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NAVY DEPARTMENT
DAVID TAYLOR MODEL BASIN
WASHINGTON, D. C.

STANDARD REFERENCE SCALES FOR WIND,
WEATHER, SEA AND SWELL



RESTRICTED

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Report R-221

DAVID TAYLOR MODEL BASIN

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FOREWORD

The information here presented is constantly needed in the preparation of logs and weather reports, and the conduct of tests and trial runs of ships at sea. Although it can be found in various texts and handbooks, it is usually scattered and therefore inconvenient to use. For that reason the David Taylor Model Basin has compiled these convenient tables from information furnished by the Hydrographic Office, USN, and from a memorandum prepared by the National Defense Research Committee, and here presents them for the benefit of those whose work requires their frequent use.

This information has been checked by the Hydrographic Office and by the Office of the Chief of Naval Operations, United States Navy.

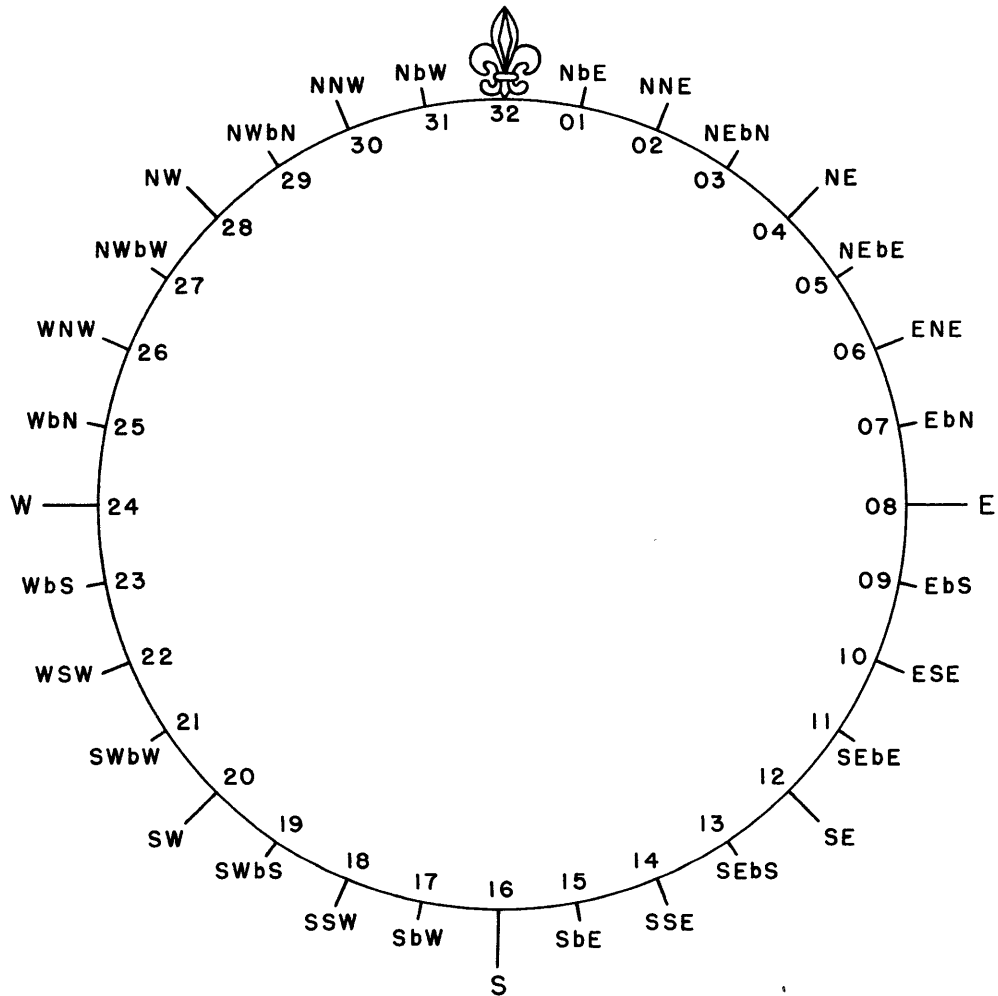


Figure 1 - The 32 Points of the Compass

The numerical points of the compass, from 1 to 32, are to be used in recording the direction from which the wind blows, the direction from which the swell moves, and the direction from which the sea moves.

