Explanation of Ratings and Parameters for the EZ Rating Rule

Source of Performance Data

The table below includes all the raw data generated by the EZ VPP. All ratings are produced from these data values. **True Wind Speed (TWS)** column headings are in **gold**; **True Wind Angle (TWA)** rows are in **green**. The sample data shown below is for a One-Design Farr 40.

Example for OD Farr 40:

Table of Polar Time Allowances (spm) for OD Farr 40								
TWA / TWS	***4 kts***	***6 kts***	***8 kts***	***10 kts***	***12 kts***	***16 kts***	***20 kts***	***24 kts***
Opt Beat Angle	45.0°	43.9°	42.4°	39.1°	37.2°	36.0°	35.9°	35.7°
Beat VMG	1,247.5	898.3	732.3	669.0	637.8	608.1	590.3	580.5
52°	780.9	579.1	489.3	464.9	451.4	433.3	422.1	415.7
60°	705.3	536.4	468.2	447.4	434.9	417.3	406.0	399.1
75°	653.0	503.4	447.4	425.7	413.1	393.9	379.4	369.2
90°	631.2	488.2	436.0	411.7	394.9	371.2	354.7	339.2
110°	620.5	477.6	423.6	397.2	376.2	344.1	320.7	303.6
120°	641.3	489.5	429.3	395.3	372.1	333.8	305.5	286.5
135°	793.5	570.1	471.0	433.4	403.2	339.1	286.7	263.4
150°	971.8	698.2	567.8	499.7	451.0	388.9	328.3	266.3
165°	1,083.9	778.7	633.3	557.4	497.6	421.4	366.2	297.1
Run VMG	1,122.1	806.2	655.6	577.0	515.1	436.1	379.1	307.5
Opt Run Angle	127.8°	132.1°	138.7°	146.8°	157.5°	166.7°	142.3°	145.4°

How to Analyze Courses and Apply Ratings

Course and Wind data is always distributed in accordance with the **distance sailed along the rhumb line** and not the time spent in each condition.

For example, a boat might spend **one hour** tacking upwind and cover **3 nm** (along the rhumb line) and then spend **one hour** on a broad reach and cover **7 nm**. The breakdown of such a course is **30% beat** and **70% reach** (by distance), not 50% beat and 50% reach (by time).

Benchmark Ratings

The ratings formulated below are typically used to set class breaks and to roughly compare boat performance. They are not typically used for scoring, but they can be.

The **General Purpose Handicap (GPH)** is calculated using the **Random Leg** course type, using a blend of 8 and 12 knots of wind. It is provided for legacy reasons and has been replaced by the IR# rating for most applications.

The **International Rating Number (IR#)** was designed to closely emulate the relative rankings of **PHRF** ratings. It uses an equal blend of beating, running and reaching in 10 and 12 knots of wind. Class breaks using IR# are very similar to PHRF.

Definition:

GPH			
Course / TWS	***8 kts***	***12 kts***	***Total***
Random Leg	**50%**	**50%**	**100%**

Definition:

IR#			
TWA / TWS	***10 kts***	***12 kts***	***Total***
Beat VMG	**16.67%**	**16.67%**	**33.33%**
60°	**5.56%**	**5.56%**	**11.11%**
90°	**5.56%**	**5.56%**	**11.11%**
120°	**5.56%**	**5.56%**	**11.11%**
Run VMG	**16.67%**	**16.67%**	**33.33%**
Total	**50%**	**50%**	**100%**

Standard Course Types

There are several **Standard Race Course Types** that the Race Committee may choose from to score a race. Each course is a mix of various True Wind Angles (TWA) applied using percentage factors totaling 100%. These percentage breakdowns were formulated by the EZ technical committee to provide the most useful, generally applicable blends. They will not fit every race course precisely, but they enable race scorers to find a reasonable "best fit" option.

The **Random Leg** course is calculated using the polar performance calculated by the VPP, averaged in one-degree increments of TWA from 0° to 180°, including optimum VMG beat and run values. It is considered a neutral "all purpose" course. The table below shows the approximate percentage blend of the standard polar table TWA values.

Windward-Leeward course types are the easiest to define. W50L50 is applicable to any W-L race with an even number of legs (or with a mid-course start-finish line.) The W60L40 course should be used for any W-L course with an odd number of legs, finishing upwind. While 5 legs is the perfect fit, 3 or 7 legs are still the best fit for W60L40.

The **Mostly Reaching** course *(NEW for 2024)* is an amalgam of headsail and spinnaker reaching angles; it can be used for either one or a mix of both.

