



Hawaii Yacht Racing Association PHRF Handbook

February 2016

1. Introduction

a. Purpose

This Handbook is established to provide Hawaii Yacht Racing Association (HYRA) organizations a simple and fair handicap system based on comparative performance of boats. The rating system is referred to as the Performance Handicap Racing Fleet (PHRF).

b. Authority

HYRA has entered into an agreement with the Offshore office of US Sailing to provide PHRF ratings and certifications for HYRA members following this Handbook. This service includes initial registration and rating issuance, certificate renewal, rating adjustment for configuration changes, rating appeals, and data storage.

c. Use

The primary use for this Handbook is for boat owners to understand the basis for rating their boats so they may keep the boat in compliance with its rating. A secondary use is to understand the effects that modifications to a boat will have on its PHRF rating.

d. Disclaimer

Competitors should be aware that although US Sailing and HYRA will make every effort to assign ratings that are fair and accurate, no handicap rating system is perfect for all types of courses and all types of conditions. When appropriate, rating decisions will be made using reasonable assumptions about the types of courses and sailing conditions commonly encountered in Hawaii.

2. Administration

a. Requirements

- HYRA must be a member of US Sailing.

- Boat owner must be a member of US Sailing and a HYRA member organization.

b. Fees

- New Certificate: \$50
- Annual Certificate Renewal: \$50
- Rating Change Request: \$40

c. Registration

The service can be accessed from the US Sailing site home page (<http://www.ussailing.org/>). Clicking on “My US Sailing” allows boat owners to log onto their personal home page that will have a link to their PHRF boat(s). Following that link takes them to the Certificate Processing Center where the PHRF certificate can be renewed, modified, or registered for the first time.

d. Safety and Eligibility

This service is open to self-righting monohull boats that meet the safety requirements designated in a regatta’s Notice of Race and/or Sailing Instructions. Organizing authorities are encouraged to consider using the US Sailing Safety Equipment Requirements located at <http://www.ussailing.org/safety/equipment-and-requirements/>.

3. Ratings and Courses

a. Time on Distance

PHRF ratings are based on speed potential and performance with “seconds per mile” (Time on Distance or TOD) used to express the ratings. Increments of performance are three (3) seconds per mile. Rating changes made as a consequence of modifications to a boat will be in accordance with Appendix B.

b. Time on Time

The majority of races are scored using the Time on Time (TOT) scoring method. For this method, each boat is assigned a Time Correction Factor (TCF), which is calculated using the formula:

$$TCF = A / (B + PHRF \text{ Rating})$$

Where the denominator (B + PHRF Rating) is the number of seconds it takes for a boat to sail a nautical mile in the expected conditions. The B factor “floats” between 480 and 650. Recommended B Factors are provided below.

B Factor	When Used
480	Heavy air or all off the wind
550	Normal conditions
650	Light air or all windward work

The A factor is simply a scaling factor and has no effect on a boat's corrected finish position. In Hawaii, Race Committees should set the A Factor to equal the B Factor. For instance, in a heavy air race the TCF formula would look like the following:

$$TCF = 480 / (480 + PHRF \text{ Rating})$$

Race Committee may set the A Factor and B Factor at its sole discretion, but it must be the same for each boat that competes in a given class within a given race. It's highly recommended that the A Factor and B Factor be the same for all classes competing in a race, especially if there is an "overall" trophy for the event.

The boat's corrected time is calculated using the formula:

$$\text{Corrected Time} = TCF \times \text{Elapsed Time}$$

c. Course Types

PHRF uses a system of THREE RATINGS to reflect the performance potential of boats in different types of courses. The ratings are designated as the "BASE COURSE RATING" (**BASE**), the "DOWNWIND COURSE RATING" (**DWC**).

- The BASE rating is assigned to all courses except DWC courses.
- The DWC rating is assigned to courses that, under normal conditions, are expected to have at least 2/3 of the distance to be a reach or a run for one-way races with no return (such as the Lahaina Race and the Kauai Channel Race).

It should be noted that under this convention, a multiple-day distance event that has mostly upwind racing on one day, and mostly downwind racing on another day, would use the BASE rating for all days of racing. Examples of this type of event would be the Ko Olina Regatta and the 3-Day Around Oahu Regatta.

