World Leader in Rating Technology

OFFSHORE RACING CONGRESS

ORC Race Management Guide 2023
USA-CAN edition

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1. INTRODUCTION

The Offshore Racing Congress (ORC) was born in 1969 when a need was identified by the Cruising Club of America and the Royal Ocean Racing Club to have a single rating rule system that could service the needs of offshore racing boats competing on both sides of the Atlantic. This was called the International Offshore Rule (IOR) and was the prevailing system used worldwide for decades, followed by the VPP-based IMS system in the mid-1980's and then since 2007 the current ORC rating system in use today.

ORC thus has over 50 years of experience with measurement, rating and scoring in handicap racing.

Being an International Rating System recognized by World Sailing, there has also been a long association of the rating rule system with Grand Prix-level regattas, where the high levels of competitiveness push the rules and standards to their limits. Defining and developing the formats and standards for annual World and Continental ORC Championship events has been the ongoing work of the ORC's Offshore Classes and Events Committee, where they are published yearly in the ORC 'Green Book' of championship rules (www.orc.org/rules).

In more recent years the ORC rating system has grown rapidly to now provide fair racing at all levels of competition, from Grand Prix to club racers, and it issues over 10,000 certificates to boats of all types in more than 40 countries. These include not only monohull offshore-capable racers and cruiser/racers but also Sportboats), Superyachts and now Multihulls as well. With this increased popularity and widespread use, the need has arisen for a coherent set of guidelines on how they can make the most of this accurate and versatile rating system.

This USA-CAN edition of the ORC Race Management Guidebook is intended to provide this advice for monohull yachts that have current and valid ORC Club, ORC International, ORC Double Handed and ORC Non-Spinnaker certificates. As ORC Multihull certificates become available these methods and principles should apply as well. We urge experienced race organizers and managers to review this guide and use it as a reference, while those that are new to use of ORC should study it carefully, especially the flow chart shown at the end of Section 3.

Racing styles evolve with time, and new ideas and innovations arise as the sport changes. Therefore, we intend to improve this book with regular updates as new features that are generated by the ORC system, and as new ideas come from the racing community itself.

Regardless, ORC is pledged to help grow, improve and sustain the sport, and our staff along with the staff in the Offshore office at US Sailing is available to offer support for new and existing users of this system. For any questions or clarifications you should first go to the ORC page on the US Sailing website - http://www.ussailing.org/competition/offshore/orc - to see if answers are there for your questions, or contact them at offshore@ussailing.org. There are also many resources at the ORC website at www.orc.org. If you still have questions, reach us on our website: www.orc.org/contact or email usa@orc.org.

PHRF vs ORC use – some thoughts

Many local race organizers face the challenge of deciding how to phase in use of ORC rating and scoring tools from use of PHRF handicapping in their area. Indeed, it is often the local PHRF committee seeking help in their recognition that handicapping boats of diverse types is increasingly problematic due to wide variations in performance depending on wind speeds and angles. Yet the complexity of having multiple ratings and the added expense of ORC Club certificates is seen as a barrier to acceptance compared to PHRF.

We are reminded that PHRF was envisioned to be a very basic local level system intended for entry-level casual use. Our recommendation is therefore to use an objective measurement-based system like ORC for the segments of the fleet that are more serious in their approach to the sport and to adopt policies for ORC system use for the more serious and prestigious trophies and events in their region, leaving PHRF for the truly casual sailors. For more examples of how to navigate this process, contact USA@orc.org.

2. EVENT STRUCTURE

2.1 Basics – overview

The popularity and effectiveness of a rating system will very much depend on how it is implemented by event organizers and race managers. ORC offers many possible solutions for fleets ranging from local club races to World Championships, but to be effective the appropriate choices should be made among these options, starting with the structure of the event.

Consider, for example, the type of race: is it a Windward/Leeward course race, a short-day race around an island, an overnight race, or a long oceanic race? Each will have its own set of appropriate rules and standards.

2.2 Committee structure

a) ***Race Committee*** – Composition of the Race Committee (RC) will vary with the type of racing. Inshore course races require more members to handle setting and moving buoys, compared to distance races where a starting and finishing line is only needed. This is no different than any other type of racing.

However, one common element is having accuracy in recording elapsed time data for each boat's finish, and additional information such as course distance data, wind direction and wind speed depending on the scoring type used. Therefore, make sure there are suitable personnel on the RC assigned to take on these important tasks.

b) ***Technical Committee*** - Note that RRS 92 specifies the appointment of a Technical Committee to be a resource to resolve issues related to measurement, inspection, and other issues. Whether or not your event intends to conduct measurements and inspections, it is nonetheless important to have someone available to fill this role who is available and familiar with ORC rules so they can be consulted on these and other ORC-related technical matters both before and during the event.

c) ***Protest Committee*** – Ideally the members of the Protest Committee or Jury should be experienced with keelboat and/or offshore boat fleet racing and have some familiarity with both safety and ORC rules. On matters related to ORC rules, they should be prepared to work with the Technical Committee or refer the matter to ORC (see RRS 64.4(b)).

2.3 Notice of Race

The Notice of Race (NoR) is a basic document for every regatta defined as a "contract" between the organizer and competitors. ORC provides a convenient Standard Notice of Race template available for download in PDF and Word formats at this link: www.orc.org/rules. Even though it is designed primarily to be used for World and continental championships, it may be edited to be used for any race or regatta where ORC scoring is used.

Regardless of NOR style, there are some specific items that needs to be included such as:

a) ***Rules*** – applicable rules shall include the **IMS Rule** as a measurement rule and **ORC Rating Systems** as a rating rule. Even though both documents may be considered under the RRS definition of "*rule*" it is always worth mentioning this in the NoR so competitors may know where to look for any technical explanation of the rules. **ORC Sportboat Class Rules** shall be included for any class organized for ORC Sportboats only.

b) ***Safety rules*** – It is important to define safety rules and apply the appropriate category to the type of the race. This may be through the World Sailing **Offshore Special Regulations** (OSR) or US Sailing's **Safety and Equipment Regulations** (SER). SER Race Categories are defined as:

- Nearshore Monohull & Multihull - Races primarily sailed during the day, close to shore, in relatively protected waters: http://www.ussailing.org/wp-content/uploads/2022/01/Monohull-SER-

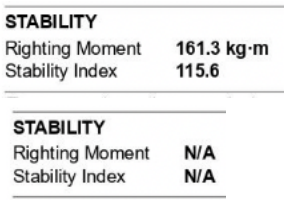
2022.0-Nearshore.pdf and www.ussailing.org/wp-content/uploads/2022/01/Multihull-SER-2022.0-Nearshore.pdf.

- Coastal Monohull & Multihull - Races not far removed from shorelines, where rescue is likely to be quickly available: www.ussailing.org/wp-content/uploads/2022/01/Monohull-SER-2022.0-Coastal.pdf and www.ussailing.org/wp-content/uploads/2022/01/Multihull-SER-2022.0-Coastal.pdf.

- Ocean Monohull & Multihull - Long distance races, well offshore, where rescue may be delayed: www.ussailing.org/wp-content/uploads/2022/01/Monohull-SER-2022.0-Ocean.pdf and www.ussailing.org/wp-content/uploads/2022/01/Multihull-SER-2022.0-Ocean.pdf.

Both OSR and SER set minimum stability requirement for the races of Categories 0, 1, 2 and 3 through Stability Index (SI) or the equivalent ISO standards – ISO compliance is not shown on ORC certificates but may be obtained from the builder, particularly production boats built in Europe to CE standards,.

Stability Index (SI) is shown on the lower right corner of the first page of ORC International and ORC Club certificates when stability is measured – it is not shown on an ORC Club certificate when the stability is not measured for that boat.



Please note that it is responsibility of the entry to meet the stability criteria established by the organizing authority.

b) ***Changes to the ORC rules*** – several ORC rules may be amended by the NoR in accordance with RRS 87 as follows:

i) Minimum crew weight - ORC certificates define a Maximum crew weight where the weight of all crew members weighed in light street clothes shall not be greater than the number recorded on the certificate. This shall always apply, and therefore shall not be amended by the NoR. There is also a Minimum crew weight that is recorded on the certificate, but this shall be applied only when specified by the NoR and Sailing Instructions. See ORC Rules 102.3 and 200.1(b) for more details.

ii) Allowed amount of liquids on board – Unwarranted quantities of stores shall be considered as ballast because their weight may have a measurable effect on performance. Any liquid carried on board in excess of 2.5 litres of drinkable fluid per person per day of racing, in the tanks or in other containers exclusive of emergence water required by safety rules, and any fuel in excess of the quantity needed to motor for 12 hours, is therefore not permitted. Race organizers of long offshore races may waive this requirement by specifying so in the Notice of Race. See ORC Rule 201.2 for more details.

iii) Moving sails or equipment - Moving sails or equipment with the intention of improving performance (i.e. "stacking") is prohibited and shall be considered as a breach of RRS 51, although organizers of long offshore races may change this in the Notice of Race. See ORC Rule 201.3 for more details.

iv) Number of sails aboard while racing – The maximum number of sails allowed on board while racing is defined as follows: exclusive of storm & heavy weather sails required by the safety rules, a boat shall not carry aboard while racing more sails of each type than the numbers defined as follows:

CDL*	**Above 16.400**	**16.400 – 11.691**	**11.690 – 9.781**	**Below 9.781**
Mainsail	2	2	2	2
Headsails	8	7	6	5
Spinnakers	6	5	5	4
Mizzen Staysail	1	1	1	1
Mizzen	1	1	1	1

** CDL is explained in Section 2.5 below*

Note that if there is a headsail used with a headsail furler as recorded on the certificate then only one headsail shall be aboard while racing.

