U.S. Department
of Transportation
Federal Aviation
Administration

Advisory Circular

Subject: Seaplane Bases

Date: 8/6/2013
Initiated by: AAS-100

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

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

2. 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.

3. Cancellation. This AC cancels AC 150/5395-1, Seaplane Bases, dated June 29, 1994.

4. Principal Changes. This revision includes the following changes:

a. Update definitions and guidance for filing notices to the FAA, U.S. Army Corps of Engineers, U.S. Coast Guard, and state, local jurisdictions, chapter 1.

b. Updated site selection guidance in chapter 2.

c. Restructured the advisory circular into guidance and recommendations for off-shore facilities, chapter 3, shoreline facilities, chapter 4, and on-shore facilities, chapter 5.

d. Clarified the basic components of a public-use seaplane base as suitable water operating area, which in turn, consists of approach/departure paths, designated sea lane, 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 (chapters 4 and 5).

e. Clarified that the advisory circular deals primarily with float planes as compared to flying boats and amphibian water craft.

f. Incorporated selected operational information from FAA-H-8083-23, Seaplane, Skiplanes, and Float/Ski Equipment Helicopter Operations Handbook that relates to the design of such facilities.

g. Revised table 2-1 to include additional sizes of seaplane bases.

h. Introduced a new paragraph numbering format.

Michael J. O'Donnell
Director of Airport Safety and Standards

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

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. It has provided a variety of services which has established it as a valuable means of air transportation. Seaplane landing sites, referred to by this advisory circular 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. Every community, whether large or small, needs access to the airways. Seaplanes serve the flying community like a marina serves boating enthusiasts. Those who engage in seaplane flying and related activities use a seaplane base as a center of business and pleasure. It provides an opportunity for charter and concession operators, the tourist industry, and other enterprises, as well as employment opportunities for commercial pilots, flight instructors, aircraft mechanics, and flight activity support staff. At some locations the seaplane base has provided access to water recreation areas while for some communities it helped to supplement major land airport facilities by utilizing close-in or downtown landing sites that were not possible with a ground airport. In other cases, nonscheduled or scheduled intrastate seaplane passenger-service routes have proven desirable where surface transportation by land or water vessel is tedious and time consuming. Figures 1-1 and 1-2 illustrate examples of seaplane bases for a public recreational area and a city’s waterfront.

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

1.1.2 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? It is the purpose of this advisory circular to answer questions such as these and to assist local communities or persons interested in solving aviation problems regarding seaplane bases.

1.1.3 Community Relationships

Although each community and each proposed site is different, a relationship does exist in which the operational use of seaplanes must be coordinated with other users and interested parties of the community.

1.1.4 Components of a Public-Use Seaplane Base

A basic public-use seaplane base, which is within a suitable water operating area, consists of approach/departure paths, designated sea lane, taxi channel(s), an anchorage area, and a shoreline ramp or pier. Depending on the necessary documentation, the seaplane base may include other shoreline facilities, such as, docks, to the more highly developed on-shore facilities, such as, an apron, service hangar, repair shop, and buildings for public use and administration (aviation purposes). Chapter 3 discusses the term "water operating area" in detail.

1.2 EXPLANATION OF TERMS

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

a. Anchorage Area. An area designed specifically for the parking of seaplanes. (Reference: Advisory Circular 150/5300-18B, General Guidance and Specifications for Submission of Aeronautical Surveys to NGS: Field Data Collection and Geographic Information System (GIS) Standards.)

b. 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.

c. 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.

d. 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 150/5300-18B.)

e. Gangway. A movable walkway where people board and disembark decks, piers, and barges.

f. 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.

g. 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.

h. Mooring Buoy. A buoy connected by chain or cable to a permanent unmovable anchor sunk deeply into the bottom of a body of water.

i. 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.

j. 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.

k. 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.

l. 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).

m. 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 and AC 150/5200-35A, Submitting the Airport Master Record in Order to Activate a New Airport.)

n. 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 150/5200-35A, Submitting the Airport Master Record in Order to Activate a New Airport.)

o. Seaplane. An airplane on floats (amphibious or non-amphibious) or a flying boat (water-only or amphibious) (Reference: AC 91-69A, Seaplane Safety for 14 CFR Part 91 Operators, Definitions). **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 descriptions 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.

p. Seaplane Base. A dedicated area of water used or intended to be used for the landing and takeoff of seaplanes, water taxiing, anchoring, ramp service, possibly with shoreline, and on-shore facilities.

q. Sea Lane. A defined path within a water operating area dedicated for the landing and takeoff run 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.

r. 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.

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

t. 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 given, 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, Seaplane Base Layout Plan (SBLP), for details. Filed Notice is submitted on

FAA Form 7480-1, 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:

a. Construct or otherwise establish a new airport or activate an airport.

b. Construct, realign, alter, or activate any runway, sea lane, or other aircraft landing or takeoff area.

c. Deactivate, discontinue using, or abandon an airport or any landing or takeoff area of an airport for a period of one year or more.

d. 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.

e. Change the status of an airport from private use to public use or from public use to private use.

f. Change any traffic pattern or traffic pattern altitude or direction.

g. 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 publically-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, available at http://www.faa.gov/forms/. 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 Results of your 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 FAA 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).

1.3.3.2 Expect an 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 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 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.

1.3.3.3 Receiving your Seaplane Base Location Identifier. The FAA or State airport inspector after inspecting the seaplane base will submit a revised 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 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.

1.3.3.4 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, Notice of Landing Area Proposal, available at http://www.faa.gov/forms/. 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 Results of your 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 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.

1.3.4.2 No On-site Inspection. When the 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 Form 5010-5. No on-site inspection will be conducted.

1.3.4.3 Receiving your 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.

1.3.4.4 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 made 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:

a. A determination as to whether an obstruction to air navigation has a substantial adverse effect upon the safe and efficient use of navigable airspace;

b. A change in an aeronautical procedure at a seaplane base with a marked water operating area;

c. A request for technical assistance in the design and development of a seaplane base with a marked water operating area;

d. A determination as to whether an object should be altered, removed, marked, or lighted;

e. 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;

f. A determination of an existing activity's electromagnetic effects upon a navigational aid or communications facility; or

g. A recommendation to the Federal Communications Commission concerning the erection or dismantling of an antenna.

1.6 SEAPLANE BASE LAYOUT PLAN (SBLP)

All seaplane base development financed with Federal funds must be in accordance with an FAA approved SBLP.

1.6.1 FAA-approved SBLP

An FAA approved SBLP is a determination considering all known obstructions to air navigation and all proposed construction whose exact location and dimensions are identified on the SBLP. Approval of a Federal agreement SBLP includes items shown on the plan, such as terminal buildings, NAVAIDs, lighting, fences, cargo facilities and maintenance or service areas. Structures in industrial area development, motels, storage hangars, and other non-aviation development inside the seaplane base boundary are also appropriate items for inclusion in the SBLP. The SBLP is similar to the ALP described in the latest edition of AC 150/5070-6, Airport Master Plans.

1.6.2 SBLP Approval

Approval of a SBLP does not constitute approval of structures unless so indicated on the SBLP.

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.

1.7.1 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.

1.8.1 Appendix B contains the application form and instructions for completing the application form as well as addresses of 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. Notice: U.S. Army Corps of Engineers permits are still required in addition to any state or local permits.

This page intentionally left blank.

CHAPTER 2. SITE SELECTION

2.1 INTRODUCTION

This advisory circular 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 advisory circular 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 as shown in figure 2-1. This advisory circular primarily deals only with the floatplanes (referred to as seaplanes) with some occasional reference to amphibian aircraft. The characteristics described below from FAA publication FAA-H-8083-23, Seaplane, Skiplane, and Float/Ski Equipment Helicopter Operations Handbook, are the more pertinent characteristics used in this advisory circular.

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. For the purpose of this advisory circular, 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 advisory circular 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, Seaplane, Skiplane, and Float/Ski Equipment Helicopter Operations Handbook).

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 advisory circular 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 advisory circular 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 Sea Lanes

As discussed in the following subparagraphs, seaplanes as compared to land airplanes must overcome different performance factors during air and water operations. For these reasons, Table 2-1 prescribes recommended sea lane lengths and widths, water depths, and approach slopes tied to varied usages. As shown by table 2-1, the minimum recommended sea lane dimensions are at least 2,500 feet (750 m) in length by 200 feet (60 m) in width. This size will accommodate a restricted sea lane width down to the minimum recommended width of 100 feet (30 m) by providing 200-foot (60 m) diameter turning basin at each end. Although a depth of 6 feet (1.8 m) is preferable, a minimum depth of 3 feet (1 m) is adequate for single-engine operations.

2.3.3.1 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.

Table 2-1. Recommended Sea Lane Dimensions, Water Depths, Approach Slopes in Feet (Meters)

Minimum length Notes 1, 2	**Minimum width**	**Minimum water depth Note3**	**Remarks**
2,500	200	3 Note 4	Minimum for limited float plane operations. Approaches should be 20:1 or flatter for a distance of at least 2 miles.
3,500	300	4 Note 4	Minimum for limited commercial operations. Approaches also used for departures should be 40:1 or flatter for a distance of at least 2 miles.
5,000	500	10	Minimum for extensive commercial operations. Approaches also used for departures should be 40:1 or flatter for a distance of at least 2 miles.
10,000	700	15	Generally unlimited. Approaches also used for departures should be 50:1 for a distance of 2 miles.

Notes:

(1) The lengths indicated in the table are for calm water, no wind, sea level elevation conditions at the standard temperature of 59 degrees Fahrenheit.

(2) The length shown shall be increased (corrected length) at the rate of one-half of one percent for each degree that the mean temperature of the hottest month of the year averaged over a period of one year exceeds the standard temperature of 59 degrees Fahrenheit.

(3) The length shown needs to be increased by 7 percent per 1000 feet (300 m) of elevation above sea level to compensate for the change in density altitude.

