

Introduction

Purpose

Coastal and harbor engineering is a relatively young science and considered one of the most complex specialties of the engineering disciplines. Marine structures must maintain their function in extreme and hostile environments that are in constant flux. Winds, waves, and currents, the corrosive effects of seawater, the sensitivity of marine life to human activities, and the changeable features of the coast offer a unique set of challenges.

This manual stresses the importance of consistent design *procedures*, as opposed to rigid geometric design *standards*. Coastal and harbor designs are site specific. Variables unique to each location must be factored into the design. Once the engineer has determined need and engineering has been authorized, the engineer must find and use state-of-the-art resources and/or technologies as they apply to the specific task.

Objectives

This manual helps the design engineer through the maze of design elements that must be considered from early phases of planning and problem identification to completion of a project. Definition of site conditions and functional requirements is important insurance against oversights and errors, which may lead to poor performance or even structural failure, and is beneficial to the designer with a conventional civil engineering background and to those who specialize in coastal engineering.

The manual concentrates on the generic aspects of coastal and harbor design. It provides recommendations, and is not intended as a stand-alone reference. This manual references technical resources already in print as a guideline for more detailed information. We anticipate the user will require specialized expertise such as numerical wave modeling, wind and wave hindcasting, data collection, or corrosion design due to the nature of coastal and harbor engineering.

Format

The manual, now available on the Internet, is intended for placement in a three-ring binder so you can add or replace portions as necessary to broaden its scope, or change procedures. Future chapters can be added to cover administrative procedures specific to the Department, or to include basic design standards or criteria similar to California Department of Boating and Waterways' *"Layout and Design Guidelines for Small Craft Berthing Facilities."* We provide all standards conditionally, and they do not substitute for proper design procedures.

How to Use the Manual

The manual is an interactive tool to walk you through each phase of design. The Design Procedures Checklist, which follows this introduction, serves as a quality assurance tool, identifying the primary tasks that may be required in a study. If you are uncertain whether a task should be included, you can branch to a quick reference within the manual text that lists decision parameters. If you are still uncertain, the manual will direct you to outside references. We encourage you to research complex problems through as many other resources as necessary.

Use the checklist as a vehicle to ensure that you have considered all the significant design elements. The completed checklist will be a tool for developing the scope of a design study effort. You have complete freedom to accomplish the design task providing it is documented, consistent with good engineering practices, and goes through a proper review process.

Review Summary

Prior to advertising, complete a summary checklist documenting the critical design elements, site conditions, operational needs, design computations, rationale for choices among alternatives, and all assumptions. This will not only be a valuable tool for your future reference on similar projects, but will also allow reviewers to quickly scan the project for quality assurance. The summary checklist can be included in the design project report.

Project name:

DESIGN PROCEDURES CHECKLIST

Prepared by:

Date:

SECTION	PRIMARY TASK	IS TASK REQ' D? Y N		IF YES, WHAT ACTION IS NECESSARY? IF NO, WHY NOT?
1.00	DETERMINE BASIN AREA			
1.10	Identify Fleet (Length & Number)			
1.20	Develop Stall Float Layout			
1.30	Develop Transient Float Layout			
2.00	REQUIREMENTS FOR BASIN DEPTH			
2.10	Based on Total Fleet (Area & Draft)			
3.00	OBTAIN DESIGN REFERENCES			
3.10	Aerial Photographs			
3.20	Nautical Charts			
3.30	USGS Quadrangle Maps			
3.40	Existing Engineering Drawings			
3.50	Hydrographic/topographic Surveys			
3.60	Land Use Maps			
4.00	IDENTIFY ALL POTENTIAL SITES			
4.10	Deep Water Limitations			
4.20	Shallow Water Limitations			
4.30	Upland Access			
4.40	Land Ownership			
4.50	Environmental Considerations			
4.60	Archeological/Historical Areas			
5.00	SITE VISIT (Apply Site Selection Matrix)			
5.10	Investigate Alternative Sites			