Since these limits may change yearly but are shown on the certificate, this table is not needed in the Notice of Race or Sailing Instructions unless these limitations are modified according to the appropriate character of the race. For example, the organizer may want to ensure all boats in a class have the same number of sail types allowed on board, or in defining cruising classes the limits may want to be reduced to suit the intentions of the organizer. See ORC Rule 206 for more details.

c) ***Eligibility and Classes*** – The NoR shall define how entries will be divided in classes and divisions with the criteria explained later in Section 2.5. The options may be, for example, to set up fixed class limits defined by CDL or APH where boats will enter a defined class or to set up a deadline after which the organizer will define classes based on the entries received.

It is strongly recommended to make reference to where participants can apply for their certificates with US Sailing at this link: www.ussailing.org/competition/offshore/orc.

Since the ORC VPP is usually issued in the first few weeks of the new year, for races and regattas held in the winter season after January 1st it should be specified in the NoR that only certificates from the previous year will be used. This is why US Sailing's default expiry date on certificates is Jan 31st.

However, for events held in February, March or even later in some Florida and northern frostbite fleets, US Sailing may at no charge re-issue valid certificates with a later expiry date to accommodate the entries in these events. Inquire with the Offshore office at offshore@ussailing.org.

d) ***Registration process*** – Registration should be made available through an online system whenever possible with following items considered:

i) There should be a deadline until when a valid ORC certificate should be issued. ORC certificates are available in digital format and are valid as soon as uploaded by the rating office to the ORC Database. There is no need for a printed copy and organizers can easily check for the existence of a valid ORC certificate in the ORC Database. This deadline may vary but should not be later than up to one week before the start of the event. This will help rating offices with certificate processing and organizers to prepare an entry list and scratch sheet. When defined, this rule will need to specify that it changes RRS 78.2.

ii) No changes shall be made on an ORC certificate after this deadline except with the permission and approval of the Technical Committee or the Race Committee either as a result of a pre-race measurement check, an unintended delay in certificate processing or an error discovered. It is important to correct any error on the certificate before the start of the first race. Corrections are allowed by ORC Rules and explained further in Section 2.4 about certificate handling.

iii) If crew lists are needed, there should be a deadline for amending these lists. The entry form presented as part of the registration process should include a list of crew members that will be onboard at the first day of the race. For subsequent changes in the crew there should be a request made on an appropriate form.

iv) If a Corinthian Division is desired, then World Sailing's Sailors Categorization Code shall be applied. More details that relate to the use of this **code** are on the WS website.

e) ***Schedule of races and Scoring*** – The Schedule of races should give the time for the warning signals for each race and describe the type of race (windward/leeward or coastal/long distance). The Scoring section should explain which scoring method will be used as explained later in Section 3. There are many options for scoring, and these do not have to be within the Scoring Options box shown on an ORC certificate. For example, if Polar Curve Scoring (PCS) is intended this should be specified, just as if a custom course model is planned for a single scoring option as explained later in Section 3.5, then the wind matrix and method used for the calculation of the single number rating should be specified.

2.4 Handling ORC rating certificates

ORC certificates are issued as HTML files in A4 page format…there is no need to convert to PDF or print in hard copy. Doing so may require manual adjustment in sizing to convert to US Letter to format correctly.

2.4.1 US Sailing and ORC Canada issue the following certificate types:

a) ***ORC International*** – for a completely measured boat

b) ***ORC Club*** – where measurement data may be measured, declared by the owner, or obtained from any other source, including photos, drawings, designs, data from identical or similar boats. *(*In the USA a category called "ORC Club+" is used when there are all the criteria met for an ORC International certificate except for an offset file approved for ORCi use.)*

c) ***ORC Double Handed certificate –*** may be issued from the data needed for ORC International or ORC Club certificate and shall apply for crews made of two persons.

d) ***ORC Non-spinnaker certificate –*** may be issued from the data needed for an ORC International or ORC Club certificate and shall apply for boats not using any spinnaker nor headsail set flying.

e) ***ORC One Design certificate*** – ORC International or ORC Club certificates where all data affecting a boat's rating are standardized based on the set of measurements for classes having One Design class rules or having all the measurements within close tolerances. A list of these can be found at this **link**.

All certificate types are fully compatible and may be used on same event. However, Double Handed and Non-Spinnaker are usually separated in different classes or divisions as described later in Section 2.5.

ORC Superyacht and ORC Multihull certificates are issued directly from ORC.

2.4.2 For race managers the following items should be considered when handling rating certificates:

a) ***VPP year*** – ORC Rating Systems use science and technology to develop its handicap system through the Velocity Prediction Program (VPP). This VPP is updated yearly and therefore it is imperative to have all boats in the same race with certificates using same VPP year. The VPP year is shown on the upper box of each rating certificate.

b) ***Expiration date*** - The certificate is valid until the date printed on the certificate. For example, in the USA the default expiration date is 31 January of the following year to accommodate winter season racing, and may be extended for boats racing in a regatta or series later than this date (see 2.3(c) above on NoR Eligibility) The expiration date is printed in the Certificate box of each rating certificate.

c) ***Valid certificate & Reference number*** - Because the ORC system is updated yearly based on the latest science and analysis of the fleet's performance to improve the VPP, it's important to score races based only on ratings from the latest valid certificate for each boat in the fleet.

A boat may have more than one certificate issued during the same VPP year period, but only the last one issued will be valid. Double Handed and Non-Spinnaker certificates may co-exist at the same time with the regular ORC International or ORC Club certificates.

Copies of all latest valid certificates are available for free viewing and download on the ORC website at this link: www.orc.org/index.asp?id=999. Click on the link to the certificate type and a new page will load that lists valid certificates alphabetically by boat type. Clicking on the ORC Reference number loads another page with the valid certificate in HTML format.

Rating data is also available in form of RMS files that may be used by **ORC Scorer** and any other scoring software as explained later in the Scoring section.

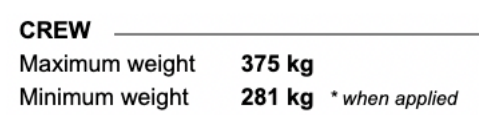
d) ***Compliance with the certificate*** – is defined as:

i) All measured, declared or recorded values shall be as close as possible to those on the certificate. Differences are allowed only if the values on the certificate give a worse (i.e. faster) rating with a lower All Purpose Handicap (APH).

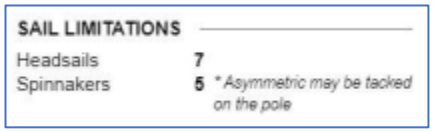
ii) The sail area should be smaller or equal to what is printed on the certificate. The sail inventory shall include the largest of each when applicable: mainsail, mizzen, quadrilateral sail or sail set on the wishbone boom, headsail set on the forestay, symmetric spinnaker, asymmetric spinnaker, mizzen staysail and *all* Headsails set Flying and all asymmetric spinnakers having SHW/SFL < 0.85.

e) ***Owner's declared values***

i) Crew weight is an important factor affecting the boat's performance and is considered in the VPP rating calculations. The crew shall not be heavier than the Maximum value recorded on the certificate. The maximum value may be declared by the owner. If not declared, it will be calculated as default according to the size of the boat. And if the NoR or Sailing Instructions specify, then the crew weight shall not be less than the Minimum shown on the certificate.



ii) When there are symmetric and asymmetric spinnakers in the sail inventory together with a spinnaker pole and bowsprit, an owner may declare that the asymmetric spinnaker will be used only when tacked on centerline. Appropriate message explaining how an asymmetric spinnaker may be used in relation to the pole is shown at the Sail Limitation section.



f) ***Correcting errors in the certificate*** – ORC Rule 303.6 allows correction of any certificate when the Rating Office has reasonable evidence that not by her own fault a boat does not comply with her certificate. Whenever there is such an error found on the certificate, by any party, the Rating Office shall be contacted immediately explaining the error and the need for correction. Correction may be done at any time before, during or after an event, and all races shall be rescored using the new rating data. This underscores the importance to have all certificates being reviewed prior to the start of the first race.

2.5 Entry organization

One of the most difficult tasks for race organizers is to define racing groups. The definitions can be applied at all levels – local, regional and national, and even international such as at the ORC World and continental Championships. Entries are divided into groups variously called Classes, Divisions, Sections, Fleets, etc., with the goal of having boats of similar characteristics racing against each other whenever possible.

There are several ways to help define appropriate racing groups. Application of these criteria should be made after careful consideration of the expected fleet of competitors and can be made singly or in combination of multiple criteria. These groups can be described in the Notice of Race of the event or delayed until the close of entries when organizers have a full picture of the composition of the fleet.

Here are some tools and examples of their application:

All-Purpose Handicap (APH) is an average representation of all time allowances in all wind speeds and wind directions. It is used for simple comparisons between boats and possible class divisions and should replace GPH for this purpose. It can also be used as the simplest of single number Time on Distance Rating options as described later in Section 3.3.2.

Class Division Length (CDL) is the main parameter that is used for dividing boats in classes for windward/leeward inshore racing at ORC World and continental championship events. Since most inshore

races have an upwind start, CDL is a parameter defined by the average of the effective sailing length (IMS L) and the rated length (RL) that is calculated from the upwind speed of the boat in a True Wind Speed of 12 knots. CDL is also used to define sail limitations (shown in 2.3b)iv above). A boat's CDL rating is shown in a separate box on its certificate.

Special divisions: Fleets may also be divided in separate divisions like Double Handed or Non-Spinnaker using relevant ***Double Handed*** or ***Non-Spinnaker*** certificates. Additionally, boats that comply with ***Sportboat*** Rules may be grouped in a separate division. Whenever possible it is better to have these fleets racing separately but if the number of boats cannot justify this, such boats may be added to the other classes as well.

