

# SECTION B

## WATER AREAS

### **B1. General**

B1.1 The design depths and widths of various water areas within a recreational boat marina must take into consideration the sizes and types of boats expected to use the marina, wave action, currents, water level fluctuations, levels of seasonal boat traffic, silt deposition rates and anticipated frequencies of dredging in order to maintain the minimum design depths over projected dredging intervals, usually measured in years. Recommended design depths are exclusive of site-specific requirements for additional depths necessary to store estimated silt accretion that occurs between scheduled dredging intervals.

### **B2. Channel Design Criteria**

B2.1 Design depths for a specific marina must be based on a design low water elevation established on the basis of a low water datum for the area or reliable long-term extreme low water data obtained from federal, state and local water authorities. Such information should include low tide levels, lowest recorded water depths, etc., in salt water or fresh water locations as required.

B2.2 Required minimum depths below design low water must be objectively determined on the basis of the type (power or sail), length and draft of the boats expected to be berthed in a marina, or specific sections within a larger marina.

The table below provides minimum water depths below design low water, but does not address additional depths that may be necessary for silt deposition storage between periodic dredging operations.

**Table B - 1 Minimum Channel Widths and Depths**

<b>Channels: →</b>	<b>Entrance Channel</b>	<b>Interior Channel</b>
Minimum Bottom Width:	75 ft	75 ft
Minimum Depth Below Design Low Water:	3 ft below deepest draft boat or 5 ft, whichever is greater	2 ft below deepest draft boat or 4 ft, whichever is greater

### B3. Fairway Design Criteria

**Table B - 2 Minimum Fairway Widths and Depths**

Fairways →	Without Side-Ties	With Side-Ties
<b>Minimum Width</b>	1.75 L <sub>b</sub>  L <sub>b</sub> = length of longest berth <b><i>perpendicular</i></b> to the fairway.	1.50 L <sub>bb</sub>  L <sub>bb</sub> = length of longest boat side-tied <b><i>parallel</i></b> to fairway.
	If boats longer than the berths will be allowed to overhang into the fairway, L <sub>b</sub> should be considered to be the length of the boats.	The minimum width of the fairway does not include the width of the side-tie berth. See Tables B - 5 and B - 6 for powerboat and sail boat berth widths.
<b>Minimum Depth</b>	Same as for Interior Channels See Table B - 1	

### B4. Berth Design Criteria

#### B4.1 Berth Length and Water Depth

**Table B - 3 Minimum Berth Depth**

<b>Berth Length (feet)</b>	<b>Minimum Berth Water Depth (feet)</b>	
	<b>Powerboats</b>	<b>Sailboats</b>
Up to 45 ft	6 ft	6 ft
Up to 55 ft	8 ft	8 ft
Up to 65 ft	8 ft	10 ft
Over 65 ft	Site Specific Determination	

B4.1.1 The values shown in Table B - 3 reflect only the minimum depth requirements for berths of various length ranges. These minimum water depths must be applied with reference to site specific historic low water level data such as tide tables for coastal marinas, and hydrographic records for river and lake marinas.



B4.1.2 For the purpose of these guidelines, the berth length is considered to be the actual length of the dock or pier that defines the berth, i.e. the length of fingerfloats.

B4.1.3 In cases where the berth length cannot be determined, as in the case of a long dock without fingerfloats, each 40 feet will be considered as a berth, particularly for the purpose of determining the total number of berths in a marina to compute the required minimum number of accessible berths. See Section B5.1.1.

## B4.2 Single Berths

### B4.2.1 Minimum Single Berth Widths

See Table B-4 below, where:

- $L_{sb}$  = length of single berth
- $W_{sbp}$  = width of single berth for powerboat
- $W_{sbs}$  = width of single berth for sailboat
- $\ln$  =  $\log^n$

