

List of Tables

Table 2-1 Summary of the large-scale field model tests, adopted from Phung Duc Long (2010)	12
Table 2-2 Definitions of load efficiency factors, adopted from Phung Duc Long (2010).....	13
Table 2-3 the geometrical information of piled raft models and the recorded load sharing at 0.5MPa	65
Table 2-4 Piled raft and conventional piled foundations for high-rise buildings - Case Histories (Phung, 2011).....	76
Table 3-1 Test on Model Unpiled raft foundation.....	82
Table 3-2 Test on Model single pile foundation.....	83
Table 3-3 Test on Model pile group foundation.....	84
Table 3-4 Test on Model piled raft foundation.....	85
Table 3-5 Numerical study on Model piled raft foundation.....	86
Table 3-6 Index and Engineering properties of sand	88
Table 4-1 Dimensions of Hollow piles with closed cone end.....	97
Table 4-2 Dimensions of piles used for the study of different shape of piles	98
Table 4-3 Notations of different soil-pile friction angles based on the degree of pile surface roughness.....	100
Table 4-4 soil-pile friction angles obtained from direct shear box test	101
Table 4-5 Dimensions of different shape of model raft	101
Table 4-6 Details of parameters used to achieve the desired density of sand using surface vibration technique.....	115
Table 4-7 properties of soil.....	120
Table 4-8 Properties of soil used for defining soil model (for validation of experimental study and prototype analysis).....	121
Table 4-9 Properties of model mild steel Pile (for validation of experimental study)	121
Table 4-10 Properties of Raft (for validation of experimental study)	121
Table 4-11 Properties of soil (Messe - Torhas Building).....	123
Table 4-12 Properties of pile (Messe - Torhas Building).....	124
Table 4-13 Material properties used in numerical analysis (Ahmed et al. (2021)	125
Table 4-14 Material parameters for the soil (ANDRÉ RYLTIENIUS)	127
Table 4-15 Material parameters for the raft (ANDRÉ RYLTIENIUS)	127
Table 4-16 Material parameters for the embedded piles (ANDRÉ RYLTIENIUS).....	128

Table 4-17 Parametric details of pile, raft, and piled raft foundation used in the experimental study for the Validation of the present numerical model.....	129
Table 4-18 Properties of Pile and Raft considered in the study	130
Table 4-19 Details of configurations	131
Table 5-1 Comparison of ultimate load of unpiled raft foundation (Q_{ur}) with different shape of raft and at different relative densities of sand bed.....	146
Table 5-2 Comparison of ultimate load of unpiled raft foundation (Q_{ur}) at different relative densities of sand bed	146
Table 5-3 Ultimate bearing capacity of unpiled raft foundation (q_{ult}) with different shape of raft and at different relative densities of Orsang river sand bed.....	146
Table 5-4 Ultimate Bearing Capacity of unpiled raft foundation (q_{ult}) at different relative densities of Narmada river sand bed.....	147
Table 5-5 Initial tangent stiffness of the unpiled raft (UPR) with different shape of raft and at different relative densities of the orsang river sand bed.....	148
Table 5-6 Initial tangent stiffness of the unpiled raft (UPR) at different relative densities of the Narmada river sand bed.....	148
Table 5-7 Ultimate load of single pile $Q_{u,sp}$ and pile group $Q_{u,pg}$ with different spacing of piles at different relative density of sand bed.....	154
Table 5-8 Ultimate load of single pile $Q_{u,sp}$ and pile group $Q_{u,pg}$ with different L/d ratios at different relative densities of the sand bed	156
Table 5-9 Ultimate load of pile group $Q_{u,pg}$ with different shape of piles at different relative density of sand bed.....	160
Table 5-10 Initial tangent stiffness of single pile k_{p1} and pile group $(k_{pg})_i$ with different spacing of pile at different relative density of sand bed (Experimental and calculated using Fleming's relation).....	161
Table 5-11 Initial tangent stiffness of single pile k_{p1} and pile group $(k_{pg})_i$ with different L/d ratios of pile at different relative density of sand bed (Experimental and calculated using Fleming's relation).....	162
Table 5-12 Settlement of pile group with different L/d ratio (Experimental, calculated using Skempton and Meyerhof equation).....	163
Table 5-13 Settlement of pile group with different spacing of piles (Experimental, calculated using Skempton and Meyerhof equation)	164
Table 5-14 Settlement reduction ratio of PRF with a circular raft at different load levels and relative densities of the sand bed	192
Table 5-15 Load improvement ratio of PRF with a circular raft at different settlement levels and relative densities of the sand bed.....	193
Table 5-16 Settlement reduction ratio of PRF with a rectangular raft at different load levels and relative densities of the sand bed.....	194

