EZ Dock General Specifications *(Revision 09-03-09)*

1. Float and Deck Design Standard

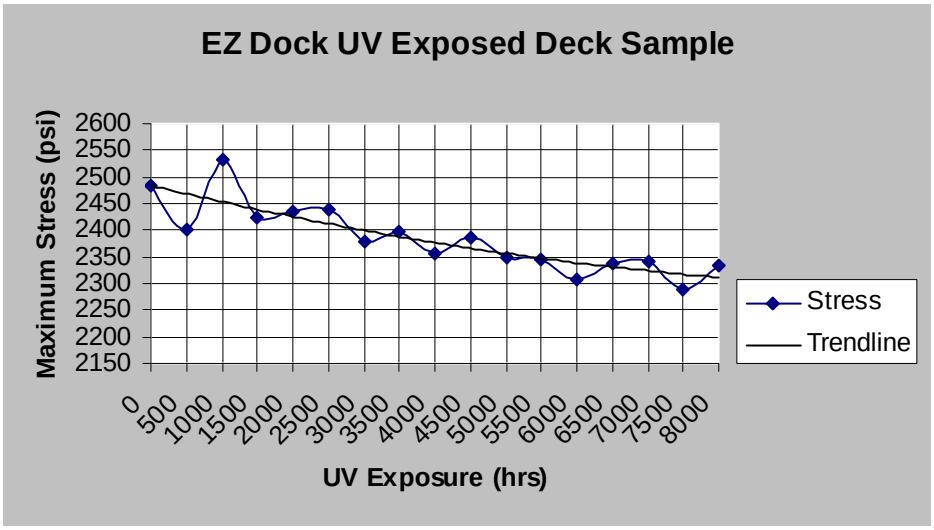
1.0 The individual dock section shall consist of decking surface and the float structure, which are to be constructed as a single, integrated component. Each section shall provide for the support of the dead load plus a specified live load of **62.5 pounds per square foot** (lb/ft^2). This shall be accomplished without the use of foam for either structural integrity or floatation. The dock sections shall be manufactured by a rotational molding process and each dock section shall be subject to the specific parameters of the particular model.

1.1 The individual dock section shall consist of a specified number of interior, air filler pylons. These pylons shall provide for flotation in the event of a breach of an exterior wall of the dock section; as well as the structural support for the deck portion of the float. Each pylon shall support the dead load plus a live load of 55 pounds (lb) The volume of each pylon shall be no less that 1540 cubic inches (in^3).

1.2 The individual dock sections shall be constructed of the following materials with the following general properties:

a. Virgin Polymer, Thermoplastic, Rotational Molding Grade **Linear Low Density Polyethylene-** (LLDPE)

b. An ultraviolet inhibitor system (UV-8) or better spectrometer specification. Laboratory testing conducted for 8000 hours yielded a 6.5% decrease in mechanical properties. The chart to the right shows the UV degradation trend line in relationship to mechanical property decrease over time. After the first 8000 hours the rate of decay is reduced significantly. Theoretical data indicated that the period of time between 8000 and 16000 hours yields an additional 0.7% decrease in mechanical properties.



(Real life scenario- 8000 hours of UV exposure can be related to approximately 9 years and 16000 hours related to 18 years of outdoor usage in southern Florida. These results show that a life expectancy in excess of 30-40 years is attainable.

c. A standard color of beige (or optional other) colorant in accordance with rotomolding standards.

d. The **density** of the section shall be approximately .932 grams per cubic centimeter (g/cm^3) or .0338 pounds per cubic inch (lbs/in^3) , per ASTM 792-00.

e. The dock section shall have a cold **brittleness** temperature equal to, or less than, -130° Fahrenheit (F), per ASTM D-746.

1.3 The properties of the exterior **wall thickness** of the dock sections shall be as follows:

a. The mean exterior material thickness shall be no less that .310 inches (in).

b. The corners shall be no less than .650 inches (in).

c. The exterior edge thickness shall be no less than 0.50 inches (in) at any particular point.

d. The walls of the dock sections shall resist a **shear** of no less that 1900 pounds per square inch (lb/in^2), per ASTM D-732, as well as having the capability of resisting a minimum **impact** of no less than 220 foot pounds (ft-lb), per ASTM D5420.

e. The **tensile strength** at failure shall be no less that 2630 pounds per square inch (lb/in^2) with 12 **elongation** at yield, per ASTM D-638.