**Table B - 4 Minimum Single Berth Widths**

Application ↓	Minimum Widths of Single Berths (feet)	
	Powerboats	Sailboats
Design Work	$W_{sbp} = 8 \ln L_{sb} - 14 \text{ ft}$	$W_{sbs} = 6.5 \ln L_{sb} - 10.5 \text{ ft}$
Useful for Preliminary Layout and Planning Work	$W_{sbp} = (L_{sb} / 4) + 6 \text{ ft} - R_{pb}$ $R_{pb} =$ Reduction Factor for powerboats = 0.20 ft per ft of berth length under 30 ft and 0.125 ft per ft over 40 ft	$W_{sbs} = (L_{sb} / 5) + 5.5 \text{ ft} - R_{sb}$ $R_{sb} =$ Reduction Factor for sailboats = 0.125 ft per ft of berth length under 30 ft and 0.075 ft per ft over 40 ft.
	Note: The widths of recreational boat berths are generally based on average boat beams + 2 feet.	

B4.2.2 The equations for design work will probably be used most of the time for both planning and design work. However, the equations for preliminary layout and planning work should not be disregarded. They can be memorized and used in the field without the aid of a table or a calculator, and are a valuable aid in computing potential berth widths “in your head” when on site and in meetings. As shown for both powerboats and sailboats in Table B - 5 and Table B - 6 respectively, the two types of equations give similar results.

**Table B-5 Single Berth Widths for Powerboats**

<b>Single Berth Widths for Powerboats</b> 0.20 ft reduction per ft below 30 ft 0.125 ft reduction per ft above 40 ft					
Berth Length (ft)	Width Design Formula 8 In $L_b$ - 14 (ft)	Preliminary Layout & Planning Width Reduction			Recommended Berth Width (ft)
		$(L_b / 4) + 6.0 - R_{pb} = \text{Reduced Width (ft)}$			
16	8.2	10.0	-2.8	7.2	7.0
18	9.1	10.5	-2.4	8.1	8.0
20	10.0	11.0	-2.0	9.0	9.0
22	10.7	11.5	-1.6	9.9	10.0
24	11.4	12.0	-1.2	10.8	11.0
26	12.1	12.5	-0.8	11.7	12.0
28	12.7	13.0	-0.4	12.6	12.5
30	13.2	13.5			13.5
32	13.7	14.0			14.0
34	14.2	14.5			14.5
36	14.7	15.0			15.0
38	15.1	15.5			15.5
40	15.5	16.0			16.0
42	15.9	16.5	-0.25	16.25	16.0
44	16.3	17.0	-0.50	16.50	16.5
46	16.6	17.5	-0.75	16.75	16.5
48	17.0	18.0	-1.00	17.00	17.0
50	17.3	18.5	-1.25	17.25	17.0
52	17.6	19.0	-1.50	17.50	17.5
54	17.9	19.5	-1.75	17.75	17.5
56	18.2	20.0	-2.00	18.00	18.0
58	18.5	20.5	-2.25	18.25	18.0
60	18.8	21.0	-2.50	18.50	18.5
62	19.0	21.5	-2.75	18.75	18.5
64	19.3	22.0	-3.00	19.00	19.0
66	19.5	22.5	-3.25	19.25	19.0
68	19.8	23.0	-3.50	19.50	19.5
70	20.0	23.5	-3.75	19.75	19.5
72	20.2	24.0	-4.00	20.00	20.0
74	20.4	24.5	-4.25	20.25	20.0
76	20.6	25.0	-4.50	20.50	20.5
78	20.9	25.5	-4.75	20.75	20.5
80	21.1	26.0	-5.00	21.00	21.0