Performance and Cruiser/Racer categories: Additionally, boats may also be categorized as Performance or Cruiser/Racer as defined by IMS Rules in Appendix 1 where ***Cruiser/Racers*** are boats designed primarily for cruising and are equipped with accommodation and cockpit layouts comparable to the standards of series production boats. Those boats not meeting these requirements are categorized in the ***Performance*** division. ORC races may be run with boats from both categories, or organizers may wish to use these categories in fleet organization to define separate classes.

Dynamic Allowance (DA) is a parameter that applies to Cruiser/Racers that describes the boat's behavior in unsteady conditions and is related to sail area, volume and wetted surface of the boat. Boats of both categories older than 30 years in design will also get a DA.

For example, the ORC of the Chesapeake defines for its races a Cruiser division for boats with a DA of ≥ 0.230 %.

Other measurement parameters may be used to group boats of like type, such as Sail Area/DSPL ratios. The Rolex Big Boat Series at St Francis YC has done this for the separation of their two ORC classes at their event in 2022.

2.6 Sailing Instructions

ORC provides a convenient Standard Sailing Instructions template available for download in PDF and Word formats at this link: www.orc.org/rules. Even though it is designed primarily to be used for World and continental championships, it may be edited to be used for any race or regatta where ORC scoring is used.

In addition to the items already described in the Notice of Race sections, there are some specific items that needs to be included in the Sailing Instructions for ORC events as follows:

a) ***Communication of the Race Committee with competitors*** – It is highly recommended to have frequent and clear communications from the Race Committee to competitors. The Sailing Instructions, for example, should include limitations of possible requests for redress based on OCS calls with wording such as:

> *"If any part of a boat's hull is on the course side of the starting line at her starting signal and she is identified, the race committee will attempt to broadcast on VHF her sail number, bow number or name of boat. Delay in the radio broadcast of these calls, or the order in which they are made, or any omission or failure in the transmission or reception of these, will not be grounds for a request for redress by the boat. This changes RRS 60.1(b)."*

Another example is this wording:

> *"The following communications may be made by the race committee on VHF: time checks and starting times, starting order and designation of race areas, confirmation of any visual signal displayed, courses including bearing and distance to the first mark, change of course, shortening, postponement, abandonment and other information explaining the intentions of the race committee.*

Delay in the broadcast of these calls, or the order in which they are made, or any omission or failure in the transmission or reception of these, will not be grounds for a request for redress by the boat. This changes RRS 60.1(b).

b) ***Scoring*** – Scoring options shall be defined by the SI's, but it is important that selection of the scoring options shall not be grounds for a request for redress by the boat, and the following wording should be included:

"*The decision on the scoring method and scoring parameters used for a race will be at the sole discretion of the Race Committee. This includes the length of the course, directions of the legs and the wind details such as strength and direction. These will not be grounds for a request for redress by the boat. This changes RRS 60.1(b).*"

c) ***OCS Penalty*** – It is common practice in long offshore races to have a scoring penalty for OCS instead of disqualification. If this is the case World Sailing Development Rule DR 21-01 should be used as explained at this **link**.

d) ***Discretionary penalties –*** The Sailing Instructions should define for which breaches of the rules that discretionary penalties, with the notation '[DP]', may be imposed by the Protest Committee that may be less than disqualification. These may include items such as the following:

- number of sails on board
- placement of the bow numbers
- minor breaches of the safety rules
- not reporting the use of the engine for rescuing people or giving help
- failing to request the change of crew or equipment
- use of support boats
- communications with the Race Committee
- haul out restriction

A Discretionary Penalty Imposed (DPI) document may be created and published as an appendix to the Sailing Instructions.

2.7 Measurement protests

Occasionally an issue may arise where there is an irregularity of a boat with its ORC certificate prior to the start or during racing. This may be, for example, a boat having a sail which is larger than that shown on her certificate, or a question about displacement, or having crew that exceeds the limit shown on the certificate. A Technical Committee appointed by the organizers should handle these matters related to measurement and certificate compliance.

The ORC Rating Systems rules have a clear definition of the procedures for measurement protests defined in ORC rule 305.

The first step for the Technical Committee should be to determine what is not in compliance on the boat with its certificate. If it is determined that this is not the fault of the owner or the crew, then the issue should be immediately reported to the relevant rating office that issued the certificate. They shall withdraw this certificate, correct the error, and issue a new certificate. Note that this may be done before the start or even during the race, if necessary, and should not hinder the boat from racing. In either case once the corrected certificate data is available then results should be re-calculated and updated.

However, if the owner or the crew are responsible for the non-compliance, the procedure should be as follows:

a) ***Prior to the start of first race*** – if the non-compliance is considered to be minor and can be easily corrected, the boat should be brought into compliance with her certificate, and, when necessary, a new certificate should be issued. The Technical Committee shall approve the issue of a new certificate.

When the non-compliance is major (even if it can be corrected) or if it cannot be corrected without requiring significant re-measurement, a boat shall not be eligible to enter a regatta. The Technical Committee shall inform the Rating Authority that the boat is not in compliance with its certificate.

b) ***During races as a result of measurement protest or post-race measurement check*** – A test certificate should be generated with the new measurements taken by the Technical Committee. The resulting APH on the test certificate shall then be compared with the APH on the original certificate used to enter the regatta.

The ORC Championship Rules may be then used to prescribe time penalties assessed in the races sailed in proportion to the change in APH.

Test certificates needed for APH comparison shall be run by the relevant rating office. However, if the rating office is not available during the regatta, the Technical Committee may use **ORC Sailor Services** to generate a new test certificate. Any costs involved shall be covered by the unsuccessful party as defined by the RRS 64.3(e).

c) ***Declared value non-compliance (Crew weight & Asymmetric spinnaker on centerline)*** - Please note that values recorded on the certificate by the owner's declaration such as Crew weight and use of an asymmetric spinnaker tacked only on the centerline are not eligible for the APH comparison procedures defined above. Infringement of these rules will result in Disqualification unless any other penalty is defined by the Sailing Instructions.

2.8 Redress

In addition to the options available in RRS A9, if there is a decision by the Protest Committee to grant redress to a competitor in the form of time sailed on the course, this should be expressed in elapsed time rather than corrected time.

3. SCORING

3.1 Ratings and Scoring

Scoring races to get acceptable race results is the primary function of race management. Competitors expect races to be run competently, and the results to reflect their abilities on the race course in a fair and unbiased way. With ORC's use of scientific modelling of boat performance to calculate ratings, this is possible with the correct selection of scoring type that best reflects the race type, the wind conditions and the expectations of the competitors.

3.2 Scoring options and the factors of choice

Since the ORC VPP produces a complete matrix of predicted boat speeds at various wind strengths and directions, ORC rating systems can therefore provide a wide variety of methods to calculate corrected time. This variety may look complex, but it is actually one of the strengths of the ORC rating systems to offer race managers choices that best suit their fleet, their race type and their race conditions. Choosing the best scoring option is therefore finding the right balance between accuracy and simplicity appropriate for the fleet.

The very simplest of options shown on ORC certificates include use of a single-number Time on Distance or Time on Time rating given for basic course types such as:

- **Windward/Leeward course** - has 50% upwind and 50% downwind race legs
- **All Purpose course** - includes equal distribution of all wind directions.

However, when boat types are widely varied, their rated performance will vary widely as well, making a single number rating approach inherently unfair. Race managers should therefore use a more sophisticated scoring method to use the full power of the VPP to create more accurate and fair corrected time results.

Selecting the appropriate scoring option should be based on several other factors besides wind geometries, such as:

a) ***Level of competition*** – For the most casual racing in club-level events with limited race committee resources, the simpler scoring options may be the appropriate choice. As the level of competition increases, then more sophisticated systems may be appropriate depending on the expectations of the sailors. For example, major races and regattas in the US with inshore racing use either constructed course models (eg, Rolex Big Boat Series) or the 5-band system (eg, Block Island Race Week), and offshore races such as those at the SORC use one of the Predominant Upwind, Reaching or Downwind models where this level of scoring is accepted and understood.

b) ***Class composition*** – Regardless of the scoring method selected it is important to have the fleet organized into racing groups (e.g. classes, divisions, sections, etc) of similar type as explained in Section 2.5). The scoring system works best when like-type and sized boats race each other, particularly when using the most accurate scoring options.

   Yet for coastal or offshore races there may be a desire to list overall results that include all entered boats in addition to the results from separate classes. For overall results it's important to use the same scoring model for all those eligible for overall prizes.

c) ***Time on Distance vs Time on Time*** – Simple scoring options offer either Time on Distance (ToD) or Time on Time (ToT) ratings. The two are equivalent, and the choice can be based on what the local fleet is accustomed to using…in the USA and CAN the prevalent choice is ToT, especially in regions that have current.

3.3 Single Number scoring options

The simplest single number scoring options shown on every ORC certificate do not use the full power of the ORC rating system but may be a preferred choice when simplicity matches the expectations of the fleet or when race weather conditions cannot be predicted. These are options include Time on Distance (ToD) and Time on Time (ToT) ratings for Windward/Leeward and All-purpose course types:

Single Number Scoring Options		
Course	Time On Distance	Time On Time
Windward / Leeward	601.8	0.9971
All purpose	486.3	1.2338

ToD coefficients are calculated for the respective course models (Windward/Leeward or All-purpose) with the following wind strength distribution:

TWS (kt)	***6***	***8***	***10***	***12***	***14***	***16***	***20***
Time Allowance percentage	5%	10%	20%	30%	20%	10%	5%

Equivalent ToT ratings are calculated for the respective course model (Windward/Leeward or All-purpose) as ToT rating = 600 / ToD rating.

