APPEDIX C

WIND-INDUCED WAVE PARAMETERS CALCULATION

Wind-induced wave parameters are determined by Bretshneider's method. It is based on the assumption that waves are induced by local design wind conditions, which is appropriate for the areas withstanding the direct impacts of wind.

$$\frac{gH_S}{w^2} = 0,283 \tanh\left[0,530\left(\frac{gh}{w^2}\right)^{0,750}\right] \tanh\frac{0,0125\left(\frac{gD}{w^2}\right)^{0,42}}{\tanh\left[0,530\left(\frac{gh}{w^2}\right)^{0,750}\right]} \qquad (C-1)$$

$$\frac{gT_p}{w} = 2\pi.1,2 \tanh\left[0,83\left(\frac{gh}{w^2}\right)^{0,375}\right] \tanh\frac{0,077\left(\frac{gD}{u^2}\right)^{0,25}}{\tanh\left[0,833\left(\frac{gh}{w^2}\right)^{0,375}\right]} \qquad (C-2)$$

where:

Hs	−	Computed wave height (m);
Tp	−	Computed peak wave period (s);
D	−	Design fetch length (m);
h	−	Average water depth in the study area (m);
w	−	Design wind velocity (m/ s).

Wave parameters are determined under conditions that wind velocities are constant within a sufficiently long period (from 15 minutes to hours) so that waves can reach their maximum growth; therefore the statistical data on wind on hourly basis at meteorological stations can be used.

For preliminary design, the look-up tables from C-1-1 to C-1-12 complied by Pilarczyk for some ranges of wind velocities and small fetch length can be used. The computed wave heights in these tables are significant values ($H_{1/3}$).

Table C-1. *Look-up table of wind-induced wave parameters*

C-1-1. Computed wave height (m), D ≤ 5 km

Average depth (m)	Average wind velocity (m/ s)			
	W ≤ 10	10 < W ≤ 15	15 < W ≤ 20	20 < W ≤ 25
10 < h ≤ 15	≤ 0.50	≤ 0.75	≤ 1.05	≤ 1.35
5 < h ≤ 10	≤ 0.50	≤ 0.75	≤ 1.00	≤ 1.30
h ≤ 5	≤ 0.50	≤ 0.70	≤ 0.90	≤ 1.10

C-1-2. Peak wave period Tp (s), D ≤ 5km

Average depth (m)	Average wind velocity (m/ s)			
	W ≤ 10	10 < W ≤ 15	15 < W ≤ 20	20 < W ≤ 25
10 < h ≤ 15	≤ 2.5	≤ 3.0	≤ 3.6	≤ 4.5
5 < h ≤ 10	≤ 2.5	≤ 3.0	≤ 3.6	≤ 4.2
h ≤ 5	≤ 2.5	≤ 3.0	≤ 3.5	≤ 4.0

C-1-3. Computed wave height (m), 5km < D ≤ 10 km

Average depth (m)	Average wind velocity (m/ s)			
	w ≤ 10	10 < w ≤ 15	15 < w ≤ 20	20 < w ≤ 25
10 < h ≤ 15	≤ 0.60	≤ 1.00	≤ 1.35	≤ 1.70
5 < h ≤ 10	≤ 0.60	≤ 0.95	≤ 1.30	≤ 1.60
h ≤ 5	≤ 0.55	≤ 0.80	≤ 1.10	≤ 1.25

C-1-4. Peak wave period Tp (s), 5km < D ≤ 10 km

Average depth (m)	Average wind velocity (m/ s)			
	W ≤ 10	10 < W ≤ 15	15 < W ≤ 20	20 < W ≤ 25
10 < h ≤ 15	≤ 3.0	≤ 3.7	≤ 4.2	≤ 4.7
5 < h ≤ 10	≤ 2.9	≤ 3.6	≤ 4.1	≤ 4.5
h ≤ 5	≤ 2.8	≤ 3.4	≤ 3.8	≤ 4.2