**Table B-6 Single Berth Widths for Sailboats**

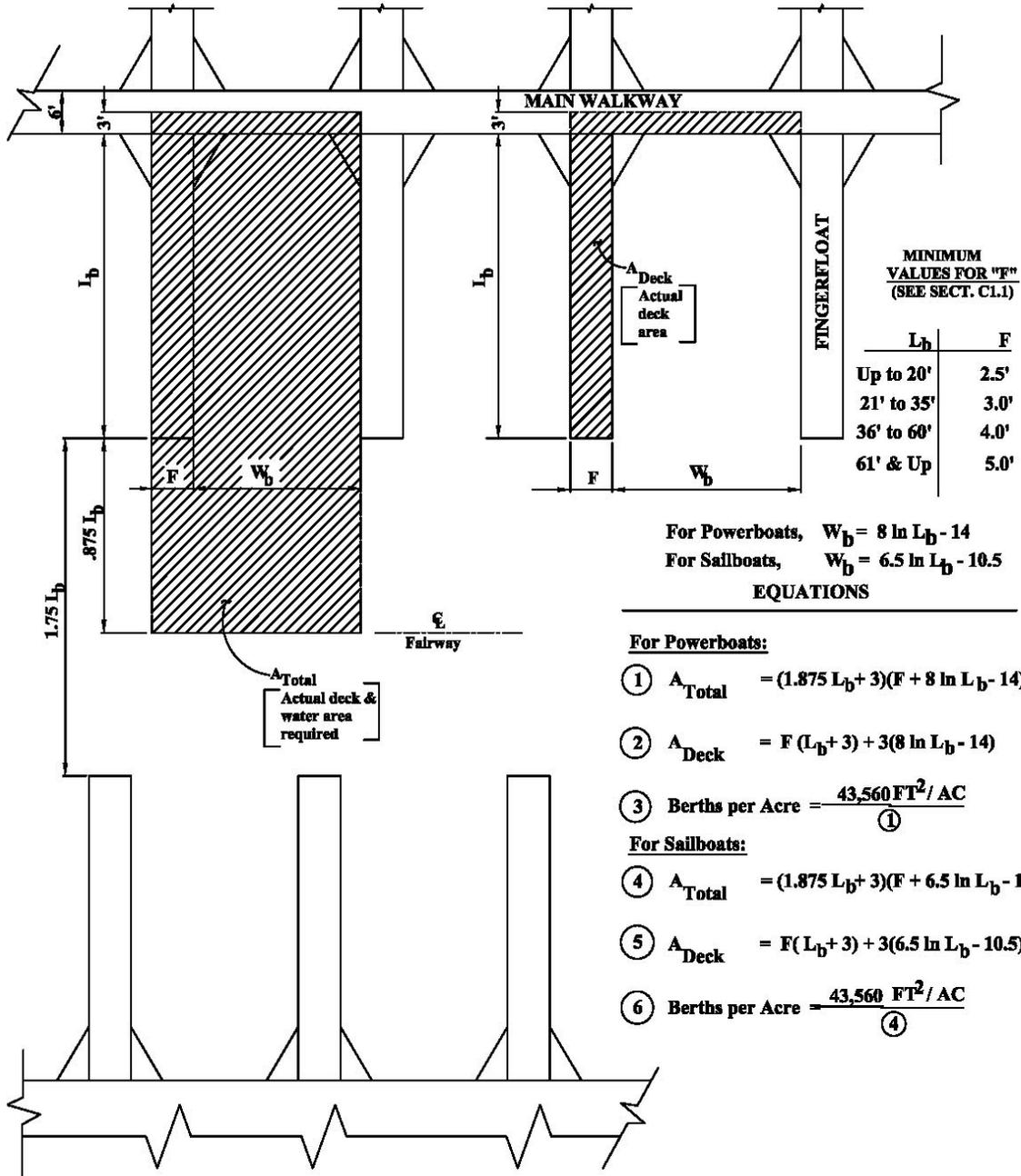
<b>Single Berth Widths for Sailboats</b> 0.125 ft reduction per ft below 30 ft 0.075 ft reduction per foot above 40 ft					
<b>Berth Lengths (ft)</b>	<b>Width Design Formula</b> $6.5 \ln L_b - 10.5$ (ft)	<b>Preliminary Layout &amp; Planning Width Reduction</b>			<b>Recommended Berth Widths (ft)</b>
		$(L_b / 5) + 5.5 - R_{sb} = \text{Reduced Width (ft)}$			
16	7.5	8.7	-1.75	6.95	7.0
18	8.3	9.1	-1.50	7.60	8.0
20	9.0	9.5	-1.25	8.25	8.5
22	9.6	9.9	-1.00	8.90	9.5
24	10.2	10.3	-0.75	9.55	10.0
26	10.7	10.7	-0.50	10.20	10.5
28	11.2	11.1	-0.25	10.85	11.0
30	11.6	11.5			11.5
32	12.0	11.9			12.0
34	12.4	12.3			12.5
36	12.8	12.7			13.0
38	13.1	13.1			13.0
40	13.5	13.5			13.5
42	13.8	13.9	-0.15	13.75	14.0
44	14.1	14.3	-0.30	14.00	14.0
46	14.4	14.7	-0.45	14.25	14.5
48	14.7	15.1	-0.60	14.50	14.5
50	14.9	15.5	-0.75	14.75	15.0
52	15.2	15.9	-0.90	15.00	15.0
54	15.4	16.3	-1.05	15.25	15.5
56	15.7	16.7	-1.20	15.50	15.5
58	15.9	17.1	-1.35	15.75	16.0
60	16.1	17.5	-1.50	16.00	16.0
62	16.3	17.9	-1.65	16.25	16.5
64	16.5	18.3	-1.80	16.50	16.5
66	16.7	18.7	-1.95	16.75	17.0
68	16.9	19.1	-2.10	17.00	17.0
70	17.1	19.5	-2.25	17.25	17.5
72	17.3	19.9	-2.40	17.50	17.5
74	17.5	20.3	-2.55	17.75	18.0
76	17.6	20.7	-2.70	18.00	18.0
78	17.8	21.1	-2.85	18.25	18.5
80	18.0	21.5	-3.00	18.50	18.5

