



WORLD SAILING – INTERNATIONAL EMPIRICAL HANDICAP SCHEME FOR YACHTS

Welcome to the World Sailing Empirical Handicap Scheme for Yachts. As the name suggests the scheme is intended to permit yachts, generally displacement boats with keels, of varying designs to race against each other and after racing determine, by calculation, the race results by excluding the performance differences of the boats themselves. The scheme is an empirical handicap scheme, that is a scheme where after racing the relative performance of each boat - their handicap, is determined from the times it took each boat to complete the race.

World Sailing provides this scheme to any race organiser who wishes to use it. It is intended to operate in isolation at local/race organiser level requiring no input to or from World Sailing or elsewhere. World Sailing does however offer users a basic method of handicap allocation to a boat for use in its first race.

Before using the scheme an organiser needs to address four factors:-

- The allocation of a boats handicap for its first race
- How to calculate race results
- How to adjust a boats handicap after racing
- Whether or not to attempt to exclude the varying skills of crews from the calculations

The allocation of a boats handicap for its first race

A boats handicap is expressed as a number based about 1. Faster boats handicaps will be higher than 1 with slow boats handicaps less than 1. Generally, the range of handicaps will be no more than 1.2 and no less than 0.8.

It would never be wrong for a race organiser to allocate a first race handicap based on their own subjective opinion of a boat. If the organiser considers the boat to be of average performance, then a handicap of 1 would suit. If, however the organiser considers the boat faster than the fleet average then a handicap above 1 in the range of say 1 to 1.2 would be appropriate. If the performance is thought to be below average, then a handicap of less than 1 in the range of 0.8 to 1 should be used.

Alternatively, if the race organiser wishes the first race handicap could be allocated using the basic calculator at the following link - .

Whatever the case the handicap number used to calculate the race results for a boat in its first and subsequent races should be adjusted before use in the boats next race.

How to calculate race results

The results of a race are determined by comparing the *corrected times* for each boat with the least time being the race winner, the next least second place and so on for each boat completing in the race.

The *corrected time* (CT) for each boat is calculated by multiplying its elapsed time (ET), that is the time it took to complete the race, by its handicap (H) i.e. $CT = ET \times H$

An example of the calculations and how best to set this out is shown below.

Example 1 - Race Results

Sail No	Boat	Finish Time	Elapsed Time (ET)	Handicap (H)	Corrected Time (CT)	Finishing Place
1	A	14:56:37	01:26:37	1.079	01:33:28	3
2	B	15:12:36	01:42:36	0.957	01:38:11	8
3	C	15:18:24	01:48:24	0.929	01:40:42	9
4	D	15:03:59	01:33:59	1.008	01:34:44	4
5	E	15:04:21	01:34:21	1.005	01:34:49	5
6	F	15:04:44	01:34:44	1.004	01:35:07	6
7	G	15:02:29	01:32:29	1.003	01:32:46	2
8	H	15:15:44	01:45:44	0.948	01:40:14	10
9	I	15:07:14	01:37:14	0.982	01:35:29	7
10	J	14:53:17	01:23:17	1.074	01:29:27	1

Start Time = 13:30:00

How to adjust a boats handicap after racing

The life blood of empirical handicap racing is the adjustment of handicaps after racing. Without this race results and the scheme will soon become meaningless.

The World Sailing empirical handicap scheme attempts to adjust the handicap of each boat based on the *standard corrected time* (SCT) of the fleet which is the average CT excluding the lowest 20% and highest 40% of the CTs (rounded down to whole numbers).

Using the race result example above those CTs exclude are flagged in red and green as shown below. The remaining CTs are averaged to give a SCT for the race (1:34:32 in the example).

Dividing the SCT by a boats ET gives the calculated handicap which the boat would have had in the race for its CT to have equalled the SCT i.e. it gives the handicap to which the boat sailed in the race (h).

The difference between H and h gives a performed indicator (PI) i.e. $PI = h - H$ (which may be plus or minus). A proportion of the PI should be applied to the boats race handicap (H) with the result used as the boats new handicap in its next race (H').

The portion of the PI applied to adjust the handicap depends on the number of races the boat has completed in the fleet. The table below gives the portions. The new handicap $H' = H + (PI \times PM)$.

Races completed	Portion	Multiplier
1	All	1
2	Half	0.5
3	One third	0.33
4	One quarter	0.25
5	One fifth	0.2
Greater than 5	One fifth	0.2

Example 2 – Race Results and Number Adjustment [add table in here]

Whether or not to attempt to exclude the varying skills of crews from the calculations

Unlike a Rating System an Empirical Handicap Scheme of the type explained here allocates handicaps to the combined boat performance and the crew skill. This can sometimes work to the detriment of good crews and benefit of not so good crews as their ability is reflected in the adjusted handicaps. Whether or not to attempt to exclude crew skill from the calculations is a decision for the race organiser bearing in mind that to attempt this mathematically will involve on-going subjective judgements on the part of the organiser. For more information on the exclusion of crew skill from the calculations please contact World Sailing at – technical@sailing.org