1.4 The decking surface shall be composed of a textured or “orange peel” surface with a grid pattern for added adhesion during dry conditions. Drainage of the decking surface shall be accomplished through the use of troughs, which shall have a width of no more than 0.5 inches (in) and a depth of no more than 0.5 inches (in). The drainage troughs shall extend over the width of the dock and shall be positioned at intervals of no less that 4.5 inches (in) and no greater than 6.5 inches (in) over the entire length of the deck

a. The deck shall have an approximate **coefficient of friction** equal to 0.35 during dry conditions and 0.61 during wet conditions. Simply put, the decking surface is 37% less slick when wet than when dry per ASTM D2394.

b. The properties of the decking surface shall be as follows:

c. The mean deck thickness shall be no less that 0.315 inches (in).

d. The deck thickness shall be no less than 0.290 inches (in) at any particular point.

e. The deck shall resist a punching shear which is no less that 1900 pounds per square inch (lb/in^2), per ASTM D-732.

f. The deck shall resist a minimum impact of no less that 120 foot pounds (ft-lb) near the center, or at the point where the deck is thinnest, per ASTM D-3029.

g. The deck shall resist a minimum impact of no less that 150 foot pounds (ft-lb) within 16 inches (in) of the outside of the dock, per ASTM D-3029.

2. Floating Dock Structure

2.0 The dock structure, as a whole, shall consist of the individual sections, which are to be coupled together in the specific configuration desired by the purchaser. Any material used in the dock structure shall provide for resistance to rust, corrosion, and the effects of any fuel or gasoline. All material designed and selected for marine environment and the conditions there of.

2.1 A 2-D or 3-D layout drawing of the final configuration, including any accessories, shall be supplied for the purchaser if desired. Recommendations for anchorage can also be provided.

2.2 The dock structure shall act as one unit when assembled, so that wave and/or wind action shall produce a minimum amount of motion. The structure shall be secured with either piles, spuds, bottom anchors, or stiff arms. The securing shall allow the structure to rise and fall freely with any water level changes and allow the structure to span waves from crest to crest, while providing a stable walking surface.

3. Connections of Dock Sections

3.0 Each dock section shall have molded-in female-type pockets spaced symmetrically along the top and bottom edges, around the entire perimeter of the dock section. These pockets shall be spaced at 19.5 inch (in) intervals, center line to center line, from each other. *All un-used pockets are to be filled with supplied EZ Dock pocket filler (PN # 201030).*

3.1 The molded-in female-type pockets shall accept a male-type coupler which shall be secured into the female pocket with the use of a 0.5 inch (in) X 13 inch (in) coupler bolt and nut.

3.2 The purpose of such connections is to provide for simple assembly and disassembly, as well as providing for the securing of one section to another. The connection will also provide for the ability to attach EZ Dock accessories to the dock sections.

3.3 Each connection point shall allow for some slippage in the event that an extreme stress is applied. This slippage will allow for disconnection without causing damage either to the male-type couplers or the female-type pockets.

3.4 The dock sections shall be connected at increments of 19.5 inches (in), in relation to each other. These connections may be made from any one side of any dock section to any other side of another dock section. These connections may also be used to connect dock sections of differing dimensions and shall provide for ease of assembly, whether the sections are to be assembled on land or in the water.

3.5 The male-type coupler shall be constructed of no less than 90% post/pre-consumer recycled tire rubber.

3.6 Each male-type coupler shall withstand a pullout force of no less than 2500 pounds (lb) before failure of coupler occurs.

3.7 Each of the molded in female connection pockets shall provide for a pullout strength of no less than 3500 pounds (lb), before damage is caused to the dock section.

3.8 The accessories shall be connected to the dock system through the use of molded in coupler pockets around the perimeter of the dock sections by the use of either male or female type half-couplers. The male-type half-coupler (hardware connector, PN # S21140SS) shall have a 3.625 inch "T"–bolt embedded within it. The female type half-coupler (hardware connector, PN # S21141SS) shall have a 3.625 inch "T"–nut embedded within it Both types of half-coupler shall withstand a pullout force of no less that 2600 pounds (lb) before failure occurs.

