Solution:

the slope ratio $= \frac{8.71-5.72}{100} = 0.015 < 0.02$

So $D = 6.33$

In china code (GB-50009-2012)

$U_H = 40\sqrt{\mu_H w_0} = 40\sqrt{2\times 0.55} = 41.95 m/s$

For the First period:

$\bar{U}_{cr1} = \frac{D}{St T_1} = \frac{6.33}{0.2\times 2.102} = 15.06 m/s$

For the second period:

$\bar{U}_{cr2} = \frac{D}{St T_2} = \frac{6.33}{0.2\times 0.508} = 62.303 m/s$

So only check the first period

the $Re = 69000 \bar{U}_{cr1} D > 3.5\times 10^6$

So it need check

The ~~strat~~ start height:

$H_1 = H\left(\frac{\bar{U}_{cr1}}{h_2 U_H}\right)^{\frac{1}{\alpha}} = 100\times\left(\frac{15.06}{1.22\times 41.95}\right)^{\frac{1}{0.15}} = 0.032m$

So the resonance height $= 0.032 \sim 100m$

as $\frac{H_1}{H} = \frac{0.032}{100}$, $\lambda_1 = 1.56$

The cross-wind force

$P_{dH}(z_i) = P_{dli}(z_i) h_i = \lambda_1 \frac{\phi_1(z_i)\bar{U}_{cr1}^2 D_0 h_i}{12800\zeta_j}$

$= P_{d1}(z_1) = 1.56\times \frac{\phi_1(z_1)\times 15.06^2\times 6.33\times h_i}{12800\times 0.05} = 3.499\phi_1(z_i)h_i$

The resuld are shown in this figure :

Point	1	2	3	4	5	6	7	8	9	10
Z_i(m)	10	20	30	40	50	60	70	80	90	100
$G_1(z_i)$(KN)	3000	2600	1700	1510	1340	1200	1110	1070	990	990
$D(z_i)$(m)	8.710	7.860	7.460	7.060	6.660	6.460	6.260	6.060	5.880	5.720
$\phi(z_i)$ (m)	0.008	0.036	0.085	0.158	0.255	0.374	0.514 0.513	0.667	0.833	1.000
P_{dz1}(KN)	0.816	1.224	2.890	5.272	8.670	12.716	17.442	22.678	28.322	17.000
M_{dz1}(KN·m)	8.160	24.480	81.720	44.880	433.500	762.960	1220.940	1814.240	2548.980	1700.000

The base loading moment :

$$M_{u1(0)} = 8814.84 \text{ KN·m}$$