**Table B-7  
SINGLE BERTH LAYOUT PLANNING DATA**

"F" Width of Finger (ft)	"L <sub>b</sub> " Length of Berth (ft)	Powerboats			Sailboats		
		Numbered Equations: See Table B-8					
		1	2	3	4	5	6
		Total Berth Area (ft <sup>2</sup> )	Actual Deck Area (ft <sup>2</sup> )	Berths per Acre	Total Berth Area (ft <sup>2</sup> )	Actual Deck Area (ft <sup>2</sup> )	Berths per Acre
2.5	16	352.5	72.0	123.6	330.7	70.1	131.7
	18	427.1	79.9	102.0	396.4	77.4	109.9
	20	504.9	87.4	86.3	464.6	84.4	93.8
3.0	22	607.5	107.2	71.7	557.2	103.8	78.2
	24	692.4	115.3	62.9	631.6	111.5	69.0
	26	779.6	123.2	55.9	707.8	119.0	61.5
	28	869.0	131.0	50.1	785.8	126.5	55.4
	30	960.4	138.6	45.4	865.5	133.8	50.3
	32	1053.7	146.2	41.3	946.7	141.1	46.0
	34	1148.8	153.6	37.9	1029.4	148.3	42.3
4.0	36	1316.1	200.0	33.1	1183.9	194.4	36.8
	38	1418.2	209.3	30.7	1273.0	203.4	34.2
	40	1521.9	218.5	28.6	1363.3	212.4	32.0
	42	1626.9	227.7	26.8	1454.7	221.4	29.9
	44	1733.4	236.8	25.1	1547.3	230.3	28.2
	46	1841.1	245.9	23.7	1641.0	239.2	26.5
	48	1950.2	254.9	22.3	1735.6	248.0	25.1
	50	2060.4	263.9	21.1	1831.3	256.8	23.8
	52	2171.8	272.8	20.1	1927.9	265.5	22.6
	54	2284.3	281.7	19.1	2025.4	274.3	21.5
	56	2397.9	290.6	18.2	2123.8	283.0	20.5
	58	2512.5	299.5	17.3	2223.0	291.7	19.6
60	2628.2	308.3	16.6	2323.1	300.3	18.8	
5.0	62	2864.0	382.1	15.2	2543.2	374.0	17.1
	64	2985.3	392.8	14.6	2648.5	384.6	16.4
	66	3107.6	403.6	14.0	2754.6	395.2	15.8
	68	3230.7	414.3	13.5	2861.4	405.8	15.2
	70	3354.6	425.0	13.0	2969.0	416.3	14.7
	72	3479.4	435.6	12.5	3077.2	426.9	14.2
	74	3605.1	446.3	12.1	3186.0	437.4	13.7
	76	3731.5	456.9	11.7	3295.5	447.9	13.2
	78	3858.7	467.6	11.3	3405.7	458.5	12.8
	80	3986.6	478.2	10.9	3516.4	468.9	12.4

# FIGURE B-1 SINGLE BERTH LAYOUT SCHEME

(BASED ON 6FT WIDE MAIN WALKWAY)



### B4.3 Double Berths

#### B4.3.1 Minimum Width for Double Berths of Same Length

Unless otherwise necessary, a double berth will typically be twice the width of a single berth of the same length.