(4) Although a depth of 6 feet (1.8 m) is preferable, a minimum depth of 3 feet (1 m) is adequate for single-engine operations.

2.3.3.2 Takeoff. For most seaplanes, the water takeoff run is usually much longer than the landing takeoff run. In a landplane, takeoff distance increases with additional takeoff weight for two reasons: it takes longer for the engine and propeller to accelerate the greater mass to lift-off speed and the lift-off speed itself is higher because the wings must move faster to produce the extra lift required. In comparison for seaplanes, there are two additional factors, both due to water drag. As seaplane weight increases, the floats sink deeper into the water, creating more drag during initial acceleration. As with the landplane, the seaplane must also accelerate to a higher airspeed to generate more lift, but the seaplane must overcome significantly more water drag force as speed increases. This extra drag reduces the rate of acceleration and results in a longer takeoff run.

2.3.3.3 Climb and Cruise. When comparing the performance of a land airplane with wheels to the same seaplane equipped with floats, the drag and weight penalty of the floats usually results in a reduced climb rate for any given weight. Likewise, cruise speeds will usually be a little lower for a particular power setting. This in turn means increased fuel consumption and reduced range.

2.4 SITE SELECTION CRITERIA

Paragraphs 2.5 through 2.13 provide proponents site selection criteria for determining a safer and more efficient seaplane base. **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 required (See Title 49 United States Code § 47106(b)(1)).

2.4.1 Seaplane Base Operations

The necessary size of a seaplane landing/takeoff and water taxiing areas will depend upon at a minimum on the following factors:

a. the performance characteristics and number of seaplanes expected to use the water operating area,

b. presence or absence in the surrounding area of existing or potential obstructions,

c. strength of water currents, water depth, wave action,

d. shoreline, river, or channel geography,

e. local regulations, and

f. noise considerations.

2.4.2 Water and Shore Relationships

Location of the water operating area and related off-shore, shoreline, and on-shore development will be influenced by these factors:

a. presence of other seaplane bases and airports in the general area;

b. public accessibility;

c. character of development within the surrounding area;

d. commercial ship and pleasure boating activities.

2.4.2.1 Meteorological and atmospheric conditions, such as fog, wind, and smoke figure 2-2, illustrates a favorable relationship 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. Pleasure boating can operate along the west shoreline with safety 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.

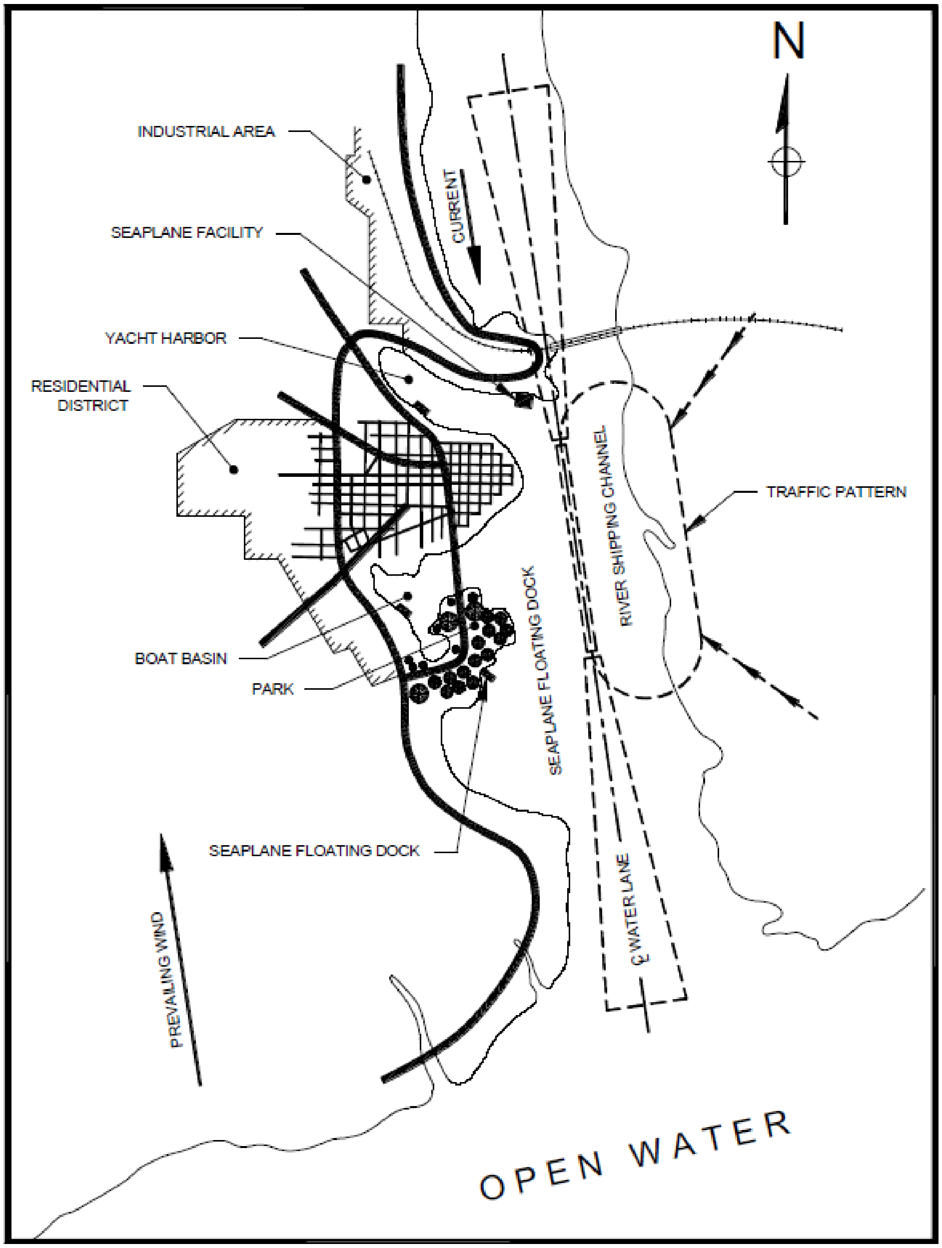


Figure 2-2. Seaplane water landing area in relation to a waterfront community

2.5 Approach and Departure Paths

The recommended location for seaplane approach/departure paths is over water, 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. In terms of approach slopes, the ideal approach path is one that is straight and which permits unobstructed approaches over water at an approach slope of at least 20:1 with ample clearance on either side of the path's center line. Where commercial service operations are anticipated, it is recommended that the approach slope be 40:1 or flatter to facilitate departures into the approach path. 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 paragraphs 1.3 and 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 Advisory Circular 70/7460-1, Obstruction Marking and Lighting prescribes standards for marking and lighting of obstructions.

2.6 SEA LANE ALIGNMENT

As previously discussed, the dedicated sea lane used for landing and takeoff operations constitutes a minimum facility within the water operating area.

2.6.1 Unmarked Sea Lanes - Operational Flexibility

An unmarked sea 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 publications, FAA-H-8083-23, Seaplane, Skiplane, and Float/Ski Equipment Helicopter Operations Handbook, provides seaplane pilots in-depth discussions on how to pilot the various landing and takeoff operating conditions encounter by seaplane pilots.

2.6.2 Marked Sea Lanes - Prevailing Winds

According to 14 CFR § 77.3, a “seaplane base is considered to be an airport only if its sea lanes are outlined by visual markers.” Therefore it is advisable that the sea lane be designated (marked) with a minimum of two visual markers identifying each end of the sea lane, and aligned to provide maximum wind coverage. With the location of the sea lane ends marked accordingly, a safety benefit is achieved by facilitating the application civil airport imaginary surfaces described in part 77. As with land runways, the direction and velocity of prevailing winds over the surface of the water will be the controlling factor in determining the direction of the sea lane. It is not necessary to consider winds of three miles per hour or less when making these determinations. The designer is alerted to the fact that the influences of approach/departure paths, shoreline, and the strength of the water current need to be considered in aligning a sea lane. This design note is given because the peculiarities of surface currents and winds over water, the channelizing effect caused by shore-line terrain or banks, and the effects of thermal air currents will produce wind conditions over water which will in many cases be at variance with wind data collected from land areas as close as a quarter of a mile away from the shore. Additionally, it may be desirable to limit wind analyses to wind data taken only during daylight hours since seaplane operations are almost nil after dark.

2.6.3 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, Airport Design. 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.

2.7 WATER CURRENTS AND WATER-LEVEL VARIATIONS

2.7.1 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:

a. Where the currents exceed 6 knots (7.0 mph);

b. Where unusual water turbulence is caused by a sharp bend in a river, the confluence of two currents, or where tide rips are prevalent.

2.7.2 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.

2.8 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 bull from 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.

2.9 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 protected area 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 3.5, Anchorage Areas.

2.10 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.

2.11 BIRD HAZARDS

The location of bird sanctuaries or areas that attract flocks of birds should be considered when seeking and orienting the sea lane (or water operating area). Waterways historically used by large flocks of birds should be avoided.

2.12 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), 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. 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 and taxi channel(s) for seaplane operations plus the placement of off-shore facilities. The basic off-shore facilities include a sea lane, taxi channel, and an anchorage area. The anchorage area may consists of just an site where pilots 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.

3.2 SEA LANE - DIMENSIONS AND WATER DEPTHS

A sea lane of at least 2,500 feet (750 m) by 200 feet (60 m) is recommended for the landing and takeoff of small seaplanes. The importance for obtaining this recommended minimum width is that it incorporates 200-foot (60 m) diameter turning basin at each end of the sea lane thus, offering seaplane pilots better turning maneuverability. For sea lanes of less than 200-foot widths, referred to as restricted sea lanes, it is highly recommended that both ends of such restricted sea lanes have turning basins of a minimum radius of 200 feet (60 m) as shown in figure 3-1. For commercial service and heavier seaplanes, table 2-1 provides the recommended dimensions, water depths, and approach slopes. Although a depth of 6 feet (1.8 m) is preferred, a minimum depth of 3 feet (1 m) is adequate for small, single-engine operations. The length of the sea lane needs to be increased by 7 percent per 1000 feet (300 m) of elevation above sea level to compensate for the change in density altitude.

