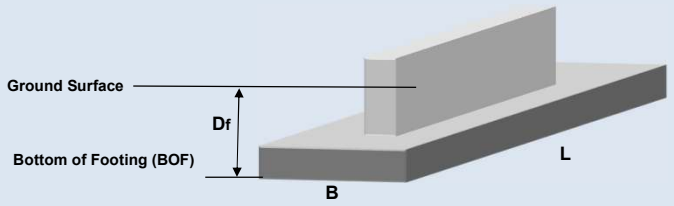
ANALYSIS OF BEARING CAPACITY OF A RECTANGULAR SPREAD FOOTING

PROJECT INFORMATION	
Project Name	
Project No.	
Project Location	
Analyzed By	
Reviewed By	

GENERAL INPUT PARAMETERS	
Analysis Description	Continuous Footing (Typical)
Bearing Capacity Failure Mode	General Shear
ASD Factor of Safety Against Bearing Failure, FS	3.00
LRFD Bearing Resistance Factor (Strength)	0.55
LRFD Bearing Resistance Factor (Extreme Event)	1.00
Effective Footing Width, B	2.00 feet
Effective Footing Length, L	40.00 feet
Footing Embedment Depth, D_f	2.00 feet, below ground surface
Ground Slope Angle, β	0.00 degrees
Footing Base Angle, α	0.00 degrees
Depth to Design GWT, D_w	20.00 feet, below ground surface



FOUNDATION SOIL PARAMETERS	
Total Unit Weight, γ_t	120.00 pcf
Saturated Unit Weight, γ_{sat}	125.00 pcf
Friction Angle, ϕ	32.00 degrees
Cohesion, c	0.00 psf

COMPUTED PARAMETERS	
Unit Weight of Water, γ_w	62.40 pcf
Effective Cohesion, c_{eff}	0.00 psf
Effective Friction Angle, ϕ_{eff}	32.00 degrees
Depth of Wedge Zone, $D = 0.5B \tan(45°+\phi_{eff}/2)$	1.80 feet
Effective Unit Weight, γ_{eff}	120.00 pcf
Effective Pressure at Footing Base, q_b	240.00 psf
Depth Factor Parameter, k	1.00
Bearing Capacity Factor N_c	35.49
Bearing Capacity Factor N_q	23.18
Bearing Capacity Factor N_γ	30.21
Shape Factor s_c	1.03
Shape Factor s_q	1.03
Shape Factor s_γ	0.98
Depth Factor d_c	1.40
Depth Factor d_q	1.28
Depth Factor d_γ	1.00
Ground Slope Factor g_c	1.00
Ground Slope Factor g_q	1.00
Ground Slope Factor g_γ	1.00
Footing Base Factor b_c	1.00
Footing Base Factor b_q	1.00
Footing Base Factor b_γ	1.00

COMPUTED BEARING CAPACITIES	
Ultimate (Nominal) Bearing Resistance, q_{ult} $q_{ult} = c\, N_c\, s_c\, d_c\, g_c\, b_c + q_b\, N_q\, s_q\, d_q\, g_q\, b_q + 0.5\, \gamma_{eff}\, B\, N_\gamma\, s_\gamma\, d_\gamma\, g_\gamma\, b_\gamma$ When $\phi = 0$, $q_{ult} = 5.14\, S_u\, (1 + s_c + d_c - b_c - g_c) + q_b$	10.9 ksf
Allowable Bearing Resistance, $q_{allow} = q_{ult\text{-}ave}/(FS)$	3.6 ksf, check if footing settlement < 1.0 inch
Bearing Resistance (Strength Limit State)	6.0 ksf, check if greater than the applied load
Bearing Resistance (Extreme Event Limit State)	10.9 ksf, check if greater than the applied load

REFERENCES:

1. AASHTO LRFD Bridge Design Specifications (2012).
2. Bowles, J. (1997), Foundation Analysis and Design - 5th Ed., "Chapter 4: Bearing Capacity of Foundations."
3. Vesic, A.S. (1973), "Analysis of Ultimate Loads of Shallow Foundations," J. of Soil Mech., ASCE Vol 99, No. SM1.