Corrected times are calculated accordingly:

a) ***Time on Distance*** - With ToD scoring, the coefficient of time allowance of one boat will not change with wind velocity, but will change with the length of the course. One boat will always give to another the same handicap in seconds/nautical mile (sec/mile), and if the distance sailed is known then it is easy

to calculate the difference in elapsed time between two boats needed to determine a winner in corrected time. Corrected time is calculated as follows:

*Corrected time = Elapsed time – (ToD_{Delta} * Distance)*

Where $ToD_{Delta} = ToD_{the\ boat} - ToD_{the\ lowest\ (fastest\ boat)\ in\ the\ fleet}$ and therefore the corrected time of the boat having the fastest ToD in the fleet will be equal to her elapsed time (this is often termed the "Scratch boat").

b) ***Time on Time*** - With ToT scoring, the time allowance will increase progressively through the duration of the race. Course distance has no effect on the results and need not be measured. Corrected time will depend only on the elapsed time, and the difference between boats may be seen in seconds depending on the duration of the races. The longer the race is in time, the larger the handicap. Corrected time is calculated as follows:

*Corrected time = ToT rating * Elapsed time*

Pursuit racing – For casual races, race managers may consider use of the Pursuit start, where for a known and measured distance of the course and the selected ToD ratings of the entries, a unique start time is calculated. In this format the boat starts the race at their designated time, with the slowest-rated entries starting first followed by others in progressive order of rating. Results are then determined by the order of boats crossing the finishing line. To calculate the start times on the scratch sheet, this formulation is used:

*Starting time = Starting time of the slowest boat + ($ToD_{slowest\ boat}$ – ToD) * course length*

3.4 Polar Curve Scoring (PCS)

PCS is used at ORC World, European and some national championship events, and is regarded as the most accurate and objective scoring method for inshore racing. It requires specialized software (eg, ORC Scorer, a Window-based program downloadable at www.orc.org/software) and race management personnel trained on its use - it is not actively used in the US at this time. For more information about PCS see its description in the general ORC Race Management Guidebook at www.orc.org/rules.

3.5 Custom-made Single Number scoring

Use of Single-number options will be accurate if the actual wind conditions are close to the wind matrix used for its calculation.

However, there is also an option to define a different wind matrix that is custom-made for a single number time allowance. This may be done using a weather forecast on the day prior to the start of the race (*see Appendix 3) or historical wind data for the course area.

Below is an example of this approach, the Upwind course model option used in the Chicago-Mackinac Race:

TWS (kt)	***6***	***8***	***10***	***12***	***16***	***20***	
Beat VMG	*1.75%*	*5.25%*	*10.50%*	*10.50%*	*5.10%*	*1.60%*	**34.70%**
52° reach	*1.40%*	*4.35%*	*9.00%*	*9.30%*	*5.10%*	*1.80%*	**30.95%**
90° reach	*0.75%*	*2.25%*	*4.50%*	*4.50%*	*2.40%*	*0.90%*	**15.30%**
135° reach	*0.60%*	*1.80%*	*3.30%*	*3.30%*	*1.50%*	*0.45%*	**10.95%**
Run VMG	*0.50%*	*1.35%*	*2.70%*	*2.40%*	*0.90%*	*0.25%*	**8.10%**
Sum	**5.00%**	**15.00%**	**30.00%**	**30.00%**	**15.00%**	**5.00%**	**100.00%**

The choice of course model should be specified in the Notice of Race and/or Sailing Instructions. If the course model is not known until the Sailing Instructions are published, then a generic reference can be made, such as "Scoring will be using Time on Time ORC ratings."

A custom-made Single number rating can also be calculated using the Time Allowance tables at the top of Page 2 on ORC certificates, and if the course length and wind angles are known this can be expressed as a

ToD rating, convertible to ToT ratings using conversion factor of ToT = 600/ToD. (A conversion factor different from 600 may be set as a ToD figure representing ratings of boats in the middle-rated speed range of the fleet - use of a different correction factor will not change the place in corrected times, it will only affect the differences in corrected time.)

This custom approach will also be available soon online at ORC's Sailor Services portal – www.orc.org/sailorservices - where all valid certificates issued since 2009 can be found in an online library. When this is available an announcement will be made through ORC media channels and US Sailing.

3.6 USA-CAN standard scoring model options

US Sailing and ORC Canada publishes multiple scoring options on Page 2 of all their valid ORC certificates. This may include ToD and/or ToT coefficients using different course models as well as multiple ToD and/or ToT coefficients for different wind ranges. The course type used to calculate these ratings and the methods of how they will be applied should be specified in the Notice of Race and/or Sailing Instructions of the races and events that use them.

a) ***Triple Number*** – When wind speed can be bracketed within a range of values – Low, Medium or High – for the duration of the race, then the Triple Number system should be considered. The range of these values is a blended mix of true wind speeds and is shown below:

TWS (kt)	6	8	10	12	14	16	20
Low	50%	50%					
Medium		8.4%	33.3%	33.3%	25%		
High					25%	37.5	37.5%

Nearly every option among non-custom models – eg, Windward/Leeward, Predominant Upwind, Downwind and Reaching, and even the All-Purpose model – has a Triple Number option.

It is a best-practice to announce (ie, on VHF) the intended choice (see 2.6(b) above, and if there is a significant change in conditions and the RC may decide to change this choice for a more accurate and appropriate choice, it should announce this by VHF prior to the first finisher in the race.

b) ***5-Band*** – For Windward/Leeward courses only, there is an additional refinement in wind speed ranges to include 5 choices according to this model (shown to the right). If the wind conditions can be constrained to be within one of these bands, race results will likely be closer and more accurate than with use of Triple or Single Number options.

TWS	6 kt	8 kt	10 kt	12 kt	14 kt	16 kt	20 kt
Low	92.3%	7.7%					
L/M	26.9%	46.2%	19.2%	7.7%			
Med		7.7%	19.2%	46.2%	19.2%	7.7%	
M/H				7.7%	19.2%	55.8%	17.3%
High						17.3%	82.7%

c) ***Predominant Upwind, Downwind and Reaching*** – These options are often useful for destination races where the wind may be constant from start to finish and conforming (mostly) to their model descriptions – these models are described in the Appendix. Each has a Single number and Triple Number options.

3.7 Scoring software

There are numerous methods of scoring available, and their suitability should match the scoring methods desired. For simple single-number methods, for example, there are a wide variety of software options available.

If, however, more complex rating options are desired, then there are fewer scoring software options available to handle the task. Several of these are listed on the **ORC website**.

Yacht Scoring is perhaps the most widely-used web-based scoring and regatta management system in the USA for ORC races and events. One reason for this is convenient handling of an entry's ratings based on the numerous options found on Page 2 of ORC certificates. For each entry the input of the boat's certificate reference number allows the program to retrieve these ratings from the ORC's database of RMS files, making these then available on the administration side of the program for scoring use by race managers.
All ORC certificate scoring options are available from the ORC database by retrieval at www.orc.org/scoring in RMS, JSON or CSV formats. Note that these are organized by certificate type: Standard (ie, full-crewed), Double Handed and Non-Spinnaker.

3.8 Time allowance sheets

It is a best-practice to list entries on a scratch sheet organized by class and each entry's APH rating. It is also a best-practice to provide rating and time allowance information to competitors so they can anticipate how they are performing in corrected time relative to their competitors.

This is a simple task when using a single number scoring option, but this becomes more complex when race managers may opt to use different scoring options within an event, necessitating a time allowance sheet produced for each option.

ORC provides a web-based utility for this within Sailor Services called Scratch Sheet. Using the Search for certificates tool, find the certificate for each class entry, add its measurement record to the online Scratch Sheet file within the user's Sailor Services account, then use the drop-down menus to select USA (or CAN) for national rating options, then the other drop down menu to select the scoring model desired.

A time allowance sheet is then generated with that scoring option's ratings and the course distance (for ToD ratings) or elapsed time sailed (for ToT ratings) in columns on this sheet. This can then be saved as an HTML file, which when opened can be edited for length of time (in minutes) or distance (in miles) in each column and a button available for each entry to use as a reference scratch boat to calculate time allowances for every other entry in the class. An example is shown below:

ORC

Scratch Sheet

ToT - 5-Band Low / Medium

	Yacht Name	Sail No	Type	APH	TOT	1 min	5 min	10 min	20 min	30 min	60 min	90 min
○	EMOCEAN	USA 37120	J 120	520.1	0.7665	6.0 00:00:06	30.0 00:00:30	60.0 00:01:00	120.1 00:02:00	180.1 00:03:00	360.2 00:06:00	540.4 00:09:00
○	LEADING EDGE	USA 74	J 122	517.9	0.7691	5.8 00:00:06	28.9 00:00:29	57.8 00:00:58	115.6 00:01:56	173.4 00:02:53	346.8 00:05:47	520.3 00:08:40
○	GROUPE 5	26	FIGARO 2	522.9	0.7823	4.7 00:00:05	23.4 00:00:23	46.7 00:00:47	93.4 00:01:33	140.1 00:02:20	280.3 00:04:40	420.4 00:07:00
○	Hooligan30	USA 30023	C&C 30 OD	502.6	0.8069	2.7 00:00:03	13.5 00:00:14	27.0 00:00:27	54.0 00:00:54	81.0 00:01:21	162.0 00:02:42	242.9 00:04:03
○	LAGERTHA	USA 4210	SWAN 42	483.6	0.8396	0.3 00:00:00	1.3 00:00:01	2.6 00:00:03	5.1 00:00:05	7.7 00:00:08	15.4 00:00:15	23.2 00:00:23
◉	Cool Breeze	USA 60432	MILLS 43 CUSTOM	470.8	0.8432	0.0 00:00:00	0.0 00:00:00	0.0 00:00:00	0.0 00:00:00	0.0 00:00:00	0.0 00:00:00	0.0 00:00:00
○	Delta	USA 241	MELGES 32 OD	483.3	0.8483	-0.4 00:00:00	-1.8 00:00:02	-3.6 00:00:04	-7.2 00:00:07	-10.8 00:00:11	-21.6 00:00:22	-32.5 00:00:33
○	INTERLODGE 44	USA 4415	BOTIN 44	411.6	0.9592	-7.3 00:00:07	-36.3 00:00:36	-72.6 00:01:13	-145.1 00:02:25	-217.7 00:03:38	-435.4 00:07:15	-653.0 00:10:53
○	EN GARDE	USA 61333	COOKSON 50	411.7	0.9742	-8.1 00:00:08	-40.3 00:00:40	-80.7 00:01:21	-161.4 00:02:41	-242.0 00:04:02	-484.1 00:08:04	-726.1 00:12:06

*Numbers in Red indicates time owed by the Scratch boat, and in Black time owed to the scratch boat.