3.3 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 3-1. The taxi channel provides direct access from the sea lane to the anchorage area and onshore facilities. When the water operating area permits, 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. The taxi channel for small seaplanes should have a minimum width of 125 feet (38 m), although a width of 150 feet (45 m) or more is desirable. The stronger the wind and current, the more room it takes to make a water turn. Hence, a minimum clearance of 50 feet (15 m) should be provided between the side of any taxi channel and the nearest object. Although wingspans vary, the minimum wingtip-to-wingtip separation for passing seaplanes using dual directional taxi channels should offer at least 50 feet.

3.4 TURNING BASINS

Turning basins as shown in figure 3-1 are extra wide water maneuvering areas to facilitate water taxiing, turn maneuvers, and to accommodate periods of changing wind and current conditions.

3.4.1 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, it is highly recommended that both ends of such restricted sea lanes have turning basins of a minimum radius of 200 feet (60 m).

3.4.2 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.

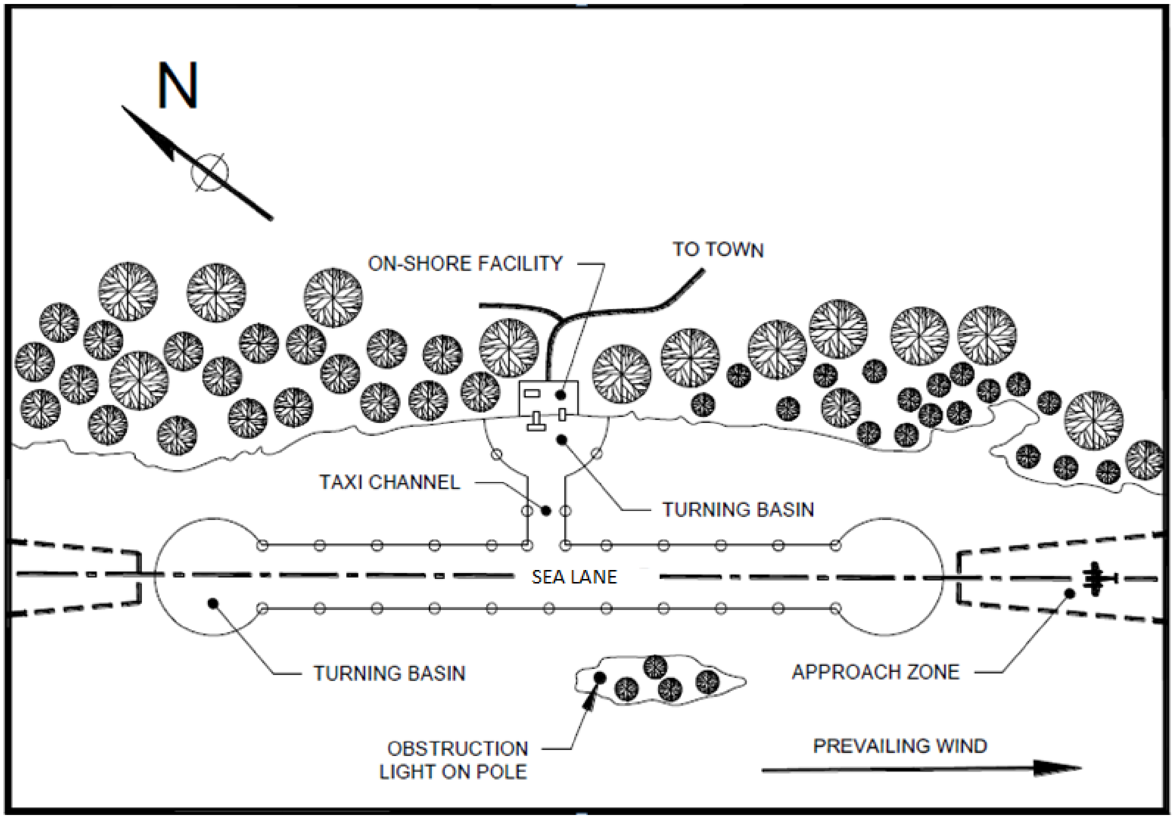


Figure 3-1. Locations of restricted sea lane, turning basins, and taxi channel

3.5 ANCHORAGE AREAS

The basic seaplane base has a dedicated anchorage area along the shoreline for securing seaplanes. Anchoring as shown in figure 3-2 is an easy, inexpensive way to secure a seaplane near the shoreline. 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, figures 3-3 and 3-4 show 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.

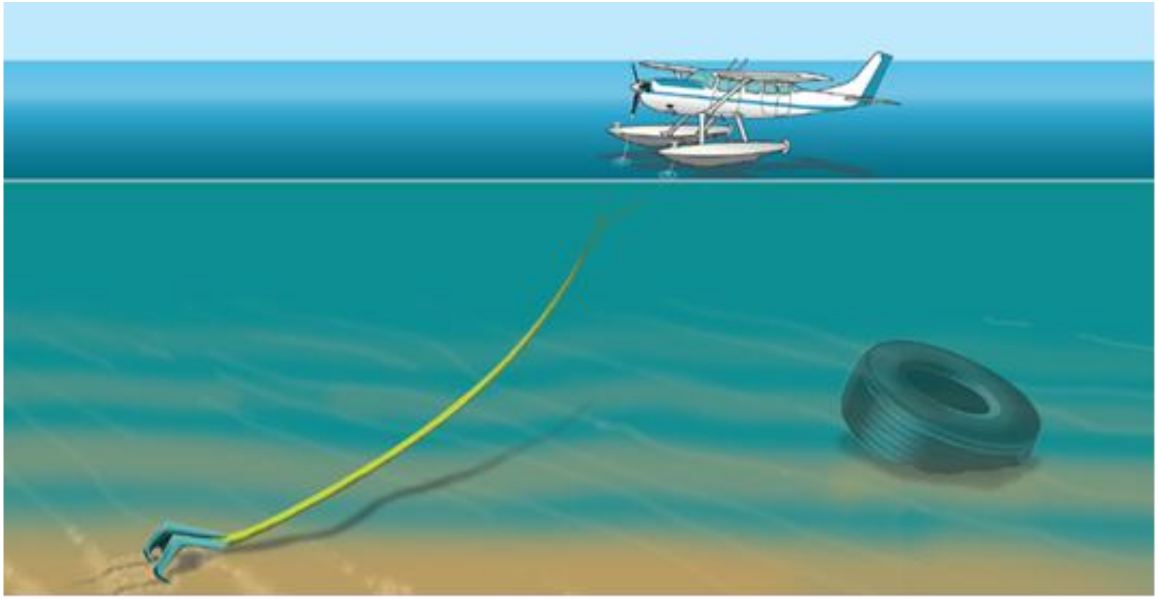


Figure 3-2. Anchoring (single anchor line)

Figure 3-3. Example of a mooring buoy anchorage area (dual anchor line plus bridle)

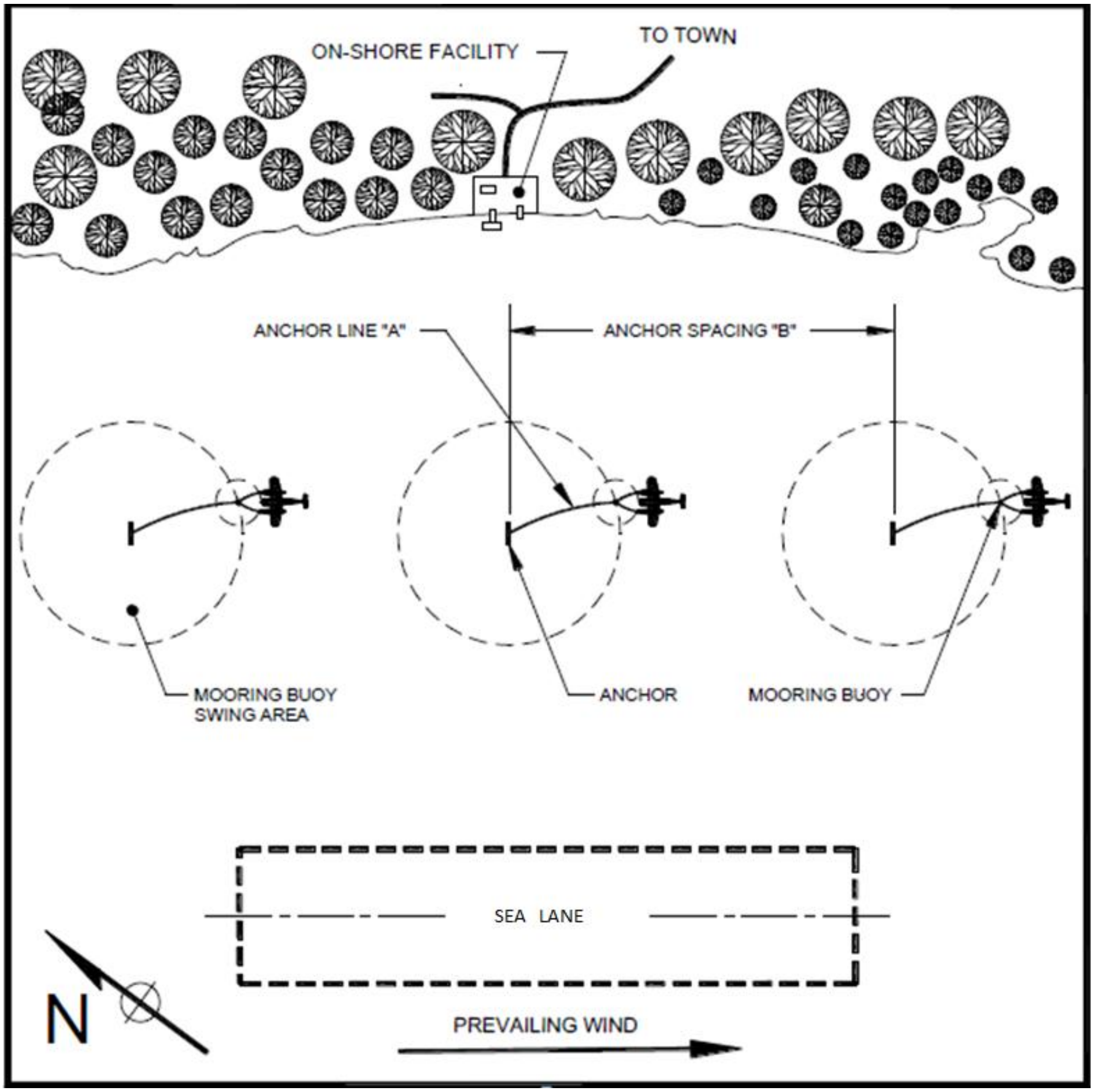


Figure 3-4. Example of an anchorage area with permanent mooring buoys swing areas. See subparagraph 3-4 (b) and (c) for dimensional A and B parameters

3.5.1 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.

