



兰州交通大学

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活载情况		单孔轻载		单孔重载		双孔重载	
力及力矩		N(kN)	M(kN.m)	N(kN)	M(kN.m)	N(kN)	M(kN.m)
主梁	桥跨恒载 N_1	1077.08	0	1077.08		1077.08	
	活载压力 R	759.76	212.73	1166.74	326.69	1821.9	0
墩顶合力(顺、横)		1836.84	212.73	2243.82	326.69	2898.98	0
墩顶初始偏心距 $e_0^{(m)}$		$\frac{212.73}{1836.84} = 0.116$		$\frac{326.69}{2243.82} = 0.146$		$\frac{0}{2898.98} = 0$	
墩顶面积 $A_1 (m^2)$		$\pi \times 0.75^2 + 15 \times 2.7 = 5.82$					
墩顶截面惯性矩 $I_0^{(m^4)}$		$\frac{\pi}{64} \times 1.5^4 + \frac{1}{12} \times 2.7 \times 1.5^3 = 1.01$					
墩底面积 $A_2 (m^2)$		$\pi \times 0.75^2 + 1.9 \times 2.7 = 7.97$					
墩底截面惯性矩 $I_d^{(m^4)}$		$\frac{\pi}{64} \times 1.9^4 + \frac{1}{12} \times 2.7 \times 1.9^3 = 2.18$					
$m (I_0/I_d, 2-7)$		$I_0/I_d = 1.01/2.18 = 0.463$ 查表2-7, $m = 1.87 + \frac{0.13}{0.1} \times 0.063 = 1.195$					
墩身平均面积		$A_0 \approx \frac{A_1 + A_2}{2} = \frac{5.82 + 7.97}{2} = 6.90$					
计算长度 $l_0 (m)$		$2 \times (0.6 + 16) = 33.2$					
$E_0 (kPa)$		24×10^6					
$\alpha^2 = \frac{0.1}{0.2 + \frac{e_{0R}}{h}} + 0.16$		$\frac{0.1}{0.2 + \frac{0.116}{1.7}} + 0.16 = 0.533$		$\frac{0.1}{0.2 + \frac{0.146}{1.7}} + 0.16 = 0.510$		$\frac{0.1}{0.2 + \frac{0}{1.7}} + 0.16 = 0.66$	
$\lambda = \frac{4mE_0I_d}{l_0^2} \Rightarrow \times$		$\frac{4 \times 1.195 \times 24 \times 10^6 \times 2.18}{33.2^2} = 0.37 \times 10^6$		0.37×10^6		0.37×10^6	
$\alpha \cdot \lambda$		197210		188700		244200	



$N_{or} = \alpha \cdot \alpha$	$17210 \times \left[1 + \frac{1}{17210} \times \frac{1}{1.1 \times 1.6 \times 1.6} \right]$		
$\left[\frac{1}{1 + \alpha \cdot \alpha \cdot \frac{1}{1.1 \times 1.6 \times 1.6}} \right]$	$= 56751$	56027	60088
主力 $KV_{顶} (K=2)$	3673.68	4487.64	5797.96
主力 $\beta_{max} = \frac{1}{1 - \frac{KV_{顶}}{N_{or}}}$	$1 - \frac{3673.68}{17210} = 1.019$	$1 - \frac{4487.64}{188700} = 1.025$	$1 - \frac{5797.96}{244200} = 1.025$
主+附 $KV_{顶} (K=1.6)$	2938.944	3590.112	4638.368
主+附 β_{max}	$1 - \frac{2938.944}{17210} = 1.015$	$1 - \frac{3590.112}{188700} = 1.019$	$1 - \frac{4638.368}{244200} = 1.019$

$$N_t = 447.8 + 38 \times 16.56 = 1077.08$$

$$R_1 = \frac{1}{16} [250 \times 4 \times (1.6 \times \frac{3}{2} - 0.25) + 10.9 \times 85 \times (\frac{10.9}{2} + 5.6 - 0.25)]$$

$$= \frac{1}{16} (12156.2) = 759.76$$

$$MR_1 = 759.76 \times 0.28 = 212.73$$

$$R_2 = \frac{1}{16} [250 \times 4 \times (10.9 + \frac{4.8}{2} + 0.8 - 0.25) + 10.9 \times 85 \times (\frac{10.9}{2} - 0.25)]$$

$$= \frac{1}{16} (18667.8) = 1166.74$$

$$MR_2 = 1166.74 \times 0.28 = 326.69$$

$$R_3 = R_4 = \frac{1}{16} [85 \times 13.3 \times (\frac{13.3}{2} - 0.25) + 2 \times 250 \times (16.53 - 0.25 - 1.61)]$$

$$= \frac{1}{16} (14575.2) = 910.75$$

$$MR_{3-4} = 0.$$

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计算结果表明：墩身受压稳定为双孔满载加桥跨恒载的主力组合控制。