



**ENSOFT, INC.**  
**ENGINEERING SOFTWARE**

3003 West Howard Lane  
Austin, Texas 78728

Phone: 512-244-6464

Fax: 512-244-6067

E-mail: sales@ensoftinc.com

[www.ensoftinc.com](http://www.ensoftinc.com)

## GeoMat

### Analyses of a Soil-Supported Mat or Structural Slab

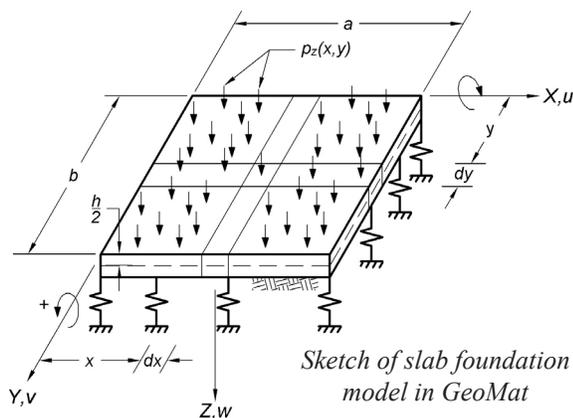
#### GENERAL DESCRIPTION

The program is aimed at the solution under static loading of two classes of problems encountered in structural engineering: a soil-supported mat or a structural slab. The mat or structural slab is modeled with linear finite elements. The shape may be rectangular, round, or irregular and the thickness may vary.

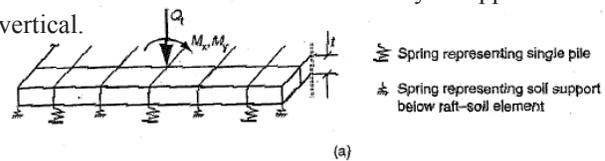
For the soil-supported mat, soil is assumed to have a linear response, defined as the subgrade modulus, and is characterized by a set of springs which can vary in stiffness at points under the mat. The springs can reflect horizontal resistance as well as vertical. The solution follows the classical Winkler model. This method of modeling soil has been widely used in the analysis of flexible beams, pavement, and mats on elastic materials.

When a structural slab is analyzed, the supports can be assumed to exist at the edges, or along the interior of the slab, as for beams. The edges of the slab are assumed to be simply supported or subjected to a moment. The supports for the slab may be assumed to be unyielding or set of deflections may be specified. Iteration may be done externally to get agreement between deflection of the slab and that of the supporting beams.

Geo-Mat allows the user to specify loadings on the surface of the mat or slab as uniform, or distributed, or concentrated as from columns. Horizontal loads may be applied as well as vertical.



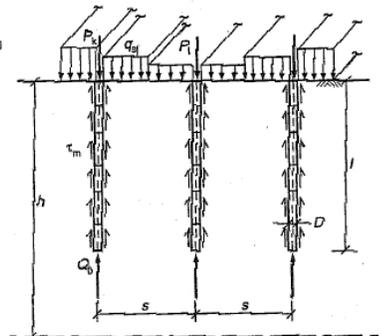
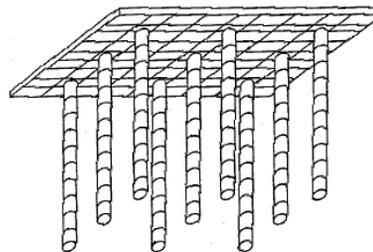
Sketch of slab foundation model in GeoMat



(a)



Iterative compatibility between (a) and (b)



#### METHOD OF ANALYSIS

The engineer must make several initial steps in performing the analysis and design of a soil-supported mat or a structural slab: 1. estimate the allowable bearing capacity of the mat or the resistance provided by the structural members supporting the slab; 2. estimate settlement and differential movement of the mat or slab; and 3. estimate the moments and shears for the structural design of the mat or slab. Assuming that a geotechnical engineer has provided information on the soil, leading to an estimate of the bearing capacity of the mat, the experience of the structural engineer will allow for the sizing of the mat or slab for the initial analyses.

