INTRODUCTION

This computer program is an updated version of a program with the same name written in 1987 by Rick Allen and Mike Duncan. The original program, which operated under DOS, has become outdated and inconvenient by today's standards. This new version, which is Windows-based, is easier to use. The program (called "Zee-Stress") computes vertical stresses due to surface loads, which are useful in computing settlements. The program calculates stresses due to point loads and loads distributed over rectangular areas, using the Boussinesq and the Westergaard equations.

ZSTRESS 2.0 was written in Microsoft Visual Basic 6.0. The program is interactive, and has facilities for creating, storing and editing data files, and for printing results.

METHOD OF ANALYSIS

ZSTRESS 2.0 calculates changes in vertical stresses due to surface loads using both the Boussinesq and the Westergaard solutions for point loads and for loads distributed uniformly over rectangular areas. The equations used within the program are:

<u>Boussinesq Equations</u> (Poulos and Davis, 1974)

Point Load: $\quad \Delta\sigma_z = \dfrac{3Q}{2\pi}\dfrac{z^3}{R^5}$

Where:

$\Delta\sigma_z$ = Change in vertical stress $\qquad$ (stress)
Q = magnitude of point load $\qquad$ (force)
z = depth of stress point $\qquad$ (length)
$R = \sqrt{x^2 + y^2 + z^2}$ $\qquad$ (length)
x = distance from load to stress point in x-direction (length)
y = distance from load to stress point in y-direction (length)

Rectangular Load: $\quad \Delta\sigma_z = \dfrac{q}{2\pi}\left[\tan^{-1}\left(\dfrac{BL}{zr_3}\right) + \left(\dfrac{BLz}{r_3}\right)\left(\dfrac{1}{r_1^2} + \dfrac{1}{r_2^2}\right)\right]$

Where:

$\Delta\sigma_z$ = change in vertical stress beneath corner
$\qquad$ of rectangular loaded area $\qquad$ (stress)
q = magnitude of surface pressure $\qquad$ (stress)
B = width of rectangle $\qquad$ (length)
L = length of rectangle $\qquad$ (length)
z = depth of stress point $\qquad$ (length)
$r_1 = \sqrt{B^2 + z^2}$ $\qquad$ (length)
$r_2 = \sqrt{L^2 + z^2}$ $\qquad$ (length)
$r_3 = \sqrt{B^2 + L^2 + z^2}$ $\qquad$ (length)