4. RACE MANAGEMENT BEST PRACTICES

4.1 Race Management Best Practices

Running an ORC event is not significantly different from running any other sailing race. However, there are some aspects that needs to be addressed specifically while using the ORC system. For this ORC offers tools that can make race management tasks even easier. This guidebook is not intended to give an overview of the basics of proper race management, there are many other resources available and this knowledge is assumed.

4.2 Setting the course

a) ***Course distance*** **-** Regardless the scoring method used (as explained in Section 3) setting up the course includes gathering basic information of the position of the marks, length and compass bearings of each leg as well as wind over the course. The polar diagram data available on ORC Certificates make it is easy to calculate the distance of the course needed to achieve the target elapsed time for the race. ORC International and ORC Club certificates with an optional second page show time allowances for pre-selected course types as follows:

Time Allowances in secs/NM							
Wind Velocity	**6 kt**	**8 kt**	**10 kt**	**12 kt**	**14 kt**	**16 kt**	**20 kt**
Beat VMG	886.1	737.6	668.8	638.7	624.4	613.1	601.9
52°	580.2	491.6	457.4	445.4	439.6	436.4	428.8
60°	547.3	471.5	444.5	433.2	427.6	424.2	417.6
75°	520.8	457.5	434.5	421.0	411.5	405.4	398.8
90°	506.5	446.2	423.6	409.0	396.6	387.9	373.3
110°	524.0	452.6	425.6	405.9	386.0	368.1	341.2
120°	553.7	465.9	430.7	409.0	387.5	369.2	335.7
135°	623.5	508.0	450.3	424.7	403.8	381.5	336.9
150°	742.8	598.6	507.4	453.6	427.5	407.6	365.5
Run VMG	857.7	691.2	585.9	518.5	474.9	440.9	400.2
Selected Courses							
Windward / Leeward	871.9	714.4	627.3	578.6	549.7	527.0	501.1
All purpose	663.6	554.7	501.3	472.7	454.4	438.9	416.9

Time allowances are shown in sec/NM that allows easy calculation of length of the course needed to achieve target time for finishing. For example, if there is a windward/leeward race planned with a target time of 01:15:00 hours, the length of course is calculated as:

Target time = 01:15:00 = 4500 sec
Observed wind speed: 10 kts, Time allowance at TWS of 10 kts = 627.3 sec /NM
Length of the course: Target time / Time allowance = 4500 / 627.4 = 7.17 NM

Using the same calculation method for wind of 12 kts and same target time length of the course would yield a result of 7.77 NM. Using this approach, it is easy to build a table of length of the course as a function of wind strength as shown in the example below for a Target time of 01:15:00.

Wind speed (kts)	***6***	***8***	***10***	***12***	***14***	***16***	***20***
Time Allowance (s/NM)	871.9	714.4	627.3	578.6	549.7	527.0	501.1
Length of the course (NM)	5.16	6.30	7.17	7.77	8.19	8.54	8.98
*Length of the 1st leg (NM)**	1.34	1.63	1.84	1.99	2.10	2.19	2.30

* *Assuming 2 laps course with 2 windward and 2 leeward legs and the leeward gate at about 0.1 NM windward for the starting line*

Once the total course length is calculated it is easy to divide it by the number of leg/laps and give this information to the mark set boat on where to set up a windward mark.

Obviously, the figures used for this calculation may be from the fastest, mid-fleet or slowest boat in the fleet depending how the target time is set. Please also note that the Scratch Sheet tool at **ORC Sailor Services** can be used to select the class entries from the Search criteria, add them to the Scratch Sheet folder, then select the PCS –Windward Leeward option to create a table of rated speed values as shown above.

The same approach may be made for All-purpose courses, where the length of the course should be calculated as the shortest distance between marks.

b) ***Course data*** - Once the course is set it is always good to have clear communications between the RC signal boat and mark set boats in monitoring the wind speed and direction. This assists the RC to decide if there is needed a possible change or shortening of the course. Data on the length of the course, wind direction and wind strength also need to be collected for scoring purposes.

Note that length of the course is not needed when Time-on-Time scoring method is used. However, it is always good to have this information which is easily obtained using GPS technology. It may be calculated from the Lat-Lon positions of starting, rounding, and finishing marks along the course or directly from the GPS instrument on the distance to the mark set boat. Regardless, the length of the course shall be recorded to a precision of 0.01 NM.

4.3 Communication from the Race Committee

Race Committee communications through VHF should be clear and frequent, explaining their intentions but also giving information about the race course. This information can include, for example, the length and compass bearing of the first leg of the course and the intended time for the warning signal. Each visual signal should be announced on the VHF with a countdown broadcast in advance and into the last few seconds prior to its display.

It is always desirable to announce boats that are OCS by VHF. Such announcements shall be clear, concise, and uniform using either bow number, sail number or boat names for all boats that are called over the line at the start. Any changes of the course or shortening of the course should also be announced on the VHF.

Radio communication from the Race Committee shall not be ground for redress as described in Section 2.6 with appropriate wording to be included in the Sailing Instructions.

4.4 Race Time Limits

Setting up a time limit in handicap racing needs to take in account rating differences between the fastest and slowest boat in the fleet. As explained in Section 4.2, having a complete set of predicted boat speeds for different wind conditions make this process much easier. There are several ways to define a time limit in the Sailing Instructions:

a) ***Fixed time limit for all boats in the fleet*** – if this option is selected it should be calculated based on the slowest rated boat in the fleet. Whatever method being used to score the race, the appropriate Time on Distance time allowance should be used. For example, if a Time-on-Time scoring method is used, then the relevant Time-on-Distance conversion factor should be used as described in Section 3. If time allowances are given for more than just one wind condition, the one for the lightest wind should be used. Once an appropriate ToD time allowance in sec/NM is selected, the estimated time need to sail the course may be calculated as:

Estimated time to sail the course = ToD x Length of course

The final time limit can then be determined by adding some margin based not only on the weather but competitive quality of the fleet: in general, smaller margins may be used for experienced competitors. For others the margin may be up to a 50% increase to the estimated elapsed time.

b) ***Fixed time limit for the first boat with finishing window for the rest of the fleet –*** Time limits for the first boat to finish may be calculated as described in a) above while the finishing window for the rest of the fleet may be calculated from the difference in ratings between the fastest and the slowest-rated boats in the fleet using the same method for selecting appropriate ToD factors:

$$\textit{Estimated time difference to sails the course} = (ToD_{\textit{fastest boat}} - ToD_{\textit{slowest boat}}) \times \textit{Length of course}$$

The final finishing window time limit shall then be determined by adding some margin increase to the estimated time difference to sail the course up to a 50% increase of estimated time difference between the fastest and the slowest boat

c) ***Individual time limit for each boat*** – may be calculated from an appropriate ToD rating and length of the course, such as:

$$\textit{Time limit} = ToD \times 2.0 \times \textit{Length of course}$$

where a factor of 2.0 may be adjusted to the type of race. This option is better to be used for Coastal/long distance races where the list of time limits may be printed and given to competitors prior to the start of the race. This option is available in the ORC Scorer Software. Please note that this option requires more attention from the Race Committee when recording finishing times to check that each boat has individually finished within her time limit.

4.5 Recording finishes and publishing results

Finishing times should be recorded to the nearest second in the format of HH:MM:SS of the actual local time when boat crosses the finishing line. With the starting time entered in the same format, scoring software will then do the calculations needed to determine elapsed and then corrected times.

For offshore races lasting longer than 24 hours the finishing day may also need to be recorded. If the race is going through more time zones, be sure to have all starting and finishing times recorded within same time zone, whether UTC or the starting venue time standard.

Results using ORC scoring are often very close. It is perfectly OK if two or more boats are finishing so close to be recorded as having finished within the same second in elapsed time, because their corrected times will likely calculate to be different. If their corrected times are the same, then ties are resolved according to RRS rule A7 with the points for the place for which boats have tied and for the place(s) immediately below added together and divided equally. Therefore, it is important to give the maximum possible accuracy on recording finishing times.

The best practice is to have one RC member monitoring the line identifying the boat finishing, and then give the sound signal when they cross the finishing line. Another RC member is then recording the time of the sound signal by writing on a finishing log sheet. Finishing times should also be recorded by a sound recorder.

The results should be published as soon as possible so that competitors may get results quickly. To facilitate this the scorer should be present on the race committee boat or at the race office with finishing times and course information sent from the race area, such as in photos taken of the log sheets. In either case, the race committee should double check all input data and resulting output with special attention paid to:

- Are all finishing times entered correctly?
- If the race lasts for more than a day, are all finishing days entered correctly?
- Is the starting time entered correctly and elapsed times calculated correctly?
- Are all time limits considered correctly?
- Are all OCS, UFD or BFD penalties entered properly?
- If PCS is used, is the scoring wind of the winning boat within range of the observed wind during the race? If not, double check the course configuration.

Once the RC is satisfied with the results, they may be published on the event web page and announced to the competitors by VHF if appropriate. The **ORC Scorer software** has an option to publish results with single click as described in its user guide.

After the results have been published, they should not be changed unless there is an error discovered. RRS 90.3(c) requires the Race Committee to correct any error that may be found from its own records or observations. If there is any request for correction of results from the competitors, the Race Committee should first check its own record and if the error is found it may proceed in accordance with RRS 90.3(c). If not, the boat may request redress according to RRS 60.1(b).