3.5.2 Individual Anchoring – Requirements

The space required for each seaplane is determined by seaplane's length and wing span, the length of the anchor line and, if used, the mooring bridle, under the lowest water level condition experienced in the anchorage area. The length of the anchor line "A" as shown in figure 3-4 should be six times the maximum depth at mean high water. Where seaplanes weathervaning swing is limited, the length of anchor line may be shortened to not less than three times the water depth, provided the normal anchor weight or holding capacity is doubled thereby avoiding dragging of the anchor.

3.5.3 Multiple Mooring - Space Requirements

Referring to figure 3-4, center-to-center anchor spacing, "B", for small twin-float seaplane mooring, should not be less than twice the length of the longest anchor line plus 125 feet (38 m). For larger seaplanes, including flying boats and amphibians, an additional 100 feet (30 m) should be added to this spacing. Anchor capacity and spacing may be influenced by bottom conditions (see subparagraph 3.4(d)).

3.5.4 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 3-2 for an example.

3.5.4.1 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 sludge. 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.

3.5.4.2 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.

3.5.5 Anchor Lines

In addition to anchor lines being of required length, as previously covered in subparagraphs 3.4 (b) and (c), they must have certain other characteristics if they are to prove satisfactory.

3.5.5.1 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.

3.5.5.2 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.

3.5.5.3 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.

3.5.6 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 3-3. 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 consists 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, Seaplane, Skiplane, and Float/Ski Equipment Helicopter Operations Handbook, for an in-depth discussion of buoys.

CHAPTER 4. SHORELINE FACILITIES

4.1 INTRODUCTION

Shore-line 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 (topography). 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 figures 4-1 and 4-2 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 less desirable steel, or concrete structures. The simplest ramp consists of a wood plank platform approximately 15 by 20 feet (5 m by 6 m) laid on a sloping shore, with up to half of its length in the water to permit small seaplanes to taxi up to, onto, and out of the water. If the ramp is wood, the seaplane can be slid up or down on the keels of the seaplane’s floats, provided the surface of the ramp above the water level is wet. Concrete boat ramps are generally not suitable for seaplanes. Ramps are known to be usually quite slippery, so pilot and passengers must be very cautious of their footing when walking on the ramp.

4.2.1 Location

Because ramps 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 ramp in the direction from which approaches are normally made (see figure 3-1).

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 (see subparagraph 4.1 (c) Slope). 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.

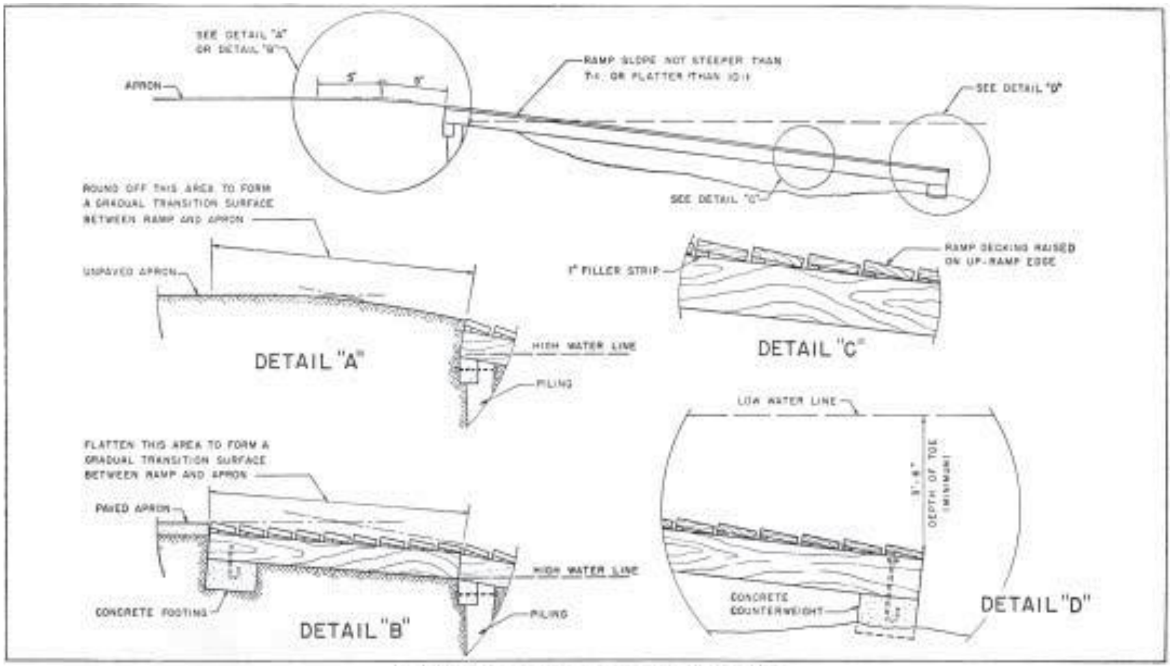


Figure 4-1. Ramp with submerged ramp toe

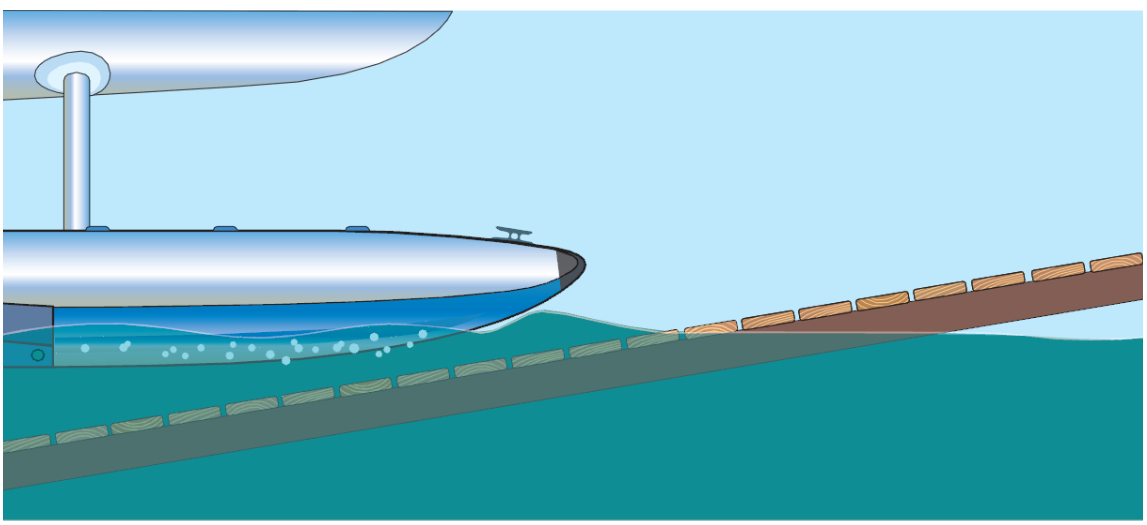


Figure 4-2. Illustration of a submerged ramp toe

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 amphibian airplanes 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-foot (1.2 m) submerged depth of ramp toe will provide sufficient clearance for most waterborne airplanes. A 3-foot (1 m) depth will accommodate all but the heaviest types of amphibian airplanes. An 18-inch (45 cm) depth should be adequate for small, light seaplanes. In all cases, 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 and the treads of amphibian airplanes. 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 For smaller seaplanes and amphibious airplane of gross weights up to approximately 15,000 pounds (6,820 kg), the above ramp width may be reduce to 15 feet (4.5 m) when the site offers relatively calm water and wind conditions. For more adverse conditions, pilots of such small seaplanes and amphibian airplanes should be able to make an unattended ramp approach after adding an additional 5 feet (1.5 m) to the 15-foot width.

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. It is highly recommended that fasteners - bolts, nails, and spikes - used to attach the decking planks be countersunk to avoid damage to floats or tires.

4.3 SLIPWAYS

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 4-3 illustrates an example of a slipway.