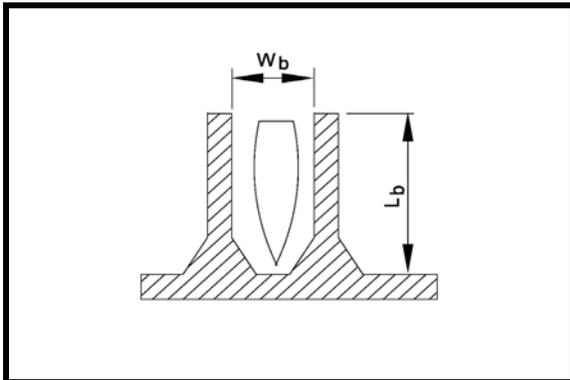
$$\begin{aligned}W_{db} &= \text{width of double berth} \\ &= W_{sb} \times 2\end{aligned}$$

#### B4.3.2 Minimum Width for Double Berths of Different Lengths

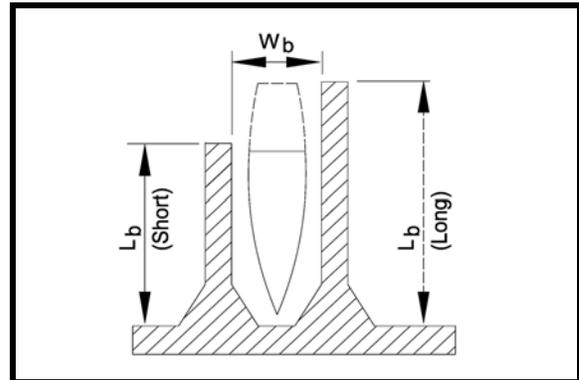
Where a double berth consists of two single berths of different lengths, the double berth width ( $W_{db}$ ) will be equal to the sum of the two single berth widths ( $W_b$ ) based on their lengths:

$$W_{db} = W_{sb1} + W_{sb2}$$

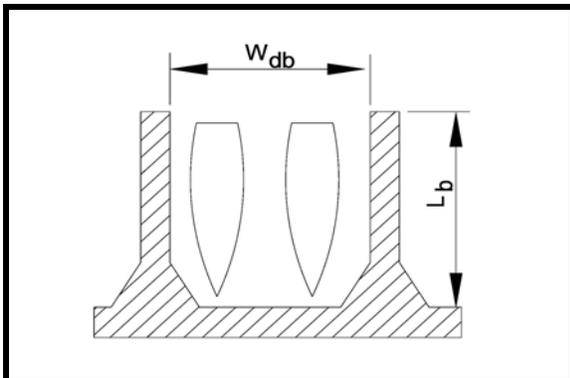
B4.3.3 Where it is desired to install a fingerfloat to divide an existing double berth into two single berths, additional berth width must be provided for the fingerfloat to avoid reduction of the design widths of the two single berths.



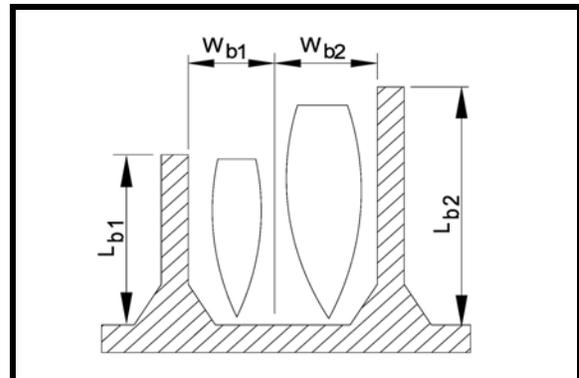
Single Berth – Equal Length Fingerfloats