Definition:

Random Leg	
Average of all points of the compass; sailing in a circle.	
TWA	***Appx. %***
Beat VMG	**22.2%**
52°	**8.9%**
60°	**6.4%**
75°	**8.3%**
90°	**9.7%**
110°	**8.3%**
120°	**6.9%**
135°	**8.3%**
150°	**8.3%**
165°	**6.1%**
Run VMG	**6.6%**
Total	**100%**

Definitions:

W50L50	
TWA	***%***
Beat VMG	**50%**
Run VMG	**50%**
Total	**100%**

W60L40	
TWA	***%***
Beat VMG	**60%**
Run VMG	**40%**
Total	**100%**

Mostly Windward	
TWA	***%***
Beat VMG	**80%**
90°	**15%**
Run VMG	**5%**
Total	**100%**

Definitions:

Mostly Reaching	
TWA	***%***
Beat VMG	**8%**
52°	**21%**
75°	**21%**
110°	**21%**
135°	**21%**
Run VMG	**8%**
Total	**100%**

Mostly Leeward	
TWA	***%***
Beat VMG	**10%**
120°	**40%**
Run VMG	**50%**
Total	**100%**

Wind Speed Profiles

There are three **Wind Speed Profile** systems offered by EZ: **Single Wind, Legacy 4-Wind** and **Standard 5-Wind**.

The **Single Wind** profile *(NEW for 2024)* is included as a simplified, all-purpose approach for when the wind data is undetermined. It is designed as a neutral, flat blend without the most extreme conditions.

Definitions:

Single Wind									
TWS	4 kts	6 kts	8 kts	10 kts	12 kts	16 kts	20 kts	24 kts	Total
Single Wind		16.67%	16.67%	16.67%	16.67%	16.67%	16.67%		100%

The **Legacy 4-Wind** system *(renamed for 2024)* is included for continuity and comparisons with past EZ ratings.

Definitions:

Legacy 4-Wind									
TWS	4 kts	6 kts	8 kts	10 kts	12 kts	16 kts	20 kts	24 kts	Total
Very Light <5	100%								100%
Light 5–10		50%	25%	25%					100%
Medium 10–15				25%	62.5%	12.5%			100%
Heavy >15						25%	50%	25%	100%

The **Standard 5-Wind** system *(NEW for 2024)* expands on the Legacy 4-Wind system with a Light/Medium profile and also re-formulates the other wind profiles to be fairer for competitors and more useful for RCs. The wind ranges are compressed in the lighter winds where relative boat performance changes quickly, while the higher wind ranges are extended as the boat performance is more consistent. Also, the wind profiles are not "weighted" as in the past, as each range must be equally applicable to every wind speed within its range, rather than favoring a central wind speed.

Definitions:

Standard 5-Wind									
TWS	4 kts	6 kts	8 kts	10 kts	12 kts	16 kts	20 kts	24 kts	Total
Very Light <5	100%								100%
Light 5–7	33.33%	33.33%	33.33%						100%
Light/Med 7–9		33.33%	33.33%	33.33%					100%
Medium 9–15			25%	25%	37.5%	12.5%			100%
Heavy >15						33.33%	33.33%	33.33%	100%

Wind Averaging

If you were to compare ratings calculated from the polar data as described above with the ratings printed on an EZ certificate, you will find that the results don't match precisely. Why is that? As we know, the wind constantly varies in both speed and direction and to account for this, the VPP injects some "fuzziness" into the polar ratings before applying the percentage blends. This is done using a bell curve distribution centered on each polar wind speed. The calculations for different courses use different standard deviations, or sigma values, as follows: W-L courses use a sigma of 1.2; all other courses use 3.3. The Table of Polar Time Allowances does not include Wind Averaging.

Putting It All Together

The following example shows the distribution of Polar Time Allowances for the Mostly Windward course type using the Standard 5-Winds system. Note how the wind and course factors are combined to generate a single rating number for each course-wind combination, shown in red below.

Example of Mostly Windward course for each Standard 5-Wind Profile:

Ratings Factors for Mostly Windward, Standard 5-Wind									
TWA / TWS	***4 kts***	***6 kts***	***8 kts***	***10 kts***	***12 kts***	***16 kts***	***20 kts***	***24 kts***	***Total***
Very Light <5									
Beat VMG	80.0%								80%
90°	15.0%								15%
Run VMG	5.0%								5%
Total	100%								100%
Light 5–7									
Beat VMG	26.67%	26.67%	26.67%						80%
90°	5.0%	5.0%	5.0%						15%
Run VMG	1.67%	1.67%	1.67%						5%
Total	33.33%	33.33%	33.33%						100%
Light/Medium 7–9									
Beat VMG		26.67%	26.67%	26.67%					80%
90°		5.0%	5.0%	5.0%					15%
Run VMG		1.67%	1.67%	1.67%					5%
Total		33.33%	33.33%	33.33%					100%
Medium 9–15									
Beat VMG			20.0%	20.0%	30.0%	10.0%			80%
90°			3.75%	3.75%	5.63%	1.88%			15%
Run VMG			1.25%	1.25%	1.88%	0.63%			5%
Total			25%	25%	37.5%	12.5%			100%
Heavy >15									
Beat VMG						26.67%	26.67%	26.67%	80%
90°						5.0%	5.0%	5.0%	15%
Run VMG						1.67%	1.67%	1.67%	5%
Total						33.33%	33.33%	33.33%	100%

In this example, the Polar Time Allowances for the OD Farr 40 are multiplied by the percentage factors for a Mostly Windward course in Light/Medium 7–9 wind, and then totaled to generate the applicable rating value, shown in red below.