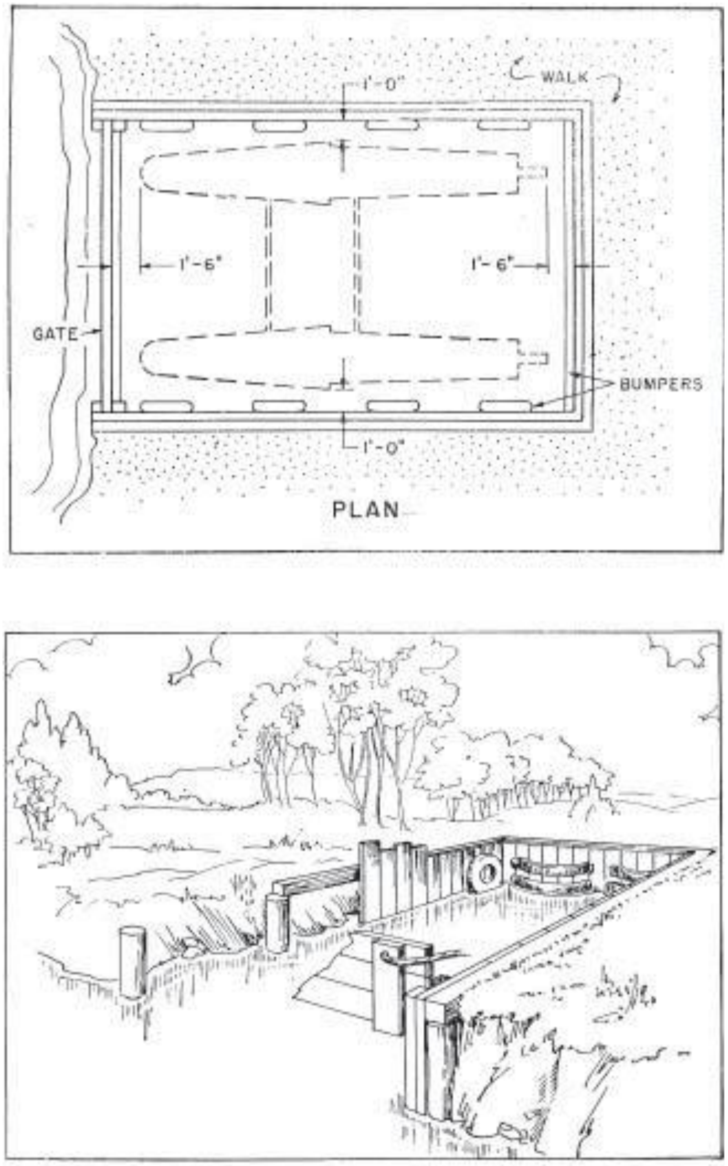


Figure 4-3. Minimum recommended clearances for a private slipway

4.3.1 Location

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 agate to reduce wave action. Regardless of the degree of wave action, slipways, some form of bumpers, made of materials such as expanded polystyrene, old 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. 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 PIERS

Piers or fixed over-water structures as shown in figure 4-4 may be used where the variation in water level is 16 inches (45 cm) or less. The length of the pier should extend into the water to a point where the water depth is adequate for the types of seaplanes being handled, usually when the depth at mean low water level is at least 3 feet (1 m). If the facility is to adequately serve the public, requirements contained in the Americans with Disabilities Act (ADA) accessibility guidelines should be satisfied.

Figure 4-4. Example of a small pier with securing cleats

4.4.1 Location

A minimum of 100 feet (30 m) of unobstructed water operating area or a turning basin should be available in the direction from which approaches are normally made to the pier. At those locations where timber piles can be used, they are the most economical type of construction. Water jetting and pile driving are common methods of setting piles. Piers should be located so that access to them by the public will not require the public to cross the land-side apron or hangar area. Since piers are constructed with decks above mean high water, most of the timber supporting members will be subject to alternate cycles of wetting and drying. To prevent decay, creosote or similarly treated timbers must be used. See paragraph 7.2 for preservation methods. Urethane, epoxy, and shellac are acceptable sealers for all creosote treated wood, and should be used to prevent tracking creosote.

4.4.2 Design Concepts

General design for a pier is to incorporate an access walkway or gangway that is at least 5 feet in width – normally 8 to 10 feet (2.5 to 3 m) - with hand railings on both sides ending with an open-decked handling area of approximately 30 by 50 feet. The length of the pier should extend into the water to a point where the water depth is adequate for the types of aircraft to be handled, usually when the depth at mean low water level is at least 3 feet (1 m). An open-decked handling area of this size provides tie-up space for four small or three large seaplanes. On extra-long piers, where the walking distance is too great for convenient handling of service equipment, a small storage shed may be located near the open decked handling area. If provided, fueling and lubrication facilities should also be located at or towards the end of the pier. The supporting timbers and decking of fixed structures used for passengers, cargo operations, etc., need to be designed to support the anticipated live loads (see local building codes). Decking spaced with a 1/2 inch (1.3 cm) gap between planks will allow for drainage and expansion.

4.4.3 Obstruction Free Decks

The surface of the fixed dock should be free of tall objects to permit the wings of seaplanes or small amphibian airplanes to come alongside the pier for berthing. 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.

4.4.4 Tie Down Methods

An appropriate number of cleats along the open areas of the pier should be provided along the sides of the deck to secure seaplanes. If the pier has no side handrails, a continuous 4 by 4 inch (10 cm by 10 cm) wood rail, raised approximately 2 inches (5 cm) above the deck, commonly called bull rail or tie rail, is recommended. Bull rails should have cleats and be secured by long lag bolts to pier's cross-members or logs. Corner posts, if provided, should extend slightly above the deck to serve as bollards. Additionally, bumpers of sufficient length installed along the sides of the structure and extending below the edge of the deck are recommended to prevent damage to the floats of seaplanes.

4.5 FIXED DOCKS

The two most common docks used at seaplane bases are fixed decks and floating docks as shown in figure 4-5.

4.5.1 Location

It is recommended that fixed docks have a minimum of 100 feet (30 m) of unobstructed water operating area or a turning basin available in the direction from which approaches are normally made to the fixed dock. It is preferable that fixed docks 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.

Figure 4-5. Example of Alaskan fixed dock with parking ramps

4.5.2 Obstruction Free Decks

The surface of the fixed dock should be free of tall objects to permit the wings of seaplanes or small amphibian airplanes to come alongside the dock for berthing. For example, an unobstructed dock surface of 21 feet (6.5 m) from the dock's edge will provide the wing clearance for most seaplanes or small amphibian airplanes to come along safely and tie down.

4.5.3 Dimensions

Fixed 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.

4.5.4 Tie Down Methods

An appropriate number of cleats along the open areas of the dock should be provided along the sides of the deck to secure seaplanes. If the dock has no side handrails, a continuous 4 by 4 inch (10 cm by 10 cm) wood rail, raised approximately 2 inches (5 cm) above the deck, commonly called bull rail or tie rail, is recommended. Bull rails should have cleats and be secured by long lag bolts to pier's cross-members or logs. Corner posts, if provided, should extend slightly above the deck to serve as bollards. Additionally, bumpers of sufficient length installed along the sides of the structure and extending below the edge of the deck are recommended to prevent damage to the floats of seaplanes.

4.6 FLOATING DOCKS (FLOATS)

Floating docks, commonly referred to as “floats,” are commonly connected to the shore by a gangway thereby offering the greatest flexibility in providing docking facilities shown in figure 4-6. This type of facility rides with the wave actions and therefore is equally satisfactory in areas of great or negligible variations in water-levels. To permit this movement, universal action must be provided in anchoring and attaching floats together. Figure 4-6 shows various types of floats for docking.

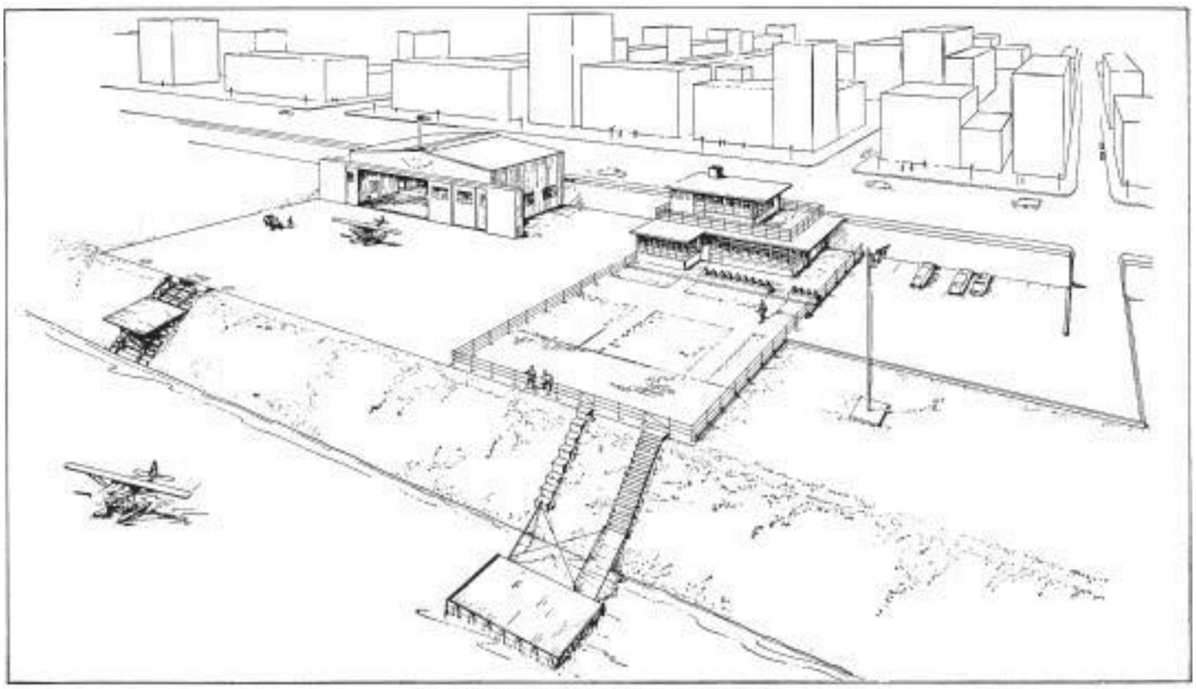


Figure 4-6. Illustration of a floating dock (float) and marine railway

4.6.1 Flotation materials

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

4.6.1.1 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.