Table 5-17 Load improvement ratio of PRF with a rectangular raft at different settlement levels and relative densities of the sand bed.....	195
Table 5-18 Settlement reduction ratio of PRF with a trapezoidal raft at different load levels and relative densities of the sand bed.....	196
Table 5-19 Load improvement ratio of PRF with a trapezoidal raft at different settlement levels and relative densities of the sand bed.....	197
Table 5-20 Settlement reduction ratio of PRF with a square raft at different load levels and relative densities of the sand bed.....	198
Table 5-21 Load improvement ratio of PRF with a square raft at different settlement levels and relative densities of the sand bed.....	199
Table 5-22 Efficiency factor of raft ($C1$), efficiency factor of pile group ($C2$), and efficiency of PRF at IYL ($\beta1$) in PRF with different shape of raft.....	207
Table 5-23 Efficiency factor of raft ($C1$), and efficiency factor of pile group ($C2$) in PRF with different shape of raft calculated from proposed equations and percentage variations in IYL determined from proposed equations with respect to experimental IYL	208
Table 5-24 Efficiency of PRF at FYL $\beta2$ and percentage variations in FYL of PRF with different shape of raft determined from proposed equations with respect to experimental FYL	210
Table 5-25 Variations in primary stiffness of PRF $kprp$ with different shapes of raft (experimental) and determined from the proposed equation.....	214
Table 5-26 Variations in secondary stiffness of PRF $kprsw$ with different shapes of raft (experimental) and determined from the proposed equation.....	216
Table 5-27 Comparison of IYL obtained from experimental study and predicted from Poulos method.....	219
Table 5-28 Comparison of $kprp$ obtained from experimental study and predicted from Omeman method.....	221
Table 5-29 Settlement reduction ratio of PRF with different L/d ratios of pile at different load levels and 40% relative densities of the sand bed.....	241
Table 5-30 Settlement reduction ratio of PRF with different L/d ratios of pile at different load levels and 60% relative densities of the sand bed.....	241
Table 5-31 Settlement reduction ratio of PRF with different L/d ratios of pile at different load levels and 80% relative densities of the sand bed.....	242
Table 5-32 Load improvement ratio of PRF with different L/d ratios of pile at different settlement levels and 40% relative densities of the sand bed.....	243
Table 5-33 Load improvement ratio of PRF with different L/d ratios of pile at different settlement levels and 60% relative densities of the sand bed.....	243
Table 5-34 Load improvement ratio of PRF with different L/d ratios of pile at different settlement levels and 80% relative densities of the sand bed.....	244

Table 5-35 Efficiency factor of raft ($C1$), efficiency factor of pile group ($C2$), and efficiency of PRF at IYL ($\beta1$) with different L/d ratios of pile.....	245
Table 5-36 Efficiency factor of raft ($C1$), and efficiency factor of pile group ($C2$) in PRF with different L/d ratios of pile calculated from proposed equations and percentage variations in IYL determined from proposed equations with respect to experimental IYL	246
Table 5-37 Percentage variations in FYL of PRF with different L/d ratios of pile determined from proposed equations with respect to experimental FYL and efficiency of PRF at FYL ($\beta2$).....	248
Table 5-38 Variations in primary stiffness of PRF $kprp$ with different L/d ratios of pile (experimental) and determined from the proposed equation.....	251
Table 5-39 Variations in secondary stiffness of PRF $kprs$ with different L/d ratios of pile (experimental) and determined from the proposed equation.....	253
Table 5-40 Settlement reduction ratio of PRF with different spacing between piles at different load levels and 40% relative densities of the sand bed	272
Table 5-41 Settlement reduction ratio of PRF with different spacing between piles at different load levels and 60% relative densities of the sand bed	273
Table 5-42 Settlement reduction ratio of PRF with different spacing between piles at different load levels and 80% relative densities of the sand bed	274
Table 5-43 Load improvement ratio of PRF with different spacing between piles at different load levels and 40% relative densities of the sand bed	274
Table 5-44 Load improvement ratio of PRF with different spacing between piles at different load levels and 60% relative densities of the sand bed	275
Table 5-45 Load improvement ratio of PRF with different spacing between piles at different load levels and 80% relative densities of the sand bed	276
Table 5-46 Efficiency factor of raft ($C1$), efficiency factor of pile group ($C2$), and efficiency of PRF at IYL ($\beta1$) with different spacing between piles.....	278
Table 5-47 Efficiency factor of raft ($C1$), and efficiency factor of pile group ($C2$) in PRF with different spacing between piles calculated from proposed equations and percentage variations in IYL determined from proposed equations with respect to experimental IYL ...	279
Table 5-48 Percentage variations in FYL of PRF with different spacing between piles determined from proposed equations with respect to experimental FYL and efficiency of PRF at FYL ($\beta2$)	281
Table 5-49 Variations in primary stiffness of PRF $kprp$ with different spacing between piles (experimental) and determined from the proposed equation.....	284
Table 5-50 Variations in secondary stiffness of PRF $kprs$ with different spacing between piles (experimental) and determined from the proposed equation	286
Table 5-51 Settlement reduction ratio of PRF with different configuration of piles at different load levels and 60% relative densities of the sand bed	300