5.20	Conduct Interviews			
5.30	Photographic Documentation			
5.40	Geotechnical (Quarries, Dredging)			
5.50	Beach Composition			
5.60	Landside Access			
5.70	Instrumentation Needs (and sites)			
6.00	SITE EVALUATION			
6.10	Select Preferred Site(s)			
7.00	PERFORM FIELD INVESTIGATIONS			
7.10	Surveying			
7.11	Cadastral			
7.12	Topography			
7.13	Hydrographic			
7.20	Geotechnical			
7.21	Surface Materials			
7.22	Sub-bottom Materials			
7.23	Quarry Investigation			
7.30	Environmental			
7.31	Prospective Contamination			
7.32	Fish migration			
7.33	Underwater Biota			
7.34	Wetlands			
7.35	Dredge Disposal/Upland Development			
7.40	Hydraulics			
7.41	Waves			
7.42	Currents			
7.43	Littoral Processes			
7.50	Planning & Economics			
8.00	METEOROLOGY			

8.10	Wind			
8.20	Air Temperature			
8.30	Precipitation			
9.00	INSTRUMENTATION NEEDS			
9.10	Anemometer			
9.20	Wave Gauges			
9.30	Tide Gauge			
9.40	Video Monitoring			
10.00	IDENTIFY WATER LEVEL VARIATIONS			
10.10	Astronomical Tides			
10.20	Tidal Datum			
10.30	Storm Surges			
10.40	Sea Level Changes			
10.50	Wave Setup			
10.60	Seiches			
10.70	Tsunamis			
11.00	DEEP WATER WAVE ANALYSIS			
11.10	Local Design Waves			
11.11	Delineate Fetches			
11.12	Estimate Winds			
11.13	Estimate Wave Height			
11.20	Non-Local Waves (Swell)			
11.21	Delineate Fetches			
11.22	Estimate Winds			
11.23	Estimate Wave Height			
11.30	Secondary Fetches			
12.00	WAVE TRANSFORMATION			
12.10	Refraction			

12.20	Diffraction			
12.30	Reflection			
12.40	Shoaling/Breaking			
13.00	CURRENTS			
13.10	Tidal Currents			
13.20	Wave-Induced Currents			
13.30	River Discharge			
14.00	SEDIMENTATION			
14.10	Identify Potential SOURCES			
14.11	Rivers/Streams			
14.12	Cliff Erosion			
14.13	Offshore Bars			
14.20	Identify Potential SINKS			
14.21	Inlets and Lagoons			
14.22	Headlands			
14.23	Offshore Slope(s)			
14.24	Spits			
14.30	Identify TRANSPORT Mechanisms			
14.31	Waves			
14.32	Currents			
14.33	Winds			
14.40	Estimate Sediment Budget			
15.00	DEVELOP INNER HARBOR WAVE CRITERIA			
15.10	Wave Disturbance			
15.11	Due to Harbor Resonance			
15.12	From Entrance Channel			
15.13	From Breakwater Transmission			
16.00	DEVELOP HARBOR LAYOUT			

16.10	Develop Basin Geometry			
16.20	Water Quality			
16.30	Evaluate Float Layout Alternatives			
16.40	Evaluate Upland Area			
16.50	Wave Resonance/Seiche			
17.00	EXPLORE BREAKWATER ALTERNATIVES			
17.10	Rubble Mound (stone, concrete, etc.)			
17.11	Determine Armor Type/Weight			
17.12	Determine Crest Height			
17.13	Determine Crest Width			
17.14	Determine Side Slopes			
17.15	Determine Layer Thickness			
17.16	Determine Toe Details			
17.20	Floating (concrete, timber, tires, etc.)			
17.30	Wave Barriers			
18.00	DEVELOP UPLANDS			
18.10	Harbormaster Office			
18.20	Public Restrooms/Showers			
18.30	Telephones			
18.40	Parking			
18.50	Utilities			
18.60	Fuel Storage			
18.70	Commercial Gear Storage			
19.00	BOAT HANDLING/HAUL-OUT			
19.10	Straddle Hoist			
19.20	Grid			
19.30	Marine Railway			
19.40	Crane Hoist			

19.50	Hydraulic Trailer			
19.60	Launch Ramp(s)			
19.70	Boat Storage			
20.00	WASTE FACILITIES			
20.10	Solid Waste Receptacles			
20.20	Liquid (Oil) Containment			
20.30	Boat Pumpout Facility			
21.00	UTILITIES			
21.10	Power			
21.20	Lighting			
21.30	Water			
21.40	Sewer			
21.50	Fire response			
21.60	Spill response			
	Appendices (other considerations)			
A	References			
B	Sources of Data			
C	Permits and Approvals			
D	Marine Construction Methods			
E	Contract Documents and Quality Assurance			
F	Operation and Maintenance			
G	Monitoring Completed Projects			
H	ADA Compliance			
I	Non-point Source Pollution			