4.6.1.2 Fifty-five gallon steel drums are commonly used as flotation devices. Drums should be placed symmetrically around the perimeter of the float to ensure stability. They are fastened to the float by steel straps of sufficient length to extend around the drum and main framing members of the float. Foam, fiberglass, plywood boxes, and steel drum floats are susceptible to damage where deadheads or strong currents prevail. Steel drums have a short life expectancy in salt water. The pilot should be aware of the corrosive effect of galvanic action caused by dissimilar metals. Securing the aircraft to steel or metal drums, by a chain or wire rope, will start a galvanic action that will corrode the aluminum floats. Satisfactory floats can be improvised by using life rafts, small floating docks, pontoons, and similar devices which can be obtained in the open market.

4.6.1.3 Where relatively large and straight timber is available, logs may be used to construct a raft-type float.

4.6.2 Dimensions

Float dimensions are determined by the number of seaplanes simultaneously using or projected to use the float. In determining the number of berths alongside the float, use the length of design craft length plus 20 feet (6 m) to offer clearance both fore and aft. A float should be wide enough to allow seaplanes to dock on opposite sides with at least a 10-foot (3 m) wingtip-to-wingtip clearance. Floats as narrow as 7 feet (2 m) have been used where a long, floating dock parallels the shoreline. Floats are usually constructed from locally available materials.

4.6.3 Deck Free Surfaces

The surface of the float(s) should be free of tall objects to permit the wings of seaplanes or small amphibian airplanes to come alongside the dock for parking. For example, an unobstructed dock surface of 21 feet (6.5 m) from the dock’s edge will provide the wing clearance for most seaplanes or small amphibian airplanes to come along safely and tie down.

4.6.4 Connecting Walkways (Gangways)

Floats are usually connected to the shore or a pier with a gangway an example shown in figure 4-7. 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.

Figure 4-7. Example of a gangway in Alaska

4.6.5 Tie Down Methods

An appropriate number of cleats along the open areas of the dock should be provided along the sides of the deck to secure seaplanes. If the dock has no side handrails, a continuous 4 by 4 inch (10 cm by 10 cm) wood rail, raised approximately 2 inches (5 cm) above the deck, commonly called bull rail or tie rail, is recommended. Bull rails should have cleats and be secured by long lag bolts to pier’s cross-members or logs. Corner posts, if provided, should extend slightly above the deck to serve as bollards. Additionally, bumpers of sufficient length installed along the sides of the structure and extending below the edge of the deck are recommended to prevent damage to the floats of seaplanes.

4.6.6 Combined Float/Ramps

Floats connected to a master float are sometimes equipped with 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.

4.7 FLOATING BARGES

A barge anchored offshore can make an excellent seaplane facility by providing some form of public access when the desired location for shoreline facilities is not practicable or possible. 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 lounge, service shop(s), possibly offices on board. The 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.

4.8 OPERATING SPACE BETWEEN SHORELINE FACILITIES

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

4.8.1 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.

4.8.2 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.

This page intentionally left blank.

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 electricity, water, telephone/cell phone coverage, and sewage. The basic public seaplane base may not require all utilities, but it is recommended that water and sanitary facilities of some sort be provided for at all locations. 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.

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.

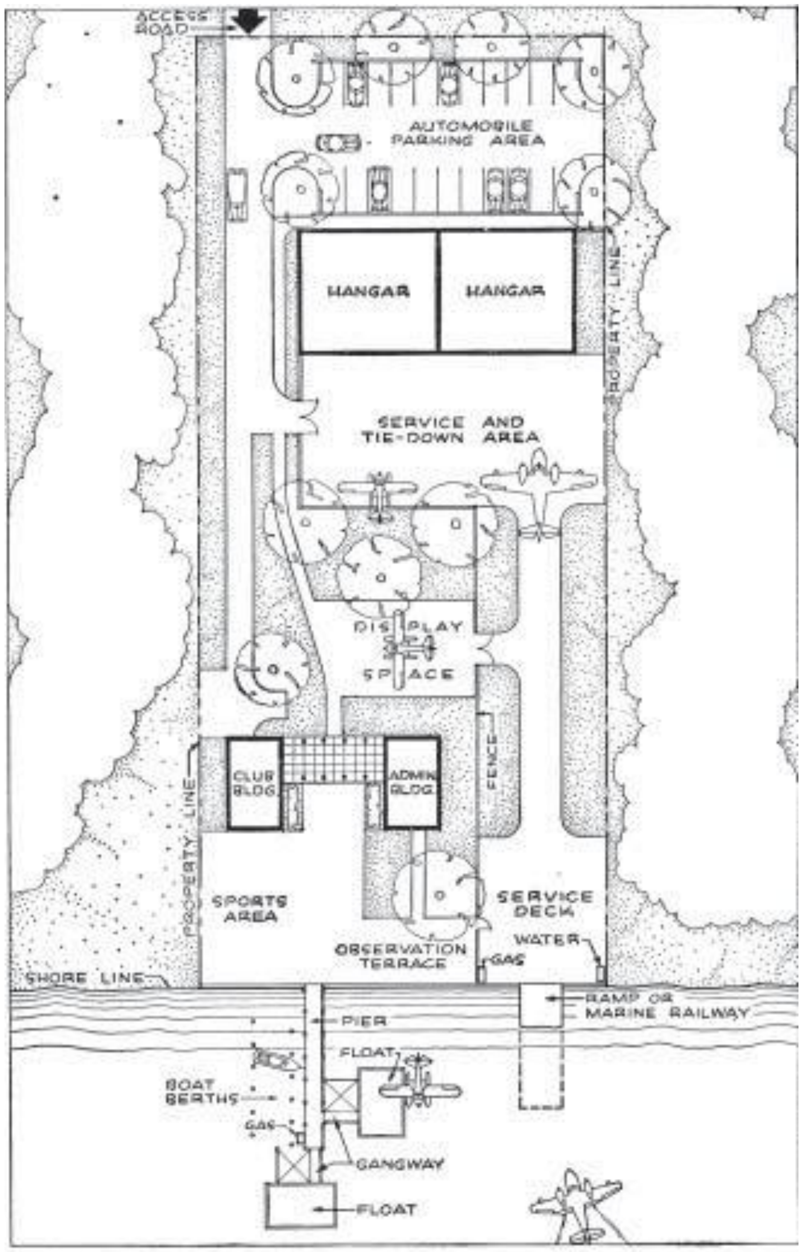


Figure 5-1. Illustration of a seaplane base with various capital improvements

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. Designers should use the internet to obtain actually dimensions of seaplanes to determine the space required for taxiing, turning, and storing the seaplanes. 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 US 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. Advisory Circular 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 4-6. 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 roadway 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.

This page intentionally left blank.

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 – 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 91-69A, Seaplane Safety for 14 CFR Part 91 Operators, 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 and, if lighted sea lanes are provided, for night operations. 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 by this advisory circular and per FAA-H, 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.

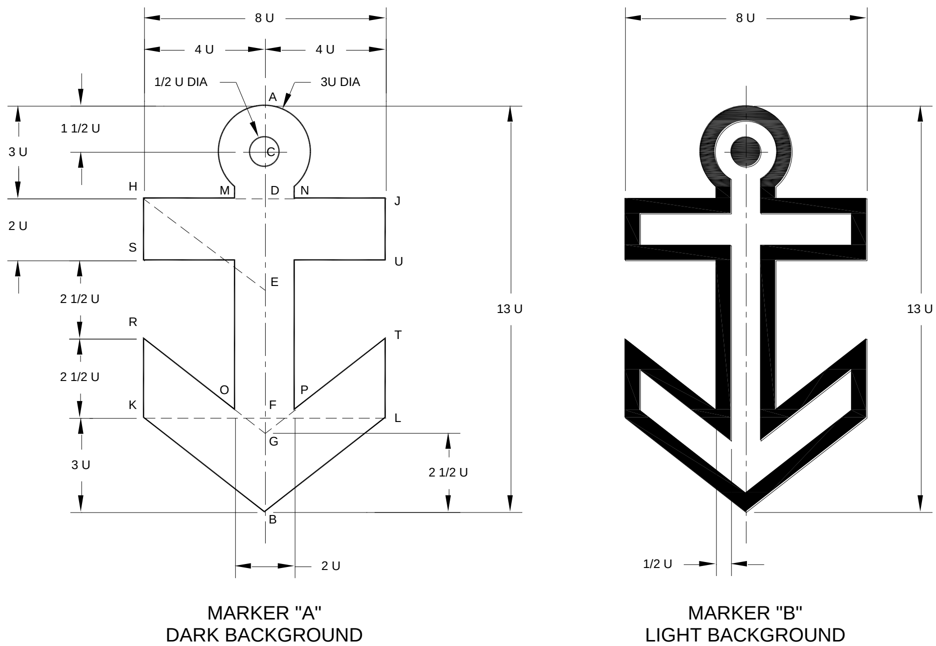
6.5 SHORELINE FLOODLIGHTS

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.



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.

Figure 6-1. Seaplane Base Air Marker Proportions

6.6.2 Color Requirements

The seaplane base marker shown in figure 6-1 shall be 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, shall be 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

a. Establish center line AB, 13 units long.

b. Establish points C, D, I, N along AB.

c. Erect perpendiculars to AB: DF, DL, IG, IK.

d. Connect points FG and KL.

e. Establish lines NP, NS, BQ, BR.

f. Connect points PQ and RS.

g. Establish points E, M, H, J, 0, T.

h. Connect points HO and JT.

i. Scribe 1.5 unit radius circle about point C.

j. Extend perpendiculars from points E and M to intersect with 1.5 unit circle.

k. Scribe 0.5 unit radius circle about point C.

This page intentionally left blank.

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.

This page intentionally left blank.

APPENDIX A. U.S. 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 Figures A-1 through A-3 contain forms and other information required to apply for a Department of the Army permit.

A.4 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.

APPLICATION FOR DEPARTMENT OF THE ARMY PERMIT *(33 CFR 325)*	OMB APPROVAL NO. 0710-0003 EXPIRES: 31 August 2012

Public reporting burden for this collection of information is estimated to average 11 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters, Executive Services and Communications Directorate, Information Management Division and to the Office of Management and Budget, Paperwork Reduction Project (0710-0003). Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. Please DO NOT RETURN your form to either of those addresses. Completed applications must be submitted to the District Engineer having jurisdiction over the location of the proposed activity.