Single Berth – Unequal Length Fingerfloats



Double Berth – Equal Length Fingerfloats



Double Berth – Unequal Length Fingerfloats

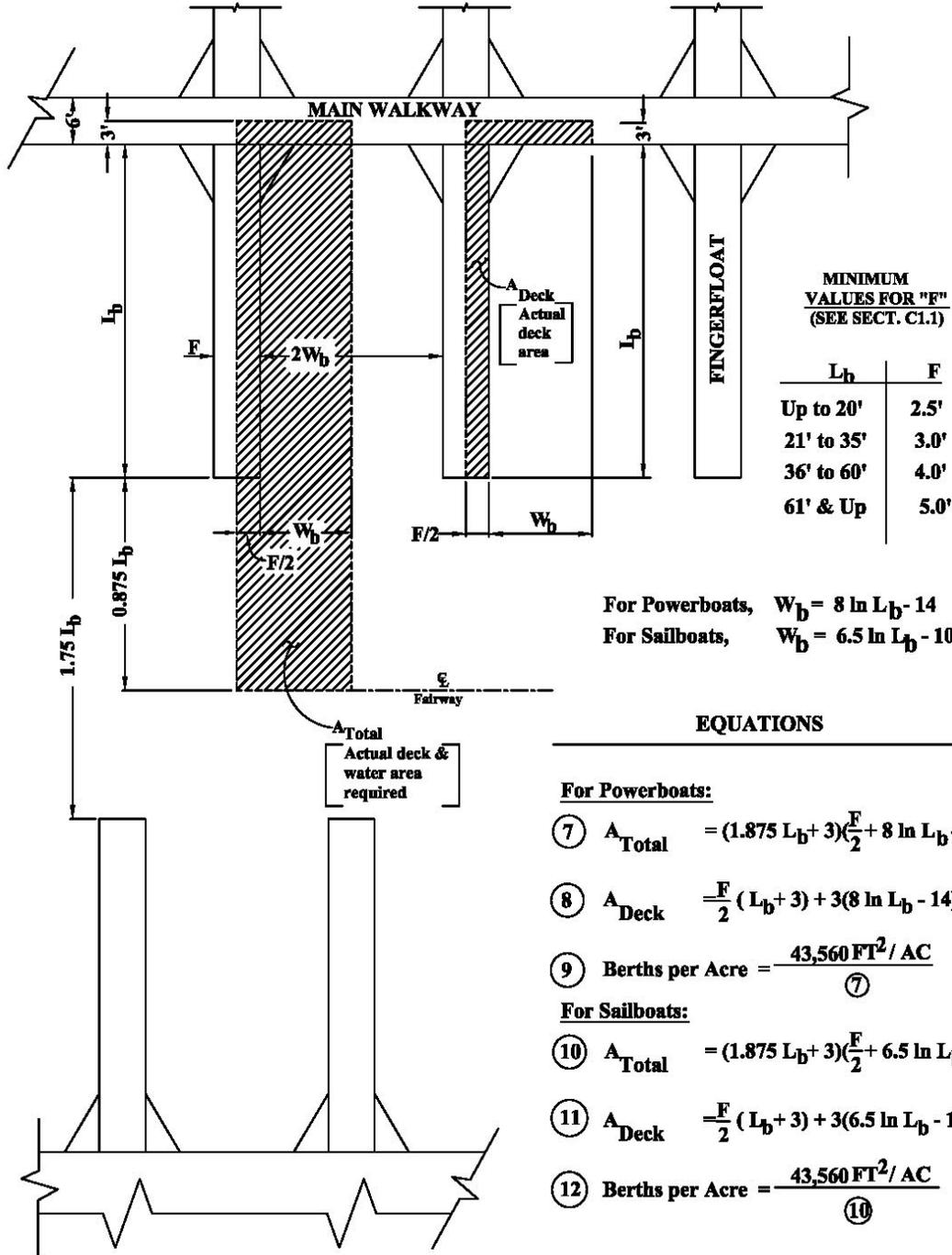
**Table B-8  
DOUBLE BERTH LAYOUT PLANNING DATA**