4. Initial Ratings

a. Application Submittal

Upon receipt of a completed "Application for Rating," US Sailing shall either assign a rating to the boat as described in Section 4.b or 4.c. Ratings will be accessible on the HYRA Valid List, which is posted on the US Sailing website.

Appendix A (Standard Sail and Equipment Specifications) defines the baseline configuration for the vast majority of standard production boats.

b. Standard Production Model Boats

If the boat is a previously rated standard production model, then US Sailing shall assign to the boat the Ratings that are currently assigned to the other boats of that standard production model. As used in this Handbook, “standard production model” means any boat for which one or more boats of the same make and model have current ratings listed in the US Sailing PHRF Ratings Handbook (the “Red, White and Blue Book”), and where all such boats have the same rig, sail, hull, and equipment dimensions and configuration.

c. Modified Standard Production Boats, Not Previously Rated Standard Production Boats, Limited Production Boats, and One-Offs

If the boat is not a previously rated standard production model, the rating shall be determined by US Sailing as described below.

- For standard production boats that have been modified, Appendix B (Standard Rating Adjustments) lists the rating adjustments for “standard” changes.
- For not previously rated standard production boats, limited production boats, and one-offs, ratings shall be determined using all available information including, but not limited to, ratings established by another fleet, ORR and IRC certificates, and the ORR VPP.
- When appropriate, ORR technology will be used to scale from ratings established by a fleet with different wind strengths and to translate BUOY ratings to DWC and MISC ratings. These sources will be used to produce a draft rating. This draft rating shall be reviewed by a consortium of chief handicappers (including at least one HYRA representative) ala Key West Race Week.
- These ratings shall not be challengeable until at least five (5) qualifying events have been sailed.

5. Aloha Class

An organizing authority may issue a rating for boats that compete in Aloha Class only.

6. Changes to Ratings

a. Triggers for Rating Changes

- An alteration of a boat’s configuration.
- A Rating Review request from one of the following:
 - The boat owner
 - HYRA
 - A competitor

b. Procedure for Initiating a Rating Change Request

Submit the following information to US Sailing electronically:

- The desired rating change.

- Results of five or more Approved Event race results where the boat remains in the same configuration.
- An analysis that supports the desired rating change.

c. US Sailing Actions

- US Sailing shall inform HYRA of the request.
- US Sailing shall respond within 30 days with their findings and accompanying rationale copying the owner and HYRA.

d. Boat Owner Options

- Accept the findings.
- Appeal the new rating and provide a rebuttal analysis – US Sailing has 30 days to respond.
- If dissatisfied with the result of the appeal, the case can be appealed at the National PHRF level (<http://www.ussailing.org/racing/offshore-big-boats/phrf/usphrf-national-appeals-process/>)

Appendix A Standard Sail and Equipment Specifications

1. Rig and Sail Measurements

Mainsails

- P** *Mainsail Hoist.* The measured length of the hoist of the sail. It is the distance along the after side of the mast from the highest level to which the head of the sail may be set to the lowest position of the tack. The highest point shall be taken at the top of the highest sheave used for the main halyard, or to the lower edge of a one-inch band around the mast. If a sliding gooseneck is used, measurement is to be made with the boom at the extreme bottom of the slide unless the lowest sailing position of the foot is marked by the upper edge of a one-inch band around the mast
- E** *Mainsail Foot Length.* The distance, measured along the top edge of the boom, from the aft edge of the mast to the furthest aft point on the boom to which the clew of the mainsail may be extended. Where this latter point is inside the boom end, it shall be indicated by the inner edge of a one-inch band around the boom.
- MH** *Mainsail Headboard.* The maximum fore and aft dimension from the luff of the main, projected if necessary, to the extreme aft edge of the leech measured across the widest part of the headboard

Jibs

- J** *Foretriangle Length.* The horizontal distance from the foreside of the mast at the deck to the forestay where it meets the deck. If the mast is moveable at the deck, the “J” shall be measured with the mast in the aftermost position.
- I** *Jib Hoist.* The vertical distance from the top of the jib sheave to the shear line abeam of the mast.
- LP** *Longest Perpendicular.* The perpendicular distance from the luff (outside the edge of the luff or rope) to the clew of the headsail (intersection of edges of sail). This is the largest such dimension of all jibs carried on board.