PRIVACY ACT STATEMENT

Authorities: Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Marine Protection, Research, and Sanctuaries Act, Section 103, 33 USC 1413; Regulatory Programs of the Corps of Engineers; Final Rule 33 CFR 320-332. Principal Purpose: Information provided on this form will be used in evaluating the application for a permit. Routine Uses: This Information may be shared with the Department of Justice and other federal, state, and local government agencies, and the public and may be made available as part of a public notice as required by Federal law. Submission of requested information is voluntary, however, if information is not provided the permit application cannot be evaluated nor can a permit be issued. One set of original drawings or good reproducible copies which show the location and character of the proposed activity must be attached to this application (see sample drawings and instructions) and be submitted to the District Engineer having jurisdiction over the location of the proposed activity. An application that is not completed in full will be returned.

(ITEMS 1 THRU 4 TO BE FILLED BY THE CORPS)

1. APPLICATION NO.	2. FIELD OFFICE CODE	3. DATE RECEIVED	4. DATE APPLICATION COMPLETE

(ITEMS BELOW TO BE FILLED BY APPLICANT)

5. APPLICANT'S NAME: First - Middle - Last – Company – E-mail Address –	8. AUTHORIZED AGENT'S NAME AND TITLE (an agent is not required) First - Middle - Last – Company – E-mail Address –
6. APPLICANT'S ADDRESS. Address - City – State – Zip – Country –	9. AGENT'S ADDRESS Address - City – State – Zip – Country –
7. APPLICANT'S PHONE NOs. W/AREA CODE. a. Residence b. Business c. Fax	10. AGENT'S PHONE NOs. W/AREA CODE a. Residence b. Business c. Fax

STATEMENT OF AUTHORIZATION

11. I hereby authorize, ____________________ to act in my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this permit application.

APPLICANT'S SIGNATURE DATE

NAME, LOCATION, AND DESCRIPTION OF PROJECT OR ACTIVITY

12. PROJECT NAME OR TITLE (see instructions)

13. NAME OF WATERBODY, IF KNOWN (if applicable)	14. PROJECT STREET ADDRESS (if applicable) Address
15. LOCATION OF PROJECT Latitude: °N Longitude: °W	City - State – Zip -

16. OTHER LOCATION DESCRIPTIONS, IF KNOWN (see instructions)
State Tax Parcel ID Municipality
Section – Township – Range –

17. DIRECTIONS TO THE SITE

ENG FORM 4345, SEPT 2009 EDITION OF OCT 2004 IS OBSOLETE Proponent: CECW-OR

Figure A-1. Application for a Department of the Army Permit - page one

18. Nature of Activity (Description of project, include all features)

19. Project Purpose (Describe the reason or purpose of the project, see instructions)

USE BLOCKS 20-23 IF DREDGED AND/OR FILL MATERIAL IS TO BE DISCHARGED

20. Reason(s) for Discharge

21. Type(s) of Material Being Discharged and the Amount of Each Type in Cubic Yards:

Type
Amount in Cubic Yards

Type
Amount in Cubic Yards

Type
Amount in Cubic Yards

22. Surface Area in Acres of Wetlands or Other Waters Filled (see instructions)
Acres
Or
Liner Feet

23. Description of Avoidance, Minimization, and Compensation (see instructions)

24. Is Any Portion of the Work Already Complete? Yes ☐ No ☐ IF YES, DESCRIBE THE COMPLETED WORK

25. Addresses of Adjoining Property Owners, Lessees, Etc., Whose Property Adjoins the Waterbody (If more than can be entered here, please attach a supplemental list).

Address –

City – State – Zip –

26. List of Other Certifications or Approvals/Denials Received from other Federal, State, or Local Agencies for Work Described in This Application.

AGENCY	TYPE APPROVAL*	IDENTIFICATION NUMBER	DATE APPLIED	DATE APPROVED	DATE DENIED

* Would include but is not restricted to zoning, building, and flood plain permits

27. Application is hereby made for a permit or permits to authorize the work described in this application. I certify that the information in this application is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

SIGNATURE OF APPLICANT DATE SIGNATURE OF AGENT DATE

The application must be signed by the person who desires to undertake the proposed activity (applicant) or it may be signed by a duly authorized agent if the statement in block 11 has been filled out and signed.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than $10,000 or imprisoned not more than five years or both.

ENG FORM 4345, SEPT 2009

Figure A-2. Application for a Department of the U.S. Army Corps Permit – page two

A.5 Part 1: Instructions for Preparing a Department of the Army Permit Application

Blocks 1 through 4. To be completed by Corps of Engineers.

Block 5. Applicant's Name. Enter the name and the E-mail address of the responsible party or parties. If the responsible party is an agency, company, corporation, or other organization, indicate the name of the organization and responsible officer and title. If more than one party is associated with the application, please attach a sheet with the necessary information marked Block 5.

Block 6. Address of Applicant. Please provide the full address of the party or parties responsible for the application. If more space is needed, attach an extra sheet of paper marked Block 6.

Block 7. Applicant Telephone Number(s). Please provide the number where you can usually be reached during normal business hours.

Blocks 8 through 11. To be completed, if you choose to have an agent.

Block 8. Authorized Agent's Name and Title. Indicate name of individual or agency, designated by you, to represent you in this process. An agent can be an attorney, builder, contractor, engineer, or any other person or organization. **Note:** An agent is not required.

Blocks 9 and 10. Agent's Address and Telephone Number. Please provide the complete mailing address of the agent, along with the telephone number where he / she can be reached during normal business hours.

Block 11. Statement of Authorization. To be completed by applicant, if an agent is to be employed.

Block 12. Proposed Project Name or Title. Please provide name identifying the proposed project, e.g., Landmark Plaza, Burned Hills Subdivision, or Edsall Commercial Center.

Block 13. Name of Waterbody. Please provide the name of any stream, lake, marsh, or other waterway to be directly impacted by the activity. If it is a minor (no name) stream, identify the waterbody the minor stream enters.

Block 14. Proposed Project Street Address. If the proposed project is located at a site having a street address (not a box number), please enter it here.

Block 15. Location of Proposed Project. Enter the latitude and longitude of where the proposed project is located. If more space is required, please attach a sheet with the necessary information marked Block 15.

Block 16. Other Location Descriptions. If available, provide the Tax Parcel Identification number of the site, Section, Township, and Range of the site (if known), and / or local Municipality that the site is located in.

Block 17. Directions to the Site. Provide directions to the site from a known location or landmark. Include highway and street numbers as well as names. Also provide distances from known locations and any other information that would assist in locating the site. You may also provide description of the proposed project location, such as lot numbers, tract numbers, or you may choose to locate the proposed project site from a known point (such as the right descending bank of Smith Creek, one mile downstream from the Highway 14 bridge). If a large river or stream, include the river mile of the proposed project site if known.

Block 18. Nature of Activity. Describe the overall activity or project. Give appropriate dimensions of structures such as wing walls, dikes (identify the materials to be used in construction, as well as the methods by which the work is to be done), or excavations (length, width, and height). Indicate whether discharge of dredged or fill material is involved. Also, identify any structure to be constructed on a fill, piles, or float-supported platforms. The written descriptions and illustrations are an important part of the application. Please describe, in detail, what you wish to do. If more space is needed, attach an extra sheet of paper marked Block 18.

Block 19. Proposed Project Purpose. Describe the purpose and need for the proposed project. What will it be used for and why? Also include a brief description of any related activities to be developed as the result of the proposed project. Give the approximate dates you plan to both begin and complete all work.

Block 20. Reasons for Discharge. If the activity involves the discharge of dredged and/or fill material into a wetland or other waterbody, including the temporary placement of material, explain the specific purpose of the placement of the material (such as erosion control).

Block 21. Types of Material Being Discharged and the Amount of Each Type in Cubic Yards. Describe the material to be discharged and amount of each material to be discharged within Corps jurisdiction. Please be sure this description will agree with your illustrations. Discharge material includes: rock, sand, clay, concrete, etc.

Block 22. Surface Areas of Wetlands or Other Waters Filled. Describe the area to be filled at each location. Specifically identify the surface areas, or part thereof, to be filled. Also include the means by which the discharge is to be done (backhoe, dragline, etc.). If dredged material is to be discharged on an upland site, identify the site and the steps to be taken (if necessary) to prevent runoff from the dredged material back into a waterbody. If more space is needed, attach an extra sheet of paper marked Block 22.

Block 23. Description of Avoidance, Minimization, and Compensation. Provide a brief explanation describing how impacts to waters of the United States are being avoided and minimized on the project site. Also provide a brief description of how impacts to waters of the United States will be compensated for, or a brief statement explaining why compensatory mitigation should not be required for those impacts.

Block 24. Is Any Portion of the Work Already Complete? Provide any background on any part of the proposed project already completed. Describe the area already developed, structures completed, any dredged or fill material already discharged, the type of material, volume in cubic yards, acres filled, if a wetland or other waterbody (in acres or square feet). If the work was done under an existing Corps permit, identity the authorization, if possible.

Block 25. Names and Addresses of Adjoining Property Owners, Lessees, etc., Whose Property Adjoins the Project Site. List complete names and full mailing addresses of the adjacent property owners (public and private) lessees, etc., whose property adjoins the waterbody or aquatic site where the work is being proposed so that they may be notified of the proposed activity (usually by public notice). If more space is needed, attach an extra sheet of paper marked Block 24. Information regarding adjacent landowners is usually available through the office of the tax assessor in the county or counties where the project is to be developed.

Block 26. Information about Approvals or Denials by Other Agencies. You may need the approval of other federal, state, or local agencies for your project. Identify any applications you have submitted and the status, if any (approved or denied) of each application. You need not have obtained all other permits before applying for a Corps permit.