4. Cleats

4.0 The tie up cleats shall be constructed of nylon 6,6 and shall have a length of 8-1/16 inches (in) and a height of 1-1/2 inches (in). The cleats shall be connected to the dock sections by two 5/16 inch (in) stainless steel bolts that are threaded into two stainless steel "T" nuts which are molded directly into the dock section. Each of the "T" nuts shall provide for a pull out force of no less that 2000 pounds (lb), so that the cleat may withstand a force of no less that 4000 pounds (lb).

4.1 T-nuts shall be molded in the dock sections in sets of two, with the distance between the two "T" nuts being 2-1/4 inches (in).

4.2 There shall be three sets of "T" nuts placed along the length of each side of the dock section. The sets of "T" nuts shall be placed at equal distances between the first and second pockets, between the third and fourth pockets, and between the fifth and sixth pockets, along both sides of the dock section.

4.3 There shall be one set of "T" nuts at one end of the 40 inch (in) wide dock section placed at equal distances between the two pockets.

4.4 There shall be two sets of “T” nuts at one end of the 60 inch (in) wide dock section placed at equal distances between the three pockets.

4.5 There shall be two sets of “T” nuts at both ends of the 80 inch (in) wide dock section. These “T” nuts shall be places at equal distance between the first and second pockets, and between the third and fourth pockets.

5. Anchorage

5.0 The dock system shall be designed to allow for the use of piling of various sizes, spud pipes, cables, or chains attached to a bottom anchor, or stiff-arm attachments for anchorage. Calculations can be supplied at purchaser’s request to support designed anchorage with the assumption that all collected data is accurate. Calculations, permitting, and licensed engineering design available at customers expense.

6. Hand Railing Attachment

6.0 The dock structure shall have the ability to accept railing which is constructed to meet the standards established by the Americans with Disabilities Act (ADA), States Organization for Boating Access (SOBA) and the National Uniform Building Code (NUBC). The railing shall be constructed of 1.5 inch (in) O. D., 14 gauge steel tubing. The steel tubing shall be finished either by a 0.003 inch (in) Hot-Dip Galvanizing or by powder coating painting process.

7. Gangways and Access

7.0 All construction is to be accordance with the minimum provisions of States Organizations for Boating Access (SOBA) and the guidelines stated by, “Marinas and Small Craft Harbors”. Gangways will be offered in several different material options but the offerings for loads, handrails, guardrails, transition plates, float mounts, shore mounts, and general designs will remain constant. Environmental conditions will influence the accessibility. Design layouts and advice can be supplied at request.

7.1 Gangways and Access Ramps shall be designed to support 90 pounds per linear foot (lbs/ftln). The deck and structural components shall be designed to support a concentrated load of 400 applied to any 12 inch X 12inch square. Lateral designed wind loads shall not exceed 77MPH.

7.2 Handrails shall be continuous along both sides of the of the walking surface and shall extend 12 inch past the walking surface on both ends. The top rail portion shall not be less than 34 inches nor more than 38 inches above the walking surface. The ends of the handrails shall be returned into the handrail body or terminate with no sharp or catching edges. The mounting and components of the handrails shall be capable of withstanding a lateral load of 50 pounds per linear foot.

7.3 Decking shall be per project specification and be skid resistant and made from marine grade appropriate materials.

8. Main Docks

8.0 The main docks are the walkways which are subjected to the most amount of traffic. These should be designed to provide for comfortable and easy walking widths. Design of the dock system for such things as pumps, power supplies, storage boxes, etc. to be attached to them, the overall width of the dock sections should have a minimum width of 60 inch (in) wide This will provide ample width for pedestrian traffic.

9. Finger Docks

9.0 The finger widths should be designed to allow for safe and comfortable walking widths. For boat or vessel mooring, a 40 inch (in) wide dock is sufficient to provide for finger stability as well as pedestrian safety for finger lengths up to 20 feet (ft) long. If the length of the finger exceeds 20 feet (ft) long, the 60 inch (in) or 80 inch (in) wide docks should be strongly considered.

10. Wind Exposure

10.0 Boat Profile Height – According to the American Society of Civil Engineers (ASCE) manual published in 1969, for the average height profile compared to the length of the boat, the following will apply.