Spinnakers

Note: Spinnakers shall be measured with such tension as will remove wrinkles across the line of measurement.

- ISP** *Spinnaker Hoist.* The vertical distance from the top of the spinnaker sheave to the shear line abeam of the mast.
- SMW** *Spinnaker Maximum Width.* The maximum distance measured between points on the luffs equidistant from the head, measured either at the foot or across the body of the sail.
- SL** *Spinnaker Luff.* The greatest length of spinnaker luff and leech measured around the edges of the sail. Where stiffening is used to extend the angles of the tack or clew of spinnakers beyond an included angle of 110

- degrees, the greatest length of any such stiffening in the foot of the sail, measured from the clew, shall be added to the luff length to determine SL.
- SF** *Spinnaker Foot*. The distance from tack to clew measured in the shortest path on the surface of the sail.
- SMG** *Spinnaker Midgirth*. The distance between the midpoints of luffs measured in the shortest path across the sail.
- SPL** *Spinnaker Pole Length*. The length of the spinnaker pole when measured from the forward edge of the mast to the end of the pole or the length of a “bowsprit pole” used with asymmetrical spinnakers when measured from the forward edge of the mast to the tack pint of the extended bowsprit pole.
- BPL** The length of a “bowsprit pole” used with asymmetrical spinnakers when measured from the forward edge of the mast to the tack point of the extended pole.
- ALU** *Asymmetrical Luff*. Similar to SL, but measuring only the luff of the asymmetrical spinnaker.
- AF** *Asymmetrical Foot*. Similar to SF, but measuring the shortest path from the tack to the clew of the asymmetrical spinnaker.
- IA** *Asymmetrical Spinnaker Hoist*.

2. Definition of Jibs

- a. A jib is defined as any sail, other than a spinnaker, that is to be set in the fore triangle.
- b. A sailboat may use a luff groove device provided that such luff groove device is of constant section throughout its length and is either essentially circular in section or is free to rotate without restraint.
- c. Jibs may be sheeted from only one point on the sail except in the process of reefing. Thus, quadrilateral or similar sails in which the sailcloth does not extend to the cringle on each corner are excluded.

3. Limitations on Jibs

- a. No clew boards may be used on jibs.
- b. No head boards may be used on jibs.
- c. Battens:
 - Battens may be used only in jibs 110% or smaller LP
 - There is no limit on the length or number of battens.
- d. Except for non-overlapping jibs, the midgirth, measured between the luff and leech, shall not exceed 50% of the foot length, nor shall the length of any intermediate girth exceed a value similarly proportional to its distance from the head of the sail.
- e. In no case shall the sum of the LP of the headsail and the distance measured from the forward end of the J to the tack of the sail be greater than the sailboat’s rated LP.

4. Definition of Spinnakers

- a. General
 - i. A spinnaker is any sail which, when carried in its normal position, is set forward of a boat's foretriangle with a midgirth (SMG) equal to, or greater than, 75% of its foot length (SF), including such sails tacked to a stemhead fitting or such sails provided with a stemhead tackline.
- b. Symmetrical Spinnakers
 - i. Luff and leech must be of equal length.
 - ii. The sail must be symmetrical, in shape and construction, about a line joining the head to the center of the foot.
- c. Asymmetrical Spinnakers
 - i. A spinnaker for which the luff and leech are not equal length.
- d. Code Zero Spinnakers
 - i. A spinnaker with a midgerth (SMG) less than 75% of its foot length (SF).

5. Limitations of Spinnakers

- a. Spinnakers shall be sheeted from only one point on the sail.
- b. Battens shall not be used in spinnakers.
- c. *Spinnaker Luff* (SL) shall not exceed 0.95 times the square root of $(I^2 + J^2)$ without adjustment.
- d. *Spinnaker Maximum Width* (SMW) shall not exceed 1.8 times J without adjustment.
- e. Adjustable leech lines are not permitted on spinnakers.
- f. Spinnaker pole length shall not exceed 100% of J without penalty unless part of the Standard Production configuration.