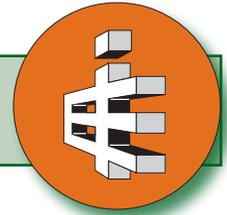
With regard to the soil-supported mat, the initial data provided by the geotechnical engineer may show a range of values because the settlement is dependent on the stiffness of the soil and on the rigidity of the mat. Iterative procedures sometimes is employed to achieve the optimized solution.

Loadings on a mat or a slab can vary widely in nature and magnitude. The finite-element method has been the best tool to take into account the variety of loadings as well as the properties of the material in a structure. With modern methods of characterizing material in the mat or slab and with the capability of desktop computers, solutions to finite-element arrays proceed rapidly and with a degree of accuracy in the control of the user.

For a given set of loadings, deformations and movements within the mat and slab can be computed, along with bending moment and shear stress at any point with the material. These results provide the engineer with information on which to base the design of the system. The method can be applied to a mat or slab that is circular, rectangular, or an irregular shape, leading to a powerful analytical tool.

# GeoMat

## Analyses of a Soil-Supported Mat or Structural Slab



### PROGRAM FEATURES

- The program employs well-established analytical solutions for soil-structure-interaction under static loading.
- The program does not set a limit on the number of finite element meshes for modeling. Only the size of RAM in the user's computer will limit the available meshes. The element types include 4-node linear elements, 8-node quadratic elements, and 9-node Lagrangian elements.
- The soil is assumed to behave in the linear range, but the user may assign different values of subgrade stiffness at various desired locations of the foundation.
- The user may input various concentrated loads at nodal points, distributed loads at any element, and uniform loads for an entire mat or slab.
- The user may specify a mat or slab with any shape. The program has the capability to generate automatically finite meshes for mats or slabs with rectangular shapes or circular shapes.

The program has the capability to generate automatically finite meshes for mats or slabs with rectangular shapes or circular shapes.

The program will display the layout of finite-element meshes with nodal numbers and element numbers.

The program will generate contour graphics of slab deformation and stress distribution. Section cut is a useful tool to plot stress components along one or more straight cut lines.

This version has the ability to compute deformation and stresses of space orthotropic plates. Three types are covered in this version are: uniform plates with orthotropic reinforcements, plate with orthotropic enhanced ribs, and plate with one way box section. This software also provides the option for inputting user-defined orthotropic properties.

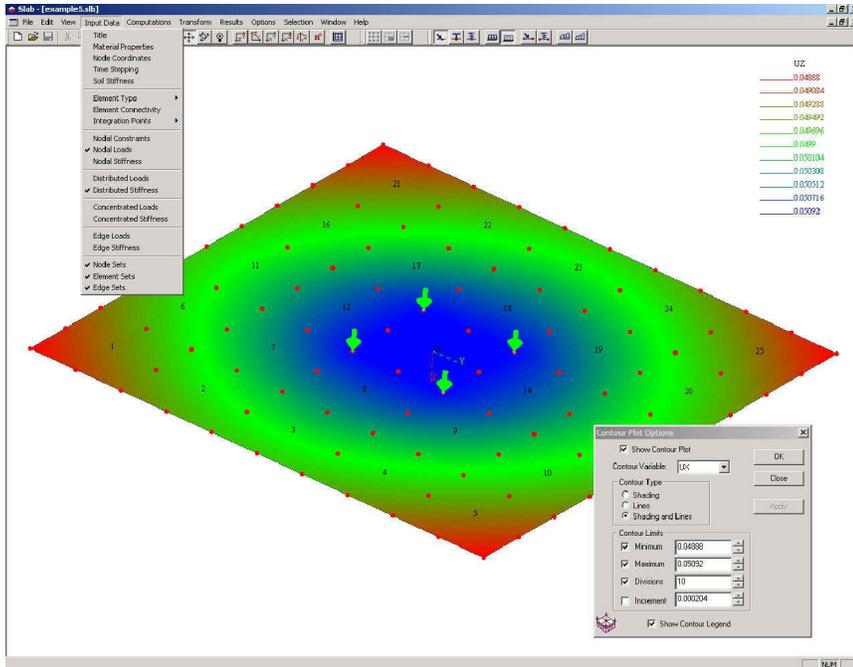


Plate with orthotropic ribs

OK Cancel

b1=

c1=

h1=

b2=

c2=

h2=

Plates with one way box section

OK Cancel

b=

n=

h=

t1=

t2=

t3=