- For a 10 foot (ft) long boat:
  ASCE average height is 3 feet (ft).
  For future considerations, will assume average heights up to 6 feet (ft).
- For a 20 foot (ft) long boat:
  ASCE average height is 3.5 feet (ft).
  For future considerations, will assume average heights up to 7 feet (ft).
- For a 25 foot (ft) long boat:
  ASCE average height is 3.6 feet (ft).
  For future considerations: will assume average heights up to 7.2 feet (ft).
- For all calculations done using the average boat profile heights, it will be considered that 100% of the boats using the dock will be twice the ASCE average profile.

10.1 Maximum Wind Exposure – From studies it has shown that forces caused by the maximum wind exposure comes from an angle to the boat, instead of directly to the side or to the front of the boat. Due to the non-feasibility of designing a dock system to handle a maximum tornado wind gust, it is suggested that a reasonable wind speed should be chosen. According to the design standards set up by the

Army Corps of Engineers, the dock system should be designed to withstand wind speeds of up to 77 miles per hour (mph) or 15 pounds per square foot (lb/ft^2).

10.2 Hidden Boats – It is a common practice to use load factors of 10% to 15% for each hidden boat affected by wind force. That is, every boat that is shielded by another boat, either in front of, or on the side of, will have a decrease in the amount of force which is applied to that boat due to the affect of the shielding boat. The use of a force factor of 15% per hidden boat shall be used in any calculations.

10.3 Load From Various Directions – In the designing of the boat dock system, if piles are to be used as the means of support, it is necessary to take into account the force being applied in the direction of the maximum wind exposure only. However; if chains, cables, or deadweights are to be used as the means of support, it would be necessary to take into account the wind exposure from all directions, when designing the dock system.

11. Load Design

11.0 **Dead Load**

a. The dead load shall consist of the entire dock system plus any additional attachments to the dock system.
b. Each dock section, without additional attachments, shall provide a **freeboard** of approximately 12.75” inches (in).
c. The surfaces of adjacent deck surfaces shall have an elevation difference of no more than 0.125 inches (in).
d. The ends of the fingers shall have an elevation of no more that 1 inch (in) above that of the main dock.
e. The deck surface of each dock section shall not slope more than 0.5 inches (in) over the 10 foot (ft) length of the dock section.
f. The deck surface of each 80 inch (in) X 10 foot (ft) dock section shall not slope more that 0.35 inches (in) over the width of the dock section.
g. The deck surface of each 60 inch (in) X 10 foot (ft) dock section shall not slope more than 0.25 inches (in) over the width of the dock.
h. The deck surface of each 40 inch (in) X 10 foot (ft) dock section shall not slope more than 0.15 inches (in) over the width of the dock section.

11.1 Live Load Due To Vertical Loads

a. Under dead load conditions plus an additional 30 pounds per square foot (lb/ft^2) of uniform live load, flotation shall provide for a minimum of 7 inches (in) of freeboard.

b. The dock structure shall support a concentrated vertical load of up to 400 pounds (lb)

at any particular point on the surface of the deck. The structure shall accomplish this while maintaining flotation.

11.2 Live Load Due To Horizontal Loads

a. The dock system shall sustain the stated design loads applied by normal current and/or debris which are normal to a particular location. (In extreme conditions other procedures such as additional anchorage, anchorage release, and/or dock system removal may be necessary.)

b. The dock system shall be capable of sustaining continuous wave action of up to 1 foot and occasional wave action not in excess of 3 feet during storm conditions.

c. The dock sections shall sustain any loads applied by non-moving ice without damage.

d. The dock system shall be compatible for the use of any boat or vessel size with a properly designed anchorage/mooring system. Boats or vessels over 35ft should be moored directly to the anchorage system.

e. The dock system and anchorage shall be capable of withstanding sustained wind loads of 77 miles per hour (mph), or 15 pounds per square foot (lb/ft^2), at 100% boat occupancy, unless otherwise specified.

f. The dock system shall be capable of withstanding the impact force caused by a 35 foot boat striking the end of a finger at a speed of 2 miles per hour (mph) and at an angle of 10^O off center.

12. Designing for Layout

The dock system, anchorage, and connections shall be designed according to the recommendations of the American Society of Civil Engineers Manual and Report on Engineering Practice Number 50, “Planning and Design Guidelines for Small Craft Harbors”, the revised edition.

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Works Cited:

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