6. Limitations of Asymmetrical Spinnakers

- a. Choice of asymmetrical, symmetrical, or both types of spinnakers shall be made at the time of application or renewal and may be changed once during the sanctioned racing season.
- b. *Asymmetrical Luff* (ALU) shall be no greater than 1.1 times the square root of $(IA^2 + (J + (SPL\%/100))^2)$ without adjustment.
- c. *Asymmetrical Foot* (AF) shall be no greater than $(J * (SPL\%/100) * 1.8)$. SPL% shall include extendible bowsprits without adjustment.
- d. *Asymmetrical Midgirth to Foot Ratio* (AMG/AF) shall not be less than 0.75 without adjustment.

7. Limitations on Mainsails

- a. The number of battens in any mainsail or mizzen is not restricted. Batten spacing shall be approximately equal between headboard and clew.
- b. The maximum unpenalized mainsail headboard (MH) dimension shall not exceed 4% of E.
- c. Rated without adjustment are One Design mainsail girths, or IMS maximum default girths as described below:
 - MGT (7/8 leech) = $0.22 * E$
 - MGU (3/4 leech) = $0.38 * E$

- MGM (1/2 leech) = 0.65 * E
 - MGL (1/4 leech) = 0.85 * E
- d. Loose-footed mainsails are permitted.

8. Mizzen

The measurement procedures and limitations for mizzens shall be the same as for mainsails.

9. Mizzen Staysails

- a. Sheet leads may be to hull or rail and to mizzen boom, but they may not be sheeted to any other spar or outrigger.
- b. Mizzen staysails must be 3-cornered (head, tack, and clew). The tack or tack pennant must be secured abaft the point of intersection of the face of the mainmast with the deck and also must be secured no higher than a rail cap, deck, or cabin top.
- c. No mizzen staysail may be carried set on a sloop rig flying from the backstay.

10. Shooters, Bloopers, etc.

Bloopers are not allowed.

11. General Equipment Limitations

- a. Sailboats shall race as rated with at least all the equipment and furnishings as supplied standard equipment by the manufacturer. A sailboat which has altered or removed bulkheads, permanently attached furniture, or structural interior components shall be considered a custom sailboat. Drawers, headliners, cabinet and locker doors, steps, ladders, and engine enclosures shall remain in place as supplied as standard equipment for a sailboat not to be considered a custom sailboat. Passageway doors, cushions, dining tables and carpet are specifically exempted and are alterable or removable provided all the safety requirements, as designated by the event's Notice of Race and/or Sailing Instructions, are met.

12. Non-Spinnaker Limitations

- a. The maximum length of a spinnaker pole (whisker pole) that may be used without adjustment shall be equal to J. If the spinnaker pole (whisker pole) is adjustable, a red color shall be visible if the pole is extended beyond its rated length.
- b. The non-spinnaker headsail shall meet all PHRF jib regulations. No part of the luff of a jib shall be more than 4% of the length of the luff away from the measured perpendicular to a straight line drawn from its halyard exit to the point on the sailboat to which it is tacked. The use of asymmetrical spinnakers is prohibited in the non-spinnaker class.
- c. All other sail and equipment rules applicable to spinnaker classes apply to non-spinnaker classes, except that the non-spinnaker class allows the concurrent use of two headsails while racing.

- d. The non-spinnaker mizzen staysail shall be in compliance with the mizzen staysail section of these specifications, and other than sheeting requirements, shall meet PHRF jib definitions and limitations.

13. Stock Boat Roller Furler

- a. If a standard class boat is supplied from the factory with a RF system for the genoa/jib, the board of handicappers will provide the rating for the class assuming no modifications to the RF system or sail attachment thereto. This means that the genoa/jib shall be tacked above the RF drum and the swivel is at maximum luff hoist when a jib is flown.
- b. Any modifications departing from these standards must be reported to the board of handicappers.

14. Unconventional Craft

- a. Boats that fall outside of the above established guidelines must meet the standards set by the board of handicappers.

