Soil-Structure Interaction

Foundation Design with Geotechnical Considerations

FIGURE 1. SOIL-STRUCTURE INTERACTION MODEL

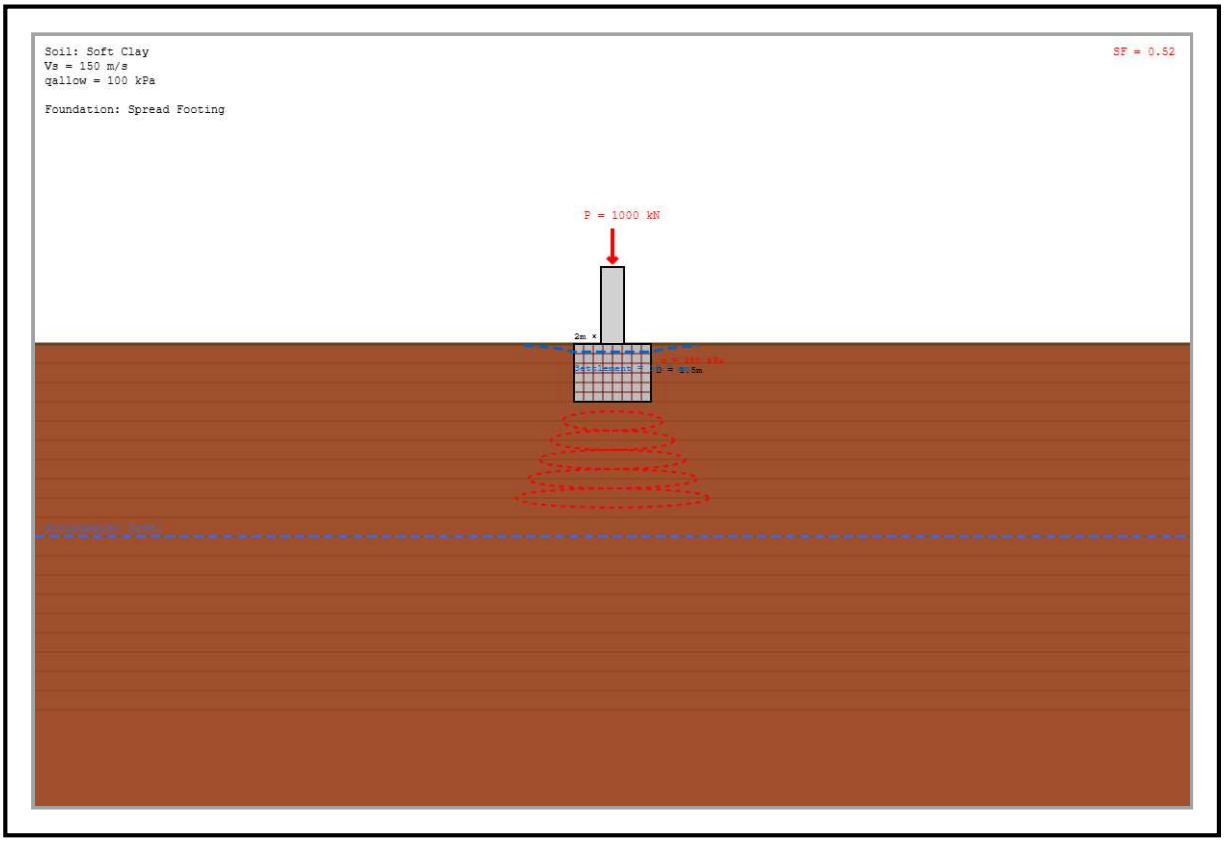

Fig. 1. Foundation behavior under structural loads considering soil properties and seismic effects

SOIL CONDITIONS

ROCK

DENSE SAND

SOFT CLAY

SELECTED SOIL PROPERTIES:

- *Vs = 150 m/s*
- *Bearing = 100 kPa*
- *Soft clay, poor foundation*

GROUNDWATER DEPTH (M)

5.000

FOUNDATION TYPE

SPREAD FOOTING

STRIP FOOTING

MAT FOUNDATION

PILE FOUNDATION

FOUNDATION SIZING

WIDTH (M)

2.000

LENGTH (M)

2.000

DEPTH (M)

1.500

STRUCTURAL LOADING

COLUMN LOAD (KN)

1000.000

SEISMIC ACCELERATION (G)

0.25

FOUNDATION ANALYSIS

BEARING PRESSURE:	**250.0** kPa
ALLOWABLE BEARING:	**130.0** kPa
SAFETY FACTOR:	**0.52**
SETTLEMENT:	**16.7** mm
SEISMIC AMPLIFICATION:	**1.33**

✗ **INADEQUATE**

Minimum SF = 2.5 recommended

DISPLAY OPTIONS

- [x] SHOW STRESS DISTRIBUTION
- [x] SHOW SETTLEMENT PROFILE

VERIFY WITH WOLFRAM ALPHA →

Foundation Design Principles

KEY DESIGN FACTORS

- ***Bearing Capacity:*** *Maximum pressure soil can support*
- ***Settlement:*** *Vertical deformation under load*
- ***Safety Factor:*** *Margin against bearing failure*
- ***Seismic Response:*** *Dynamic amplification effects*
- ***Groundwater:*** *Reduces effective stress and capacity*

FOUNDATION SELECTION

- ***Spread Footings:*** *Good soil, moderate loads*
- ***Strip Footings:*** *Walls, uniform loading*
- ***Mat Foundations:*** *Poor soil, heavy structures*
- ***Pile Foundations:*** *Very poor surface soils*
- ***Deep Foundations:*** *High loads, weak soils*

SEISMIC CONSIDERATIONS

Seismic forces modify foundation design through soil amplification effects. Softer soils amplify ground motion more than stiff soils. The shear wave velocity (Vs) is a key parameter for determining site amplification factors used in seismic design.