“F” Width of Finger (ft)	“L <sub>b</sub> ” Length of Berth (ft)	Powerboats			Sailboats		
		Numbered Equations: See Table B-10					
		7	8	9	10	11	12
		Total Berth Area (ft <sup>2</sup> )	Actual Deck Area (ft <sup>2</sup> )	Berths per Acre	Total Berth Area (ft <sup>2</sup> )	Actual Deck Area (ft <sup>2</sup> )	Berths per Acre
2.5	16	311.2	48.3	140.0	289.5	46.3	150.5
	18	381.2	53.6	114.3	350.5	51.1	124.3
	20	454.2	58.6	95.9	414.0	55.7	105.2
3.0	22	541.1	69.7	80.5	490.8	66.3	88.8
	24	620.4	74.8	70.2	559.6	71.0	77.8
	26	702.0	79.7	62.1	630.2	75.5	69.1
	28	785.7	84.5	55.4	702.6	80.0	62.0
	30	871.5	89.1	50.0	776.6	84.3	56.1
	32	959.2	93.7	45.4	852.2	88.6	51.1
	34	1048.7	98.1	41.5	929.2	92.8	46.9
4.0	36	1175.1	122.0	37.1	1042.9	116.4	41.8
	38	1269.7	127.3	34.3	1124.5	121.4	38.7
	40	1365.9	132.5	31.9	1207.3	126.4	36.1
	42	1463.4	137.7	29.8	1291.2	131.4	33.7
	44	1562.4	142.8	27.9	1376.3	136.3	31.6
	46	1662.6	147.9	26.2	1462.5	141.2	29.8
	48	1764.2	152.9	24.7	1549.6	146.0	28.1
	50	1866.9	157.9	23.3	1637.8	150.8	26.6
	52	1970.8	162.8	22.1	1726.9	155.5	25.2
	54	2075.8	167.7	21.0	1816.9	160.3	24.0
	56	2181.9	172.6	20.0	1907.8	165.0	22.8
	58	2289.0	177.5	19.0	1999.5	169.7	21.8
60	2397.2	182.3	18.2	2092.1	174.3	20.8	
5.0	62	2565.9	219.6	17.0	2245.0	211.5	19.4
	64	2677.8	225.3	16.3	2341.0	217.1	18.6
	66	2790.7	231.1	15.6	2437.8	222.7	17.9
	68	2904.4	236.8	15.0	2535.2	228.3	17.2
	70	3019.0	242.5	14.4	2633.3	233.8	16.5
	72	3134.4	248.1	13.9	2732.2	239.4	15.9
	74	3250.7	253.8	13.4	2831.7	244.9	15.4
	76	3367.7	259.4	12.9	2931.8	250.4	14.9
	78	3485.5	265.1	12.5	3032.6	256.0	14.4
	80	3604.1	270.7	12.1	3133.9	261.4	13.9

## FIGURE B-2

### DOUBLE BERTH LAYOUT SCHEME

(BASED ON 6FT WIDE MAIN WALKWAY)



**B5. Minimum Required Number of Accessible Berths**

B5.1 *The minimum required number of accessible berths shall be provided as per Table B5.1.*

B5.1.1 *Where the number of boat slips is not identified, such as along the edge of a long side-tie dock for example, each 40 feet of linear dock edge, or fraction thereof, shall be counted as one boat slip.*

**Example:** A side-tie dock 375 ft long would be considered to be 10 berths.

B5.1.2 The total number of berths in a marina facility must include all single berths, double berths, side-tie berths, end-tie berths, open berths and covered berths, as well as berths that are components of courtesy landings, visitor docks, fuel docks, sewage pumpout docks, harbor master office docks, haul out and repair docks, etc.

**Table B-9**  
**Minimum Required Number of Accessible Berths**  
(ADAAG Table 15.2.3)

Total Number of Boat Slips	Minimum Number
1 to 25	1
26 to 50	2
51 to 100	3
101 to 150	4
151 to 300	5
301 to 400	6
401 to 500	7
501 to 600	8
601 to 700	9
701 to 800	10
810 to 900	11
901 to 1000	12
1001 and over	12, plus 1 for each 100 or fraction thereof over 1000

