Information Manual and/or Water Aerodrome Supplement	Park Superintendent in an emergency

Source: Aeronautical Information Manual, TBL 7-5-1

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Advisory Circular Feedback

If you find an error in this AC, have recommendations for improving it, or have suggestions for new items/subjects to be added, you may let us know by (1) mailing this form to:

Federal Aviation Administration
Airport Engineering Division (AAS-100)
800 Independence Avenue SW
Washington, DC 20591

or (2) faxing it to the attention of Manager, Airport Engineering Division (AAS-100), (202) 267-8663.

Subject: AC 150/5395-1B Date: ____________________

Please check all appropriate line items:

☐ An error (procedural or typographical) has been noted in paragraph __________ on page _____________.

☐ Recommend paragraph ______________ on page ______________ be changed as follows:

____
____
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☐ In a future change to this AC, please cover the following subject:
(Briefly describe what you want added.)

____
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☐ Other comments:

____
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☐ I would like to discuss the above. Please contact me at (phone number, email address).

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Submitted by: ___________________________ Date: ____________________________

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