Appendix B

Effects of Boat Modifications on Ratings

Rating adjustments for modifications are applied on an individual basis. The following guidelines are useful for estimating the rating effect of changes, but do not necessarily reflect the actual adjustments that would be made. Sometimes the penalty, or credit, applied is less than the sum of the individual components in these guidelines. This happens most often when two or more of a combination of modifications fall between break points in a complimentary fashion. Other reasons for deviating from the guidelines are usually based on the different ways in which the same change might affect boats in unlike characteristics.

1. Rig Adjustments

Guidelines for rating adjustments due to rig changes are based on percent change to the calculated Sail Area (SA). SA includes 100% foretriangle and mainsail area, including mainsail roach.

- a. Guide for I alone, J alone, I & J together, or I & P together.
 - i. 3 sec/mi for up to 2% change
 - ii. 6 sec/mi for over 2% up to 4% change
 - iii. 9 sec/mi for over 4% up to 6% change
 - iv. 12 sec/mi for over 6% up to 10% change
 - v. 15 sec/mi for over 10% up to 15% change

- b. Guide for P alone, E alone, or P & E together (affecting main only)
 - i. 3 sec/mi for up to 5% change
 - ii. 6 sec/mi for over 5% change

- c. Replacement of a yacht's mast with a new mast differing from the original mast in manufacturer, extrusion section, standing rigging, or design, shall cause the yacht to be designated a "MOD" and individually rated based upon observed performance. Changes to running rigging or backstay adjuster type shall not constitute a modification.

2. Spinnaker, Pole, and Bowsprit Adjustments

Symmetrical and asymmetrical spinnakers may be used on the same yacht as requested by the owner at the time of application or renewal of the boat's rating. A boat choosing to race with both types of spinnakers is subject to a rating adjustment for using both types of spinnakers to be determined on a boat by boat basis by the US Sailing handicappers.

- a. **GUIDE FOR SYMMETRICAL SPINNAKERS AND POLES.** No adjustment is imposed for the use of symmetrical spinnakers, provided they do not exceed the guidelines defined in the Standard Sail and Equipment Specifications (Appendix A). These guidelines apply to the largest spinnaker, if more than one is carried on the boat. These guidelines are almost always applied as

shown. Combinations not shown are considered unusual and must be evaluated by the handicappers.

- i. Spinnaker Pole Length (SPL) alone; adjustment = 3 sec/mi per 10% above unpenalized maximum, not to exceed 6 sec/mi.
 - ii. Spinnaker Girth (SMW), or maximum width, alone; adjustment = 3 sec/mi per 5% above unpenalized maximum, not to exceed 6 sec/mi.
 - iii. Spinnaker Luff Length (SL) alone; adjustment = 3 sec/mi per 5% above unpenalized maximum, not to exceed 6 sec/mi.
 - iv. Combined SPL and G adjustment, if both match each other (i.e., G is 180% of SPL); adjustment = 3 sec/mi for each 5% increase of SPL over 100% of J.
- b. GUIDE FOR ASYMMETRICAL SPINNAKERS, POLES, AND BOW SPRITS. No penalty is imposed for the use of asymmetrical spinnakers, provided they do not exceed the guidelines defined in the Standard Sail and Equipment Specifications (Appendix A). These guidelines apply to the largest asymmetrical spinnaker, if more than one is used.
- i. Asymmetrical Luff (ALU) adjustment = 3 sec/mi for up to each 3% variation (+ or -) from unpenalized size range.
 - ii. Asymmetrical Foot (AF) adjustment = 3 sec/mi for up to each 3% addition to unpenalized maximum.
 - iii. Asymmetrical Mid Girth to Asymmetrical Foot (AMG/AF) ratio adjustment = 3 sec/mi for up to each 3% reduction from unpenalized maximum.
 - iv. Extended spinnaker poles or Bow Sprit (BS):
 - Adjustment = 3 sec/mi for up to 25% increase over J.
 - Adjustment = 6 sec/mi for 26% - 50% increase over J.
 - Adjustment for over 50% increase over J shall be evaluated by the US Sailing handicappers.