Block 27. Signature of Applicant or Agent. The application must be signed by the owner or other authorized party (agent). This signature shall be an affirmation that the party applying for the permit possesses the requisite property rights to undertake the activity applied for (including compliance with special conditions, mitigation, etc.).

A.6 Part 2: Drawings and Illustrations

A.6.1 General Information.

Three types of illustrations are needed to properly depict the work to be undertaken. These illustrations or drawings are identified as a Vicinity Map, a Plan View or a Typical Cross-Section Map. Identify each illustration with a figure or attachment number. Please submit one original, or good quality copy, of all drawings on 8½ x11 inch plain white paper (electronic media may be substituted). Use the fewest number of sheets necessary for your drawings or illustrations. Each illustration should identify the project, the applicant, and the type of illustration (vicinity map, plan view, or cross-section). While illustrations need not be professional (many small, private project illustrations are prepared by hand), they should be clear, accurate, and contain all necessary information.

Figure A-3. U.S. Army Corps of Engineer Division boundaries

This page intentionally left blank.

APPENDIX B. U.S. COAST GUARD PROGRAMS

The U.S. Coast Guard is charged with marking navigable waterways. For the purpose of this advisory circular, "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 Figures B-1 through B-4 contain instructions for completing the application form as well as a district map of the U.S. Coast Guard District Commanders.

B.5 The following link may be used to locate the United States Coast Guard Districts offices: http://www.uscg.mil/top/units/.

U. S. COAST GUARD

PRIVATE AIDS TO NAVIGATION APPLICATION

INSTRUCTIONS

1. The rules, regulations, and procedures pertaining to private aids to navigation are set forth in the copy of Code of Federal Regulations; Title 33, Chapter 1, Part 66, on the back of this page.

2. Three copies of the application for private aids shall be forwarded to the Commander of the Coast Guard District in which the aids will be located 30 days in advance of the proposed action. Sections of charts or sketches showing the work proposed shall accompany each application.

3. When making application for private aids to mark structures and mooring buoys in navigable waters or to mark the excavating or depositing of material therein, evidence is required of the authorization obtained from Corps of Engineers, Department of the Army, for such work. (Code of Federal Regulations; Title 33, Part 209.120.)

4. The applicant shall complete all of Blocks 1, 2, 3, 4, 5, 9 and 10 for all new applications. When an aid is being discontinued, Block 3 need not be completed. Block 6 shall be completed whenever authorization is required to be obtained from Corps of Engineers (See Instruction No. 3). Columns of Block 7 will be completed as follows:
   a. Unlighted buoys - 7a, 7e, 7f, and 7j.
   b. Lighted buoys - 7a, 7b, 7c, 7d, 7e, 7f, 7g, 7h, and 7j.
   c. Daybeacons - 7a, 7e, 7f (if applicable), 7h, 7i, and 7j.
   d. Light on a structure - 7a, 7b, 7c, 7d, 7e, 7f (if applicable), 7g, 7h, 7i, and 7j.

When an aid is being changed, Block 8 shall be used to describe the nature of the change.

5. The required information for each column includes the following:
   (7a) Proposed number or letter to be assigned to the aid.
   (7b) Period of light (time in seconds for one complete cycle).
   (7c) Flash length in seconds. For complex or multiple flashes, explain in column (7j).
   (7d) Color of light.
   (7e) Position by two or more horizontal angles, or bearing and distance from a prominent charted landmark. If a prominent charted landmark is not available, show latitude and longitude as precisely as the chart permits.
   (7f) Depth of water at buoy or structure (if marine site). All depths are measured from mean low water except on Great Lakes where depths are measured from low water datum.
   (7g) Candlepower, if known; otherwise, include the following information in column (7j); lens size, lamp voltage and amperage if electric, or details of other illuminant to be used.
   (7h) Height of light or unlighted structure above water. Height is measured from mean high water except in the Great Lakes where heights are measured from low water datum shown on U.S. Lake Survey Charts. The height of a light on a buoy is measured from the water line.
   (7i) Include details of structure (type, color).
   (7j) Used for the following specific information, plus any other useful details: a. buoys - size, shape, color, and reflective material used; b. structures - daymark shape and color; c. fog signal on a buoy or structure - type and model, audible range, and characteristic (number of strokes or blasts, period and blast length).

6. This form may be used to cover more than one aid in the same geographic area. Draw a line between each aid as indicated in example. Attach separate sheet if additional space is required.

7. Attach a section of chart showing the proposed location of the aid(s) to navigation.

8. a. After receipt of the approved form the applicant will advise the District Commander by telegram or other rapid means of communications when the work authorized is actually accomplished.
   b. If the aids have not been installed within one year of the approval date, the approved application is automatically cancelled.
   c. Any discrepancy in the operation of the aid(s) at any time shall be reported to the Disctrict Commander by telegram or other rapid means of communication in order that Notices to Mariners may be issued. A discrepancy exists whenever the aid is not as described in the approved application, i.e., lack of signal, incorrect light characteristic, or improper color, shape of position of shore structure or buoy. The correction of the discrepancy will also be reported by the same method.

9. All classes of private aids to navigation shall be maintained in proper condition. They are subject to inspection by the Coast Guard at any time and without prior notice to the maintainer.

7. APPLICANT WILL FILL IN APPLICABLE REMAINING COLUMNS

FOR DISTRICT COMMANDERS ONLY		EXAMPLE OF USE OF APPLICATION									
			LIGHT							STRUCTURE	
LIGHT LIST NUMBER OR PAGE	NAME OF AID	NO. OR LTR. (7a)	PER. (7b)	FLASH LGTH. (7c)	COLOR (7d)	POSITION (7e)	DEPTH OF WATER (7f)	CAN-DLE POWER (7g)	HT. ABOVE WATER (7h)	TYPE, COLOR, AND HEIGHT (7i)	REMARKS *(See Instructions)* (7j)
		1	4s	0.4s	WHITE	205°T, 3540 yds from tank, Bayview, VA.	9 Ft.	20	6 Ft.		5' Lighted buoy - black
		2				200°T, 3425 yds from tank, Bayview, VA.	7 Ft.				Nun buoy - Red White reflector
		3				210°T, 2810 yds from tank, Bayview, VA.	2 Ft.		7 Ft.	Single pile	2' square daymark - black
		5	2.5s	0.5s	WHITE	218.5°T, 330 yds from tank, Bayview, VA.	8 Ft.	20	13 Ft.	5 - pile	3' square daymark - black

Dept. of Homeland Security, USCG, CG-2554 (Rev. 03-03)

Reset

Figure B-1. Federal regulations Concerning Private Aids to Navigation, 33 CFR Part 66

DEPARTMENT OF HOMELAND SECURITY U.S. COAST GUARD CG-2554 (Rev. 03-03)	**PRIVATE AIDS TO NAVIGATION APPLICATION** *(See attached instructions and copy of Code of Fed. Reg., Title 33, Chap. 1, Part 66)*	Form Approved OMB-1625-0011

NO PRIVATE AID TO NAVIGATION MAY BE AUTHORIZED UNLESS A COMPLETED APPLICATON FORM HAS BEEN RECEIVED (14 U.S.C. 83; 33 C.F.R. 66.01-5)

1. ACTION REQUESTED FOR PRIVATE AIDS TO NAVIGATION: A. ☐ ESTABLISH AND MAINTAIN B. ☐ DISCONTINUE C. ☐ CHANGE D. ☐ TRANSFER OWNERSHIP

2. DATE ACTION TO START

3. AIDS WILL BE OPERATED: A. ☐ THROUGHOUT THE YEAR B. ☐ TEMPORARILY UNTIL ______ C. ☐ ANNUALLY ______ TO ______

4. NECESSITY FOR AID *(Continue in Block 8)*

5. GENERAL LOCALITY

6. CORPS OF ENGINEERS AUTHORIZED THIS STRUCTURE OR BUOY BY ☒ PERMIT OR ☐ LETTER *(file and date)* NWP-1

FOR DISTRICT COMMANDERS ONLY		7. APPLICANT WILL FILL IN APPLICABLE REMAINING COLUMNS									
			LIGHT							STRUCTURE	
LIGHT LIST NUMBER OR PAGE	NAME OF AID	NO. OR LTR. (7a)	PER. (7b)	FLASH LGTH. (7c)	COLOR (7d)	POSITION (7e)	DEPTH OF WATER (7f)	CAN-DLE POWER (7g)	HT. ABOVE WATER (7h)	TYPE, COLOR, AND HEIGHT ABOVE GROUND (7i)	REMARKS *(See Instructions)* (7j)

8. ADDITIONAL COMMENTS

9a. NAME AND ADDRESS OF PERSON IN DIRECT CHARGE OF AID	10a. NAME AND ADDRESS OF PERSON OR CORPORATION AT WHOSE EXPENSE	10b. THE APPLICANT AGREES TO SAVE THE COAST GUARD HARMLESS WITH RESPECT TO ANY CLAIM OR CLAIMS THAT MAY RESULT ARISING FROM THE ALLEGED NEGLIGENCE OF THE MAINTENANCE OR OPERATION OF THE APPROVED AID(S).	
9b. TELEPHONE NO.		10c. DATE	10d. SIGNATURE AND TITLE OF OFFICIAL SIGNING

FOR USE BY DISTRICT COMMANDER						
SERIAL NO.	CLASSIFICATION OF AIDS	RECD.			DATE APPROVED	SIGNATURE *(By direction)*
		CHART				
		L. N. M.				

PREVIOUS EDITIONS ARE OBSOLETE

Reset

Figure B-2. Private Aids to Navigation Application

Page 2 of CG-2554 (Rev. 03-03)

REMARKS

DATE	REFERENCE	ACTION AND REMARKS

J	F	M	A	M	J	J	A	S	O	N	D

NAME OF AID	LIGHT LIST NO.	PAGE

Reset

Figure B-3. Private Aids to Navigation Application - continued

Figure B-4. U.S. Coast Guard Districts

This page intentionally left blank.