Example of Mostly Windward course in Light/Medium 7–9 wind for Farr 40:

OD Farr 40 – Mostly Windward, Light/Medium 7–9 Rating (spm)									
TWA / TWS	***4 kts***	***6 kts***	***8 kts***	***10 kts***	***12 kts***	***16 kts***	***20 kts***	***24 kts***	***Total***
Light/Medium 7–9									
Beat VMG		107.8	410.1	80.3					598.2
90°		11.0	45.8	9.3					66.1
Run VMG		6.0	22.9	4.3					33.2
Total		124.8	478.8	93.9					697.5

Performance Curve Scoring (PCS) Ratings

For **PCS ratings**, the Standard Course Type percentages are applied to each wind speed column of the polar table; the Standard Wind Profiles are **not used** for PCS. The resulting ratings values for each wind speed, shown in red below, are used to generate the Performance Curve for that course type. Standard PCS ratings include Wind Averaging.

Example of Mostly Windward course:

Standard PCS Ratings – Mostly Windward Course								
TWA / TWS	***4 kts***	***6 kts***	***8 kts***	***10 kts***	***12 kts***	***16 kts***	***20 kts***	***24 kts***
Beat VMG	**80%**	**80%**	**80%**	**80%**	**80%**	**80%**	**80%**	**80%**
90°	**15%**	**15%**	**15%**	**15%**	**15%**	**15%**	**15%**	**15%**
Run VMG	**5%**	**5%**	**5%**	**5%**	**5%**	**5%**	**5%**	**5%**
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Below are the PCS Rating calculations for a OD Farr 40 on a Mostly Windward course.

Example of Mostly Windward course for Farr 40:

Standard PCS Ratings – Mostly Windward Course								
TWA / TWS	***4 kts***	***6 kts***	***8 kts***	***10 kts***	***12 kts***	***16 kts***	***20 kts***	***24 kts***
Beat VMG	998.0	718.6	585.8	535.2	510.2	486.5	472.2	464.4
90°	94.7	73.2	65.4	61.8	59.2	55.7	53.2	50.9
Run VMG	56.1	40.3	32.8	28.9	25.8	21.8	19.0	15.4
Total	**1,148.8**	**832.1**	**684.0**	**625.9**	**595.2**	**564.0**	**544.4**	**530.7**

EZ PHRF Ratings *(Expanded for 2024)*

EZ PHRF ratings are provided as an "on ramp" to VPP-based ratings for those used to traditional PHRF. These ratings are currently a work-in-progress, as we learn what format and options best serve the needs of those new to VPP-based ratings.

The **EZ PHRF** ratings are functionally identical to the Standard 5-Winds TOD ratings but, to present them in a more familiar format, they are benchmarked ('zeroed') to the OD Farr 40, which is always rated 0.0. This simply means that the Farr 40's TOD ratings are subtracted from the subject boat's ratings to generate a TOD number that resembles PHRF.

The **EZ PHRF Single Number Rating** is based on the IR# rating as described above. This rating is considered very comparable to typical single-number PHRF ratings and always falls about midway between the Random Leg and W50L50 ratings in Medium 9-15 kts wind. This rating is useful for creating familiar class breaks in any type of fleet or for scoring fleets that prefer the simplicity of old school PHRF.

The **EZ PHRF Single Wind and 5-Wind Ratings** are all benchmarked to the OD Farr 40, which always rates 0.0 for all winds and courses. Because of this approach, consider the limitations explained below.

Limitations of the EZ PHRF tables: It is important to understand that, in order to compare a boat's performance across different courses and wind speeds, you must look at the **EZ Standard 5-Wind Ratings** and not the PHRF ratings. You cannot use the EZ PHRF ratings for this purpose because the benchmark rating for the OD Farr 40 for each standard rating changes as well.

For example, for a given boat, the EZ PHRF W50L50 rating might be 135 and the Random Leg rating might be 130. You might think that only a 5 spm difference between those two course types is not correct. However, if you looked at the EZ Standard ratings, the difference might be 50 spm, which is as expected. This is because the Standard ratings are the actual predicted boat speeds, while the PHRF ratings are always benchmarked to the Farr 40 OD at 0.0.