3. Keel Rating Adjustments

Credits and penalties for keel variations or modifications, including boards, may vary from 3 to 12 sec/mi. The Board of Handicappers will evaluate each case on an individual basis.

4. Engine Rating Adjustments

The rating differential between boats of the same type, one powered by an inboard motor, and the other by an outboard, may vary from 3 to 6 sec/mi. The actual adjustment depends on the size, weight, and design configuration of the boat. Six (6) sec/mi is a normal adjustment. Boats rated without an auxiliary engine shall have a penalty adjustment of 3 or 6 sec/mi.

5. Roller Furling Genoa/Jib Adjustments

Roller furling credits may be given if a roller furling sail meets material guidelines and has UV protection on the leech and foot. A credit of 6 sec/mi may be given if the roller furling drum is located wholly above deck level. A credit of 3 sec/mi may be given if the roller furling drum is located at or below deck level. Roller furling sails made before January 1, 2001 and constructed of aramid (i.e., Kevlar™, etc.) or carbon material are not allowed for roller furling credits. Roller furling headsails built after December 31, 2000, must be of woven material, or have woven taffeta outer skins, and have a woven leech and foot cover of at least 4 oz. UV protected woven material to be eligible for a rating adjustment.

6. Propeller Rating Adjustments

Credits to ratings may be provided for various types of fixed bladed propellers based on the type, number of blades, and the propeller's "exposure." The actual adjustment depends on the size, design, and number of blades, and exposure as installed on the particular yacht. Evaluation of the design of the propeller will depend on the intended purpose being primarily to propel the yacht under power (i.e., a cruising design).

- a. Credit = 9 sec/mi for 3 bladed solid prop on exposed shaft.
- b. Credit = 6 sec/mi for 2 bladed solid prop on exposed shaft.
- c. Credit = 6 sec/mi for 2 or 3 bladed solid prop on outboard fixed in well.
- d. Credit = 6 sec/mi for 3 bladed solid prop in an aperture.

No credits are recommended for any propeller on a retracting outboard motor, 2 bladed solid propellers in an aperture, retracting propeller shaft or any 2 or 3 bladed feathering or folding propeller, whether installed on an exposed shaft or in a full apert

7. Mainsail Roach Adjustments

Mainsail roach exceeding the values listed in paragraph 11.C of the Standard Sail and Equipment Specifications (Appendix A) by up to 5% may be penalized 3 sec/mi. Excessive girth mainsails may be adjusted 6 sec/mi depending on the amount of increased girth. In addition, handicappers may review headboard size and if the headboard exceeds 6 inches, or $0.04 * E$, whichever is larger, an adjustment may be applied.

8. Stored Energy Adjustments

If stored energy is used to help in adjustment of sails, rigs, or to otherwise enhance performance, a rating adjustment may be applied.

9. Roller Furling Adjustments

Roller furling mainsail credit may be given if the mainsail can be furled on a drum and spindle mechanism mounted within the mast or boom extrusion. A credit of 6 sec/mi may be given if the mainsail does not have battens. A credit of

3 sec/mi may be given for mainsails with full-length battens that furl within the boom. Roller furling mizzen sails may be given a credit of 3 sec/mi.

- a. For air battens, the pressure in the air battens shall not be adjusted during a race.
- b. Roller reefing boom, where the mainsail is rolled around the boom, is not eligible for a rating credit.

10. ORR Analysis Adjustments

A boat may request an evaluation of changes based on the ORR Rule. There shall be a fee for this service based on the complexity of the changes.

11. Approved Regattas

In order to be eligible to be considered as part of the basis for a rating change, a regatta must have the following characteristics:

- a. At least two other competitors in the boat's class finished the race(s).
- b. Wind conditions were reasonably consistent during the race(s).
- c. There were no significant errors in sail handling, navigation, equipment failure, etc.
- d. Scoring was done on a Time-On-Time basis.
Note: "beer can" races are specifically excluded, and are not eligible as Approved Regattas.
- e. The Organizing Authority provides a brief report to US Sailing and/or the HYRA PHRF liaison regarding weather conditions and other notable events that occurred while racing.