Table 5-52 Load improvement ratio of PRF with different configuration of piles at different load levels and 60% relative densities of the sand bed	301
Table 5-53 Primary Stiffness of Piled Raft k_{prp} in kN/m and Secondary Stiffness of Piled Raft k_{prs} in kN/m with different configuration of piles	303
Table 5-54 Efficiency factors of the raft ($C1$), and pile group ($C2$) in PRF with different configuration of piles calculated from proposed equations and percentage variations in IYL determined from proposed equations with respect to experimental IYL	305
Table 5-55 Variations in FYL with different configurations of pile (experimental) and determined from the proposed equation.....	308
Table 5-56 Settlement reduction ratio of PRF with different soil-pile friction angles at different load levels and 40% relative densities of the sand bed.....	328
Table 5-57 Settlement reduction ratio of PRF with different soil-pile friction angles at different load levels and 60% relative densities of the sand bed.....	329
Table 5-58 Settlement reduction ratio of PRF with different soil-pile friction angles at different load levels and 80% relative densities of the sand bed.....	329
Table 5-59 Load improvement ratio of PRF with different soil-pile friction angles at different settlement levels and 40% relative densities of the sand bed.....	330
Table 5-60 Load improvement ratio of PRF with different soil-pile friction angles at different settlement levels and 60% relative densities of the sand bed.....	331
Table 5-61 Load improvement ratio of PRF with different soil-pile friction angles at different settlement levels and 80% relative densities of the sand bed.....	331
Table 5-62 Primary Stiffness of Piled Raft k_{prp} in kN/m and Secondary Stiffness of Piled Raft k_{prs} in kN/m with different soil-pile friction angles.....	333
Table 5-63 Settlement reduction ratio of PRF with different shape of piles at different load levels and 40% relative densities of the sand bed.....	339
Table 5-64 Settlement reduction ratio of PRF with different shape of piles at different load levels and 60% relative densities of the sand bed.....	340
Table 5-65 Settlement reduction ratio of PRF with different shape of piles at different load levels and 80% relative densities of the sand bed.....	341
Table 5-66 Load improvement ratio and efficiency of PRF with different shape of piles at different settlement levels and 40% relative densities of the sand bed.....	342
Table 5-67 Load improvement ratio and efficiency of PRF with different shape of piles at different settlement levels and 60% relative densities of the sand bed.....	343
Table 5-68 Load improvement ratio and efficiency of PRF with different shape of piles at different settlement levels and 80% relative densities of the sand bed.....	344
Table 5-69 Primary Stiffness of Piled Raft k_{prp} in kN/m and Secondary Stiffness of Piled Raft k_{prs} in kN/m with different shape of piles	346
Table 5-70 Values at Initial Yield Load at square pattern	355

Table 5-71 Values at Final Yield Load at square pattern.....	355
Table 5-72 Values at Initial Yield Load at circular pattern.....	356
Table 5-73 Values at Final Yield Load at circular pattern.....	356
Table 5-74 Properties of foundation soil.....	381