

접수된 다공원판의 고유진동해석

Free Vibration Analysis of Perforated Circular Plates

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1. f_L , f_o , T_p^* , T_L^* 가가 가 (1) η 가 (2) ,

$$\eta = \frac{T_L^*}{T_p^*} = \left(\frac{\rho}{\rho_o} \right) \left(\frac{A}{A_o} \right) \left(\frac{h}{d_{eq}} \right) \tau \quad (2)$$

(1-) 가 , τ (3)

$$\tau = \frac{\rho A h}{\rho_o A_o d_{eq}} \left[\left(\frac{f_o}{f_L} \right)^2 - 1 \right] \quad (3)$$

2. 가

2.1 가

ρ , ρ_o , A , A_o , h , d_{eq} 가

2.2 가 가

ANSYS

(1) (4) 6 가

$$f_L = \frac{f_o}{\sqrt{1 + (T_L^*/T_p^*)}} = \frac{f_o}{\sqrt{1 + \eta}} \quad (1)$$

$$\tau = -0.00596 + 0.55755 \exp[-(d/p)/0.21575] + 2.27499 \exp[-(d/p)/0.0630] + 10.14908 \exp[-(d/p)/0.02503] \quad (4)$$

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d , p

3.

가 가 가

(5)

$$fr_L = \frac{fr_A}{\sqrt{1 + \tau \rho_o D^3 / \{2 \rho h (D^2 - N d^2)\}}}$$

fr_A fr_L

D

, N

Fig. 1

ANSYS

가 Table 1

Table 2

(5)

가

d/p 가

가

가 가

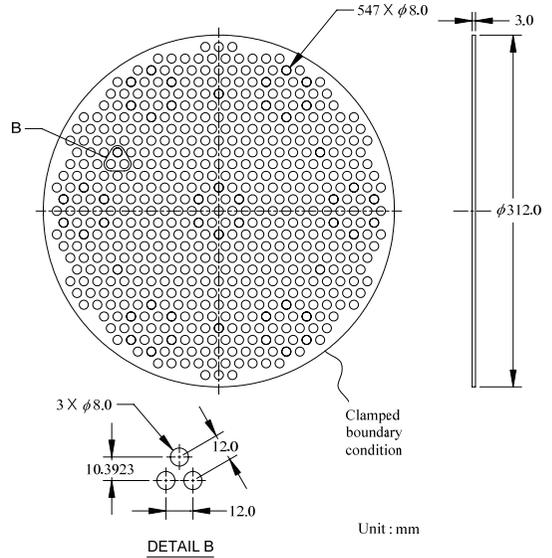


Fig. 1 Perforated plate submerged in water

4.

가 가

가

. d/p 가

Table 1 Input data for a perforated plate and water

Variable	Value	Variable	Value
D	312.0 mm	d	8.0 mm
h	3.0 mm	E	69 GPa
p	12.0 mm	μ	0.33
ρ_o	1000 kg/m ³	ρ	2700 kg/m ³

Total number of shell Elements = 38330

Total number of fluid elements = 1948120

Table 2 Natural frequency of flexible perforated plate

Mode			In air	Wet condition		
Serial	n	m		Calc.	FEM	Error
1	0	0	275.2	218.6	212.7	2.77
2	1	0	570.8	453.3	442.9	2.35
3	2	0	933.6	741.4	726.6	2.04
4	0	1	1064.2	845.2	829.0	1.95
5	3	0	1361.0	1080.7	1058.8	2.07
6	1	1	1622.6	1288.8	1267.8	1.66
7	4	0	1855.2	1473.4	1450.8	1.56
8	2	1	2249.9	1786.9	1762.6	1.38
9	0	2	2369.3	1881.9	1855.7	1.41

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