C-1-5. Computed wave height (m), 10 km < D ≤ 15 km

Average depth (m)	Average wind velocity (m/ s)			
	w ≤ 10	10 < w ≤ 15	15 < w ≤ 20	20 < w ≤ 25
10 < h ≤ 15	≤ 0.75	≤ 1.15	≤ 1.55	≤ 1.95
5 < h ≤ 10	≤ 0.70	≤ 1.10	≤ 1.45	≤ 1.75
h ≤ 5	≤ 0.60	≤ 0.90	≤ 1.15	≤ 1.30

C-1-6. *Peak wave period Tp (s), 10 km < D ≤ 15 km*

Average depth (m)	Average wind velocity (m/s)			
	W ≤ 10	10 < W ≤ 15	15 < W ≤ 20	20 < W ≤ 25
10 < h ≤ 15	≤ 3.2	≤ 4.0	≤ 4.6	≤ 5.1
5 < h ≤ 10	≤ 3.2	≤ 3.9	≤ 4.4	≤ 4.9
h ≤ 5	≤ 3.0	≤ 3.6	≤ 4.1	≤ 4.5

C-1-7. Computed wave height (m), 15 km < D ≤ 20 km

Average depth (m)	Average wind velocity (m/s)			
	w ≤ 10	10 < w ≤ 15	15 < w ≤ 20	20 < w ≤ 25
0 < h ≤ 15	≤ 0.85	≤ 1.25	≤ 1.70	≤ 2.10
5 < h ≤ 10	≤ 0.80	≤ 1.20	≤ 1.55	≤ 1.90
h ≤ 5	≤ 0.70	≤ 0.95	≤ 1.15	≤ 1.35

C-1- 8. *Peak wave period Tp (s), 15 km < D ≤ 20 km*

Average depth (m)	Average wind velocity (m/s)			
	W ≤ 10	10 < W ≤ 15	15 < W ≤ 20	20 < W ≤ 25
10 < h ≤ 15	≤ 3.5	≤ 4.2	≤ 4.8	≤ 5.3
5 < h ≤ 10	≤ 3.3	≤ 4.1	≤ 4.6	≤ 5.1
h ≤ 5	≤ 3.1	≤ 3.7	≤ 4.2	≤ 4.6

C-1-9. Computed wave height (m), 20 km < D ≤ 25 km

Average depth (m)	Average wind velocity (m/s)			
	w ≤ 10	10 < w ≤ 15	15 < w ≤ 20	20 < w ≤ 25
10 < h ≤ 15	≤ 0.90	≤ 1.35	≤ 1.80	≤ 2.25
5 < h ≤ 10	≤ 0.85	≤ 1.25	≤ 1.65	≤ 1.95
h ≤ 5	≤ 0.70	≤ 1.00	≤ 1.20	≤ 1.40

C-1-10. Peak wave period Tp (s), 20 km < D ≤ 25 km

Average depth (m)	Average wind velocity (m/s)			
	W ≤ 10	10 < W ≤ 15	15 < W ≤ 20	20 < W ≤ 25
10 < h ≤ 15	≤ 3.6	≤ 4.5	≤ 5.0	≤ 5.6
5 < h ≤ 10	≤ 3.5	≤ 4.2	≤ 4.8	≤ 5.3
h ≤ 5	≤ 3.2	≤ 4.0	≤ 4.5	≤ 4.8

C-1-11. Computed wave height (m), 25 km < D ≤ 30 km

Average depth (m)	Average wind velocity (m/ s)			
	w ≤ 10	10 < w ≤ 15	15 < w ≤ 20	20 < w ≤ 25
10 < h ≤ 15	≤ 0.95	≤ 1.45	≤ 1.90	≤ 2.35
5 < h ≤ 10	≤ 0.90	≤ 1.30	≤ 1.70	≤ 2.05
h ≤ 5	≤ 0.75	≤ 1.00	≤ 1.20	≤ 1.40

C-1-12. Peak wave period Tp (s), 25 km < D ≤ 30 km

Average depth (m)	Average wind velocity (m/ s)			
	W ≤ 10	10 < W ≤ 15	15 < W ≤ 20	20 < W ≤ 25
10 < h ≤ 15	≤ 3.7	≤ 4.5	≤ 5.2	≤ 5.7
5 < h ≤ 10	≤ 3.6	≤ 4.3	≤ 4.90	≤ 5.5
h ≤ 5	≤ 3.3	≤ 4.0	≤ 4.5	≤ 4.9