REFERENCES

All correspondence on this subject will be found on TMB files H1-15 and H4-7.

BEAUFORT WIND AND WEATHER SCALE

Code for Wind Force	Limits of Speed		Beaufort's Description	Deep Sea Criterion
	ft/sec	knots		
0	Less than 2	Less than 1	Calm	Sea mirror smooth.
1	2 - 5	1 - 3	Light air	Small wavelets like scales. No whitecaps.
2	6 - 11	4 - 6	Light breeze	Waves short and more pronounced, crests begin to break. Foam has glassy appearance, not as yet white.
3	12 - 18	7 - 10	Gentle breeze	
4	19 - 27	11 - 16	Moderate breeze	Waves longer, many whitecaps.
5	28 - 36	17 - 21	Fresh breeze	Waves more pronounced and long whitecaps everywhere.
6	37 - 46	22 - 27	Strong breeze	Larger waves form. Whitecaps more extensive.
7	47 - 56	28 - 33	Moderate gale	Sea heaps up, wind starts to blow the foam in streaks.
8	57 - 68	34 - 40	Fresh gale	Height of wave increases visibly, also height of crests, foam is blown in dense streaks.
9	69 - 80	41 - 47	Strong gale	
10	81 - 93	48 - 55	Whole gale	High waves with long overhanging crests, great foam patches.
11	94 - 106	56 - 63	Storm	Waves so high that ships within sight are hidden in troughs, sea covered with streaky foam, air filled with spray.
12	107 - 120	64 - 71	Hurricane	
13	121 - 135	72 - 80		
14	136 - 150	81 - 89		
15	151 - 167	90 - 99		
16	168 - 184	100 - 109		
17	185 - 199	110 - 118		

The direction from which the wind blows to be recorded in numerical points, see Figure 1.

INTERNATIONAL SWELL SCALE

Code	Swell	In Open Sea
0	None	Low
1	Short or Average Length	
2	Long	
3	Short	Moderate Height
4	Average Length	
5	Long	
6	Short	Heavy
7	Average Length	
8	Long	
9	Confused	Note: Qualifying condition applicable to previous conditions. For example, 9-6 indicates a short heavy confused swell.

The direction from which the swell moves to be recorded in numerical points, see Figure 1.

SEA SCALE

Code	Sea	Height of Waves Crest to Trough feet
0	Calm	0
1	Smooth	Less than 1
2	Slight	1 - 3
3	Moderate	3 - 5
4	Rough	5 - 8
5	Very Rough	8 - 12
6	High	12 - 20
7	Very High	20 - 40
8	Mountainous	40 and over
9	Confused	Note: Qualifying condition applicable to previous conditions. For example, 5-9 indicates a very rough, confused sea.

The direction from which the sea moves to be recorded in numerical points, see Figure 1.

VISIBILITY

Code	Objects not Visible	
	Naut. Mi. Approx.	Yards
0		55
1		220
2		550
3	1/2	1100
4	1	2200
5	2	
6	5	
7	11	
8	26	
9	Over 26	

CEILING

Code	Height in feet	Height in meters
0	0 to 150	0 to 49
1	151 to 300	50 to 99
2	301 to 600	100 to 199
3	601 to 1000	200 to 299
4	1001 to 2000	300 to 599
5	2001 to 3000	600 to 999
6	3001 to 5000	1000 to 1499
7	5001 to 6500	1500 to 1999
8	6501 to 8200	2000 to 2499
9	Above 8200, or no clouds	Above 2500, or no clouds

The term "Ceiling" shall be defined as the lowest height above ground at which the total cloudiness present covers more than 5/10 of the sky.