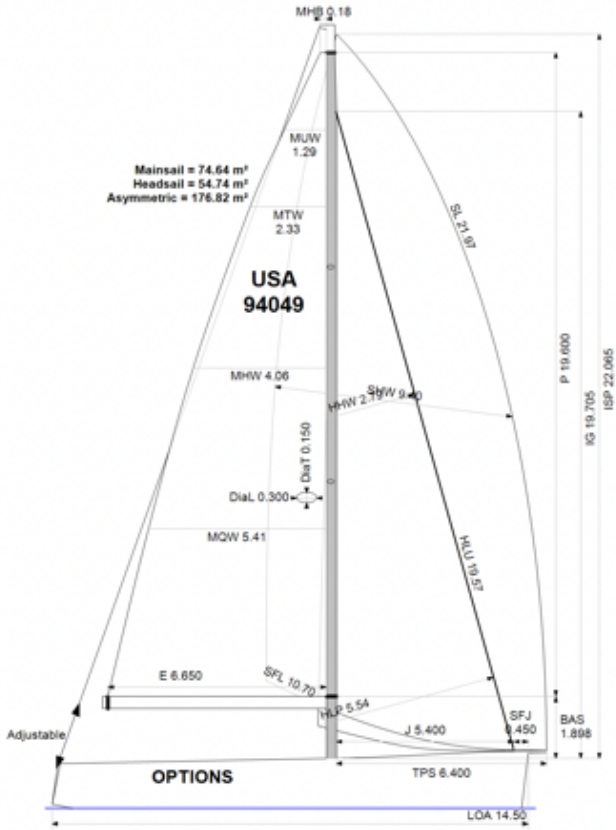
APPENDIX 1

ORC USA certificate example Page 1 & 2

ORC International Certificate 2023

Boat **OPTIONS** USA 94049

US SAILING
1 ROGER WILLIAMS UNI WAY
BRISTOL, RI 02809
USA



APH: **497.1**	CDL: **11.770**
GPH: **556.9**	CertNo: **US9404**

BOAT

Class	**X4.9**
Designer	**X-Yacht Design**
Builder	**X-Yachts**
Age date	**12/2022**
Series date	**01/2019**
Offset file	**X4.9-LK.off**
Data file	**USA94049**

HULL

Length Overall	**14.495 m**
Maximum Beam	**4.484 m**
Draft	**2.106 m**
Displacement	**14,976 kg**
DLR	**5.8631**
IMS Division	**Cruiser/Racer**
Dynamic Allowance	**0.250%**
Age Allowance	**0.130%**

PROPELLER

Installation	**Strut**
Type	**Folding 3 blades**
Diameter	**0.450m**

CREW

Maximum weight	**1,075 kg**
Minimum weight	**806 kg** ** when applied*
Non Manual Power	**Yes**
Crew Arm Extension	

SAIL AREAS (m²)

	Measured	Rated
Mainsail	**74.64**	**75.76**
Headsail Luffed	**54.74**	**54.74**
Headsail Flying		
Symmetric		
Asymmetric	**176.82**	**176.82**

(All asymmetric spinnakers with SHW/SFL > 85%)

STORM SAIL AREAS (m²)

Trysail	**22.81**
Storm Jib	**19.56**
Heavy Weather Jib	**52.81**

SAIL LIMITS

Headsails	**7**
Spinnakers	**5**

STABILITY

Righting Moment	**308.1 kg·m**
Stability Index	**116.1**

The owner and any other person in charge is responsible that boat is complying with her certificate in accordance with RRS 78.1 and ORC Rule 304.

Rated boat velocities in knots							
Wind Velocity	6 kt	8 kt	10 kt	12 kt	14 kt	16 kt	20 kt
Beat Angles	45.4°	43.0°	41.8°	41.4°	41.4°	41.2°	41.8°
Beat VMG	3.75	4.58	5.09	5.34	5.47	5.53	5.55
52°	5.86	6.95	7.63	7.95	8.11	8.20	8.26
60°	6.26	7.31	7.97	8.30	8.45	8.54	8.62
75°	6.57	7.60	8.24	8.61	8.82	8.94	9.09
90°	6.47	7.61	8.26	8.68	8.98	9.21	9.55
110°	6.52	7.81	8.57	9.00	9.29	9.52	9.89
120°	6.36	7.68	8.50	9.01	9.43	9.83	10.37
135°	5.70	7.06	8.08	8.72	9.19	9.65	10.64
150°	4.80	6.07	7.16	8.01	8.56	8.93	9.61
Run VMG	4.16	5.26	6.20	6.94	7.41	7.80	8.78
Gybe Angles	142.4°	146.2°	148.9°	149.8°	150.5°	170.0°	176.3°

ORC International Certificate 2023

Boat
OPTIONS
USA 94049

US SAILING
1 ROGER WILLIAMS UNI WAY
BRISTOL, RI 02809
USA

US SAILING

Time Allowances in secs/NM							
Wind Velocity	6 kt	8 kt	10 kt	12 kt	14 kt	16 kt	20 kt
Beat VMG	960.2	785.9	707.2	674.6	658.5	650.6	649.0
52°	614.4	517.9	471.9	452.9	444.0	439.2	435.8
60°	575.2	492.4	451.8	433.9	426.1	421.6	417.8
75°	548.0	473.5	436.8	418.3	408.1	402.5	396.2
90°	556.0	473.2	435.8	414.6	400.9	390.7	377.0
110°	551.8	460.8	420.2	400.2	387.7	378.3	363.9
120°	566.5	468.5	423.4	399.7	381.6	366.3	347.0
135°	631.1	509.8	445.5	413.0	391.9	372.9	338.2
150°	750.3	592.9	503.0	449.4	420.7	403.3	374.6
Run VMG	866.3	684.7	580.8	518.9	485.6	461.3	410.2
Selected Courses							
Windward / Leeward	913.2	735.3	644.0	596.8	572.1	555.9	529.6
All purpose	697.1	572.4	510.5	479.3	462.0	450.2	433.8

Single Number Scoring Options		
Course	Time On Distance	Time On Time
Windward / Leeward	623.5	0.9623
All purpose	497.1	1.2071

Custom scoring options for United States of America

Scoring Option	Time On Distance	Time On Time
Triple Number All Purpose Low	634.7	0.9453
Triple Number All Purpose Medium	493.1	1.2168
Triple Number All Purpose High	447.0	1.3423
Triple Number Windward/Leeward Low	824.3	0.7279
Triple Number Windward/Leeward Medium	617.9	0.9711
Triple Number Windward/Leeward High	550.1	1.0907
Predominantly Upwind	543.4	1.1042
Predominantly Downwind	498.7	1.2031
Predominantly Upwind Low	718.5	0.8351
Predominantly Upwind Medium	566.5	1.0592
Predominantly Upwind High	532.3	1.1272
Predominantly Downwind Low	685.5	0.8753
Predominantly Downwind Medium	491.7	1.2203
Predominantly Downwind High	418.8	1.4325
Chicago-Mac Upwind		1.0834
Chicago-Mac All Purpose		1.1294
Chicago-Mac Downwind		1.1825
Bayview-Mac Cove Island		1.0539
Bayview-Mac Shore		1.0601
Harvest Moon Regatta	425.5	1.4102
Victoria-Maui		1.2615

Scoring Option	Time On Distance	Time On Time
San Francisco Bay Heavy	535.5	1.1205
San Francisco Bay Medium	608.6	0.9859
Predominantly Reaching		1.2845
Predominantly Reaching Low		1.0520
Predominantly Reaching Medium		1.3028
Predominantly Reaching High		1.4683
Windward/Leeward 60-40 Low	834.0	0.7194
Windward/Leeward 60-40 Medium	642.6	0.9336
Windward/Leeward 60-40 High	584.7	1.0261

5-Band Windward/Leeward	Time On Distance	Time On Time
5-Band Low	899.5	0.6670
5-Band Low / Medium	755.0	0.7947
5-Band Medium	608.6	0.9859
5-Band Medium / High	557.6	1.0760
5-Band High	534.1	1.1233