PRESENT WEATHER CONDITIONS

ABBREVIATED DESCRIPTION OF SKY AND SPECIAL PHENOMENA

Code	Condition
00	Cloudless
01	Partly Cloudy
02	Cloudy
03	Overcast
04	Low fog, on ground or over sea
05	Haze (visibility 1,000 m., 1,100 yds. or more)
06	Dust devils seen
07	Distant lightning
08	Light fog (visibility between 1,000 and 2,000 m., 1,100 and 2,200 yds.)
09	Fog at a distance, but not at the ship
10	Precipitation within sight
11	Thunder, without precipitation at the ship
12	Dust storm within sight, but not at the ship
13	Ugly, threatening sky
14	Squally weather
15	Heavy squalls
16	Waterspouts seen
17	Visibility reduced by smoke (industrial, grass or forest fires), or volcanic ashes
18	Dust storm (visibility greater than 1,100 yds.)
19	Signs of tropical storm (hurricane)

PRECIPITATION IN LAST HOUR BUT NOT AT TIME OF OBSERVATION

20	Precipitation (rain, drizzle, hail, snow, or sleet)	} In last hour but not at time of observation
21	Drizzle	
22	Rain	
23	Snow	
24	Rain and snow, mixed	
25	Rain shower (s)	
26	Snow shower (s)	
27	Hail or rain and hail shower (s)	
28	Slight thunderstorm	
29	Heavy thunderstorm	

DUST STORMS AND STORMS OF DRIFTING SNOW
(Visibility less than 1,000 m., 1,100 yds.)

30	Dust or sand storm
31	Dust or sand storm has decreased
32	Dust or sand storm, no appreciable change
33	Dust or sand storm has increased
34	Line of dust storms
35	Storm of drifting snow
36	Slight storm of drifting snow
37	Heavy storm of drifting snow
38	Slight storm of drifting snow
39	Heavy storm of drifting snow

FOG
(Visibility less than 1,000 m., 1,100 yds.)

40	Fog
41	Moderate fog in last hour
42	Thick fog in last hour
43	Fog, sky discernible
44	Fog, sky not discernible
45	Fog, sky discernible
46	Fog, sky not discernible
47	Fog, sky discernible
48	Fog, sky not discernible
49	Fog in patches

DRIZZLE

(Precipitation consisting of numerous minute drops.)

50	Drizzle	
51	Intermittent	} slight drizzle
52	Continuous	
53	Intermittent	} moderate drizzle
54	Continuous	
55	Intermittent	} thick drizzle
56	Continuous	
57	Drizzle and fog	
58	Slight or moderate	} drizzle and rain
59	Thick	

RAIN

60	Rain	
61	Intermittent	} slight rain
62	Continuous	
63	Intermittent	} moderate rain
64	Continuous	
65	Intermittent	} heavy rain
66	Continuous	
67	Rain and fog	
68	Slight or moderate	} rain and snow, mixed
69	Heavy	

SNOW

70	Snow (or snow and rain, mixed)	
71	Intermittent	} slight snow in flakes
72	Continuous	
73	Intermittent	} moderate snow in flakes
74	Continuous	
75	Intermittent	} heavy snow in flakes
76	Continuous	
77	Snow and fog	
78	Grains of snow (frozen drizzle)	
79	Ice crystals; or frozen raindrops (sleet - U.S. definition)	

SHOWER (S)

80	Shower (s)	
81	Shower (s) of slight or moderate	} rain
82	Shower (s) of heavy	
83	Shower (s) of slight or moderate	} snow
84	Shower (s) of heavy	
85	Shower (s) of slight or moderate	} rain and snow
86	Shower (s) of heavy	
87	Shower (s) of snow pellets (soft hail)	
88	Shower (s) of slight or moderate	} hail, or rain and hail
89	Shower (s) of heavy	

THUNDERSTORM

90	Thunderstorm	
91	Rain at time	} thunderstorm during last hour, but not at time
92	Snow, or rain and snow mixed at time	
93	Thunderstorm, slight without hail but with rain (or snow)	} at time of observation
94	Thunderstorm slight with hail	
95	Thunderstorm moderate without hail, but with rain (or snow)	
96	Thunderstorm moderate with hail	
97	Thunderstorm heavy without hail, but with rain (or snow)	
98	Thunderstorm combined with dust storm	
99	Thunderstorm heavy with hail	