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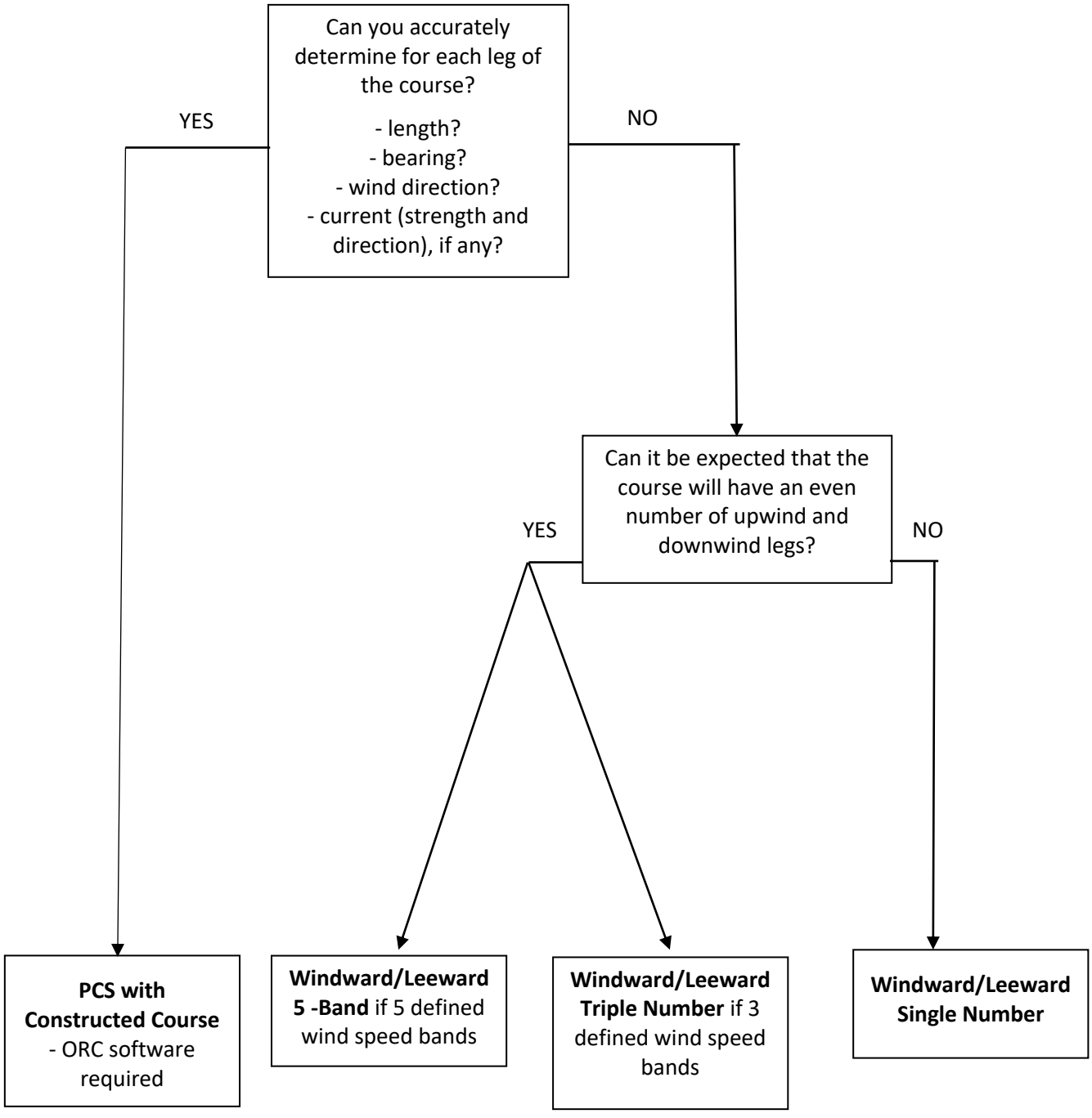
APPENDIX 2

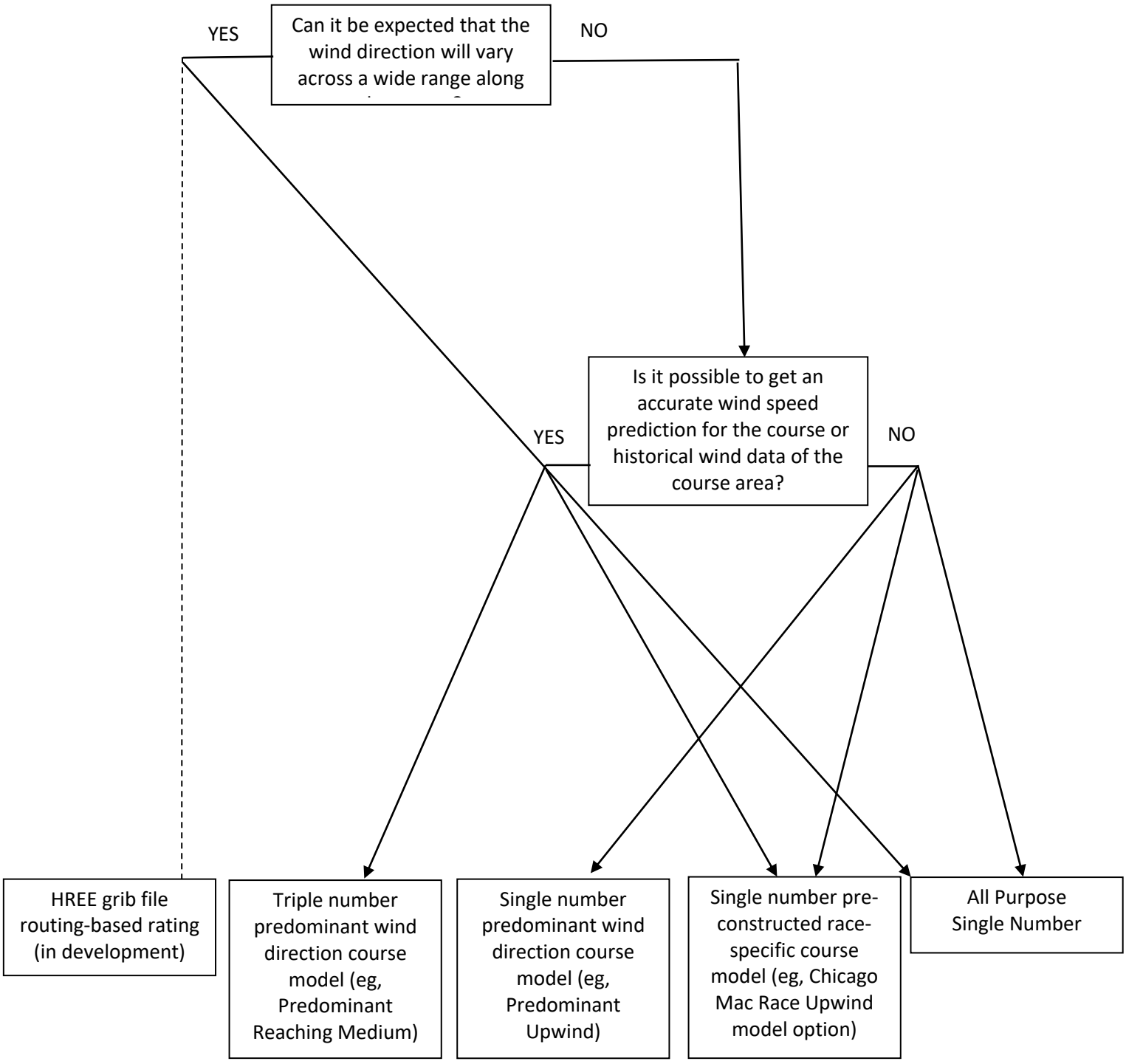
USA Windward / Leeward race scoring options flow chart



ACCURACY ⟷ **SIMPLICITY**

APPENDIX 3

Coastal / Long Distance race scoring options flow chart



ACCURACY ⟵ ⟶ **SIMPLICITY**

APPENDIX 4

USA-CAN Standard Scoring Models

General: In the new 2023 USA-CAN certificate design, there are some new formulations added from 2022 on Page 2 of all ORC certificates.

1. **Single Number** rating options remain the same. **Windward/Leeward** ratings are calculated based on a course model that is 50% upwind VMG and 50% downwind VMG.

Single Number Scoring Options		
Course	Time On Distance	Time On Time
Windward / Leeward	509.3	1.1781
All purpose	412.3	1.4552

The **All Purpose** model is based on an equal mix of all wind angles.

Both models condense the rating into a single number based on this mix of wind speeds:

TWS (kt)	***6***	***8***	***10***	***12***	***14***	***16***	***20***
Time Allowance percentage	5%	10%	20%	30%	20%	10%	5%

2. Other options include **Triple Number** for All Purpose, Windward/Leeward and Predominant wind direction models – **Upwind, Downwind** and a new **Reaching** model. Triple Number wind speed mixes are shown here for the **Low, Medium** and **High** wind band ranges:

TWS (kt)	6	8	10	12	14	16	20
Low	50%	50%					
Medium		8.4%	33.3%	33.3%	25%		
High					25%	37.5	37.5%

3. **Predominant wind direction** models for **single number** ratings are shown here:

Upwind

TWS (kt)	***8***	***12***	***16***
Beat VMG	10%	15%	7%
52°	10%	15%	9%
90°	5%	7%	3%
135°	4%	5%	2%
Run VMG	3%	4%	1%

Downwind

TWS (kt)	***8***	***12***	***16***
Beat VMG	3%	4%	1%
52°	4%	5%	2%
90°	5%	7%	3%
135°	10%	15%	9%
Run VMG	10%	15%	7%

Reaching

TWS (kt)	8	12	16
Beat VMG	2%	4%	2%
52°	6%	8%	4%
90°	12%	18%	8%
135°	8%	12%	8%
Run VMG	2%	4%	2%

Predominant wind direction models for **Triple number LOW** ratings are shown here:

Upwind LOW

TWS (kt)	6	8
Beat VMG	20%	25%
52°	15%	10%
90°	5%	5%
135°	5%	5%
Run VMG	5%	5%

Downwind LOW

TWS (kt)	6	8
Beat VMG	5%	5%
52°	5%	5%
90°	5%	5%
135°	15%	10%
Run VMG	20%	25%

Reaching LOW

TWS (kt)	6	8
Beat VMG	2.5%	2.5%
52	10.0%	10.0%
90	15.0%	20.0%
135	15.0%	20.0%
Run VMG	2.5%	2.5%

Predominant wind direction models for **Triple number MEDIUM** ratings are shown here:

Upwind MEDIUM

TWS (kt)	8	10	12	14
Beat VMG	5%	15%	15%	12%
52°	3%	12%	12%	8%
90°	0.4%	4.3%	4.3%	3%
135°	0	1%	1%	1%
Run VMG	0	1%	1%	1%

Downwind MEDIUM

TWS (kt)	8	10	12	14
Beat VMG	0	1%	1%	1%
52°	0	1%	1%	1%
90°	0.4%	4.3%	4.3%	3%
135°	3%	12%	12%	8%
Run VMG	5%	15%	15%	12%

Reaching MEDIUM

TWS (kt)	8	10	12	14
Beat VMG	0.5%	2.0%	2.0%	0.5%
52	2.5%	7.5%	7.5%	2.5%
90	7.5%	10.0%	10.0%	7.5%
135	7.5%	10.0%	10.0%	7.5%
Run VMG	0.5%	2.0%	2.0%	0.5%

Predominant wind direction models for **Triple number MEDIUM** ratings are shown here:

Upwind HIGH

TWS (kt)	14	16	20
Beat VMG	12%	18%	18%
52°	8%	12%	12%
90°	3%	5.5%	5.5%
135°	1%	1%	1%
Run VMG	1%	1%	1%

Downwind HIGH

TWS (kt)	14	16	20
Beat VMG	1%	1%	1%
52°	1%	1%	1%
90°	3%	5.5%	5.5%
135°	8%	12%	12%
Run VMG	12%	18%	18%

Reaching HIGH

TWS (kt)	14	16	20
Beat VMG	1.0%	3.0%	1.0%
52	5.0%	10.0%	5.0%
90	10.0%	15.0%	10.0%
135	10.0%	15.0%	10.0%
Run VMG	1.0%	3.0%	1.0%

4. The 5-band Windward/Leeward course model is based on this matrix of wind speeds for 50% Upwind VMG and 50% Downwind VMG wind angles:

TWS	6 kt	8 kt	10 kt	12 kt	14 kt	16 kt	20 kt
Low	92.3%	7.7%					
L/M	26.9%	46.2%	19.2%	7.7%			
Med		7.7%	19.2%	46.2%	19.2%	7.7%	
M/H				7.7%	19.2%	55.8%	17.3%
High						17.3%	82.7%

5. **Race-specific course model** matrices shown on USA-CAN certificates are shown here:

Chicago Mac Upwind

	TWS						
TWA	6 Kts	8 Kts	10 Kts	12 Kts	16 Kts	20 Kts	
Optimum Beat	1.75%	5.25%	10.50%	10.50%	5.10%	1.60%	34.70%
52 deg Reach	1.40%	4.35%	9.00%	9.30%	5.10%	1.80%	30.95%
90 deg Reach	0.75%	2.25%	4.50%	4.50%	2.40%	0.90%	15.30%
135 deg Reach	0.60%	1.80%	3.30%	3.30%	1.50%	0.45%	10.95%
Optimum Run	0.50%	1.35%	2.70%	2.40%	0.90%	0.25%	8.10%
Sum	5.00%	15.00%	30.00%	30.00%	15.00%	5.00%	**100.00%**

Chicago Mac All-Purpose

TWA	6 Kts	8 Kts	10 Kts	12 Kts	16 Kts	20 Kts	
Optimum Beat	1.45%	3.90%	6.90%	6.00%	2.40%	0.60%	21.25%
52 deg Reach	0.700%	2.40%	5.40%	6.00%	3.15%	1.10%	18.75%
90 deg Reach	0.700%	2.40%	5.40%	6.00%	3.90%	1.60%	20.00%
135 deg Reach	0.700%	2.40%	5.40%	6.00%	3.15%	1.10%	18.75%
Optimum Run	1.45%	3.90%	6.90%	6.00%	2.40%	0.60%	21.25%
Sum	5.00%	15.00%	30.00%	30.00%	15.00%	5.00%	**100.00%**

Chicago Mac Offwind

TWA	6 Kts	8 Kts	10 Kts	12 Kts	16 Kts	20 Kts	
Optimum Beat	0.50%	1.35%	2.70%	2.40%	0.90%	0.25%	8.10%
52 deg Reach	0.60%	1.80%	3.30%	3.30%	1.50%	0.45%	10.95%
90 deg Reach	0.75%	2.25%	4.50%	4.50%	2.40%	0.90%	15.30%
135 deg Reach	1.40%	4.35%	9.00%	9.30%	5.10%	1.80%	30.95%
Optimum Run	1.75%	5.25%	10.50%	10.50%	5.10%	1.60%	34.70%
Sum	5.00%	15.00%	30.00%	30.00%	15.00%	5.00%	**100.00%**

Course models for the **Bayview-Mackinac Race** are as follows:

Cove Island Course

Wind (knots):	6	8	10	12	16
VMG Up	6.000%	8.125%	6.250%	3.938%	1.250%
60	5.250%	7.500%	6.250%	4.500%	1.875%
90	0.000%	2.500%	5.000%	6.750%	5.000%
120	0.000%	1.875%	3.750%	5.063%	3.750%
VMG Dn	3.750%	5.000%	3.750%	2.250%	0.625%

Shore Course

Wind (knots):	6	8	10	12	16
VMG Up	6.000%	6.250%	5.000%	3.000%	1.000%
60	6.000%	6.250%	5.000%	3.000%	1.000%
90	2.000%	3.750%	5.000%	5.000%	3.000%
120	1.000%	3.125%	5.000%	5.500%	3.500%
VMG Dn	5.000%	5.625%	5.000%	3.500%	1.500%

The **Harvest Moon Regatta** course model is:

TWA - TWS	6	8	10	12	14	16	20
VMG up	0.5	1.0	1.0	0.5	0.5	0.0	0.0
60	1.0	2.0	2.0	4.0	4.0	1.0	0.0
90	0.0	0.0	5.0	6.5	6.5	8.0	5.0
120	0.0	0.0	1.0	5.5	8.0	8.0	4.0
150	0.0	0.0	1.0	3.0	5.0	5.0	4.0
VMG down	0.5	0.5	0.5	0.5	2.0	2.0	1.0

The **Victoria-Maui Race** course model is:

True Wind Angle	True Wind Speed (kts)						
	6	8	10	12	14	16	20
VMG BEAT	1.6%	1.2%	0.9%	0.4%	0.3%	0.1%	0.1%
60	1.1%	0.6%	0.6%	0.7%	0.3%	0.1%	0.4%
90	1.2%	2.1%	2.3%	1.1%	0.9%	0.1%	0.7%
110	1.0%	1.2%	1.6%	1.9%	1.5%	1.1%	2.2%
120	0.4%	0.7%	1.4%	2.7%	1.8%	0.8%	1.2%
135	0.2%	0.8%	0.7%	0.7%	0.7%	0.5%	2.0%
150	1.6%	3.9%	5.1%	5.1%	4.2%	3.6%	6.1%
VMG RUN	0.3%	1.5%	3.9%	4.0%	6.3%	6.0%	6.5%

Courses used in the **StFYC's Rolex Big Boat Series** are:

San Francisco Bay Heavy Single Number

	6 Knots	8 Knots	10 Knots	12 Knots	14 Knots	16 Knots	20 Knots	Sum
Optimum Beat	0.00%	0.00%	0.00%	5.41%	0.00%	28.03%	15.75%	49.19%
52 deg Reach	0.00%	0.00%	0.00%	0.00%	0.00%	0.80%	0.81%	1.61%
60 deg Reach	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
75 deg Reach	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
90 deg Reach	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
110 deg Reach	0.00%	0.00%	0.00%	0.00%	0.00%	1.03%	0.00%	1.03%
120 deg Reach	0.00%	0.00%	0.00%	0.00%	0.00%	2.23%	0.51%	2.74%
135 deg Reach	0.00%	0.00%	0.00%	0.00%	0.00%	5.49%	2.95%	8.44%
150 deg Reach	0.00%	0.00%	0.00%	0.00%	0.00%	5.49%	3.47%	8.96%
Optimum Run	0.00%	0.00%	0.00%	5.29%	0.00%	14.13%	8.60%	28.01%
Sum	0.00%	0.00%	0.00%	10.70%	0.00%	57.20%	32.10%	**100.00%**

San Francisco Bay Medium Single Number

	6 Knots	8 Knots	10 Knots	12 Knots	14 Knots	16 Knots	20 Knots	Sum
Optimum Beat	0.00%	10.83%	14.01%	14.01%	0.00%	10.34%	0.00%	49.19%

52 deg Reach	0.00%	0.00%	0.40%	0.40%	0.00%	0.81%	0.00%	1.61%
60 deg Reach	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
75 deg Reach	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
90 deg Reach	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
110 deg Reach	0.00%	0.00%	0.51%	0.51%	0.00%	0.00%	0.00%	1.03%
120 deg Reach	0.00%	0.00%	1.12%	1.12%	0.00%	0.51%	0.00%	2.74%
135 deg Reach	0.00%	0.00%	2.75%	2.75%	0.00%	2.95%	0.00%	8.44%
150 deg Reach	0.00%	0.00%	2.75%	2.75%	0.00%	3.47%	0.00%	8.96%
Optimum Run	0.00%	10.57%	7.06%	7.06%	0.00%	3.32%	0.00%	28.02%
Sum	0.00%	21.40%	28.60%	28.60%	0.00%	21.40%	0.00%	**100.00%**

SF W/L 60-40 **Low**

	6 Knots	8 Knots	10 Knots	12 Knots	14 Knots	16 Knots	20 Knots	Sum
Optimum Beat	30.00%	30.00%	0.00%	0.00%	0.00%	0.00%	0.00%	60.00%
Optimum Run	20.00%	20.00%	0.00%	0.00%	0.00%	0.00%	0.00%	40.00%
Sum	50.00%	50.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**

SF W/L 60-40 **Medium**

	6 Knots	8 Knots	10 Knots	12 Knots	14 Knots	16 Knots	20 Knots	Sum
Optimum Beat	0.00%	5.63%	22.29%	22.29%	16.75%	0.00%	0.00%	66.96%
Optimum Run	0.00%	2.77%	11.01%	11.01%	8.25%	0.00%	0.00%	33.04%
Sum	0.00%	8.40%	33.30%	33.30%	25.00%	0.00%	0.00%	**100.00%**

SF W/L 60-40 **High**

	6 Knots	8 Knots	10 Knots	12 Knots	14 Knots	16 Knots	20 Knots	Sum
Optimum Beat	0.00%	0.00%	0.00%	0.00%	16.75%	25.13%	25.13%	67.01%
Optimum Run	0.00%	0.00%	0.00%	0.00%	8.25%	12.37%	12.37%	32.99%
Sum	0.00%	0.00%	0.00%	0.00%	25.00%	37.50